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With this publication, the CD with all papers from the International Conference on Information Technology and Development of Education, ITRO 2014 is also published.

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INTRODUCTION

This Proceedings comprises papers from the **International conference on Information technology and development of education** that is held in the National House of Mihajlo Pupin, Idvor on June 27th 2014.

The International conference on Information technology and development of education has had a goal to contribute to the development of education in Serbia and in the region, as well as, to gather experts in natural and technical sciences' teaching fields.

The expected scientific-skilled analysis of the accomplishment in the field of the contemporary information and communication technologies, as well as analysis of state, needs and tendencies in education all around the world and in our country have been realized.

The authors and the participants of the Conference have dealt with the following thematic areas:

- Theoretical and methodological questions of contemporary pedagogy
- Personalization and learning styles
- Social networks and their influence on education
- Children security and safety on the Internet
- Curriculum of contemporary teaching
- Methodical questions of natural and technical sciences subject teaching
- Lifelong learning and teachers' professional training
- E-learning
- Education management
- Development and influence of IT on teaching
- Information communication infrastructure in teaching process

All submitted papers have been reviewed by at least two independent members of the Science Committee.

The papers presented on the Conference and published in this Proceedings can be useful for teacher while learning and teaching in the fields of informatics, techniques and other teaching subjects and activities. Contribution to science and teaching development in this region and wider has been achieved in this way.

The Organizing Committee of the Conference

CONTENTS

STUDENTS' TRAINING THROUGH THE BLACKBOARD LEARN E-PLATFORM

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Abstract - Looking for possibilities to adapt the educational process in higher education to the requirements of the labor market requires bringing forward the use of electronic forms of distance learning. A good way to ensure quality education services in high schools is mixed (electronic and traditional) education, which develops and incorporates the possibilities offered by information and communication technologies in traditional educational context. The broad understanding of mixed education refers to the integration of electronic and traditional learning, in which electronic environment is specially organized to have key functions in the overall educational process in higher education, namely by helping in achieving and supporting students' learning and the students' interaction with learning resources, other students and their teachers . This study presents the mixed (traditional and electronic) training of students as it has been applied in the Faculty of Pedagogy and the attitude of students towards it. It introduces the experience of teachers to work with the e-learning platform Blackboard Learn. An attempt has been made to display the accents on the requirements for educational content and its presentation in the electronic platform in the extracurricular activities of the students and the possibilities for the diagnosis and assessment of their academic achievement.

I. BLENDED EDUCATION OF UNIVERSITY STUDENTS FROM THE PEDAGOGY MAJORS

The growing demands towards the preparation of the students with pedagogical majors and the need for continuous improvement of the quality of higher education have resulted in the search for new and more effective educational technologies and practices. The development of the information and communication technologies enables their successful integration within the framework of the university education at different levels. The e-learning environment allows students to determine their own pace of learning as well as the time, place and duration of the learning process. The e-learning platforms are extremely flexible and adjust the learning process in accordance with the individual needs of each student and the specifics of the course of study. The platforms and the e-learning environment allow for the training of large groups, and at the same time provide individual assessment of the achievements. The informal communication between the teacher and the students via the electronic portal provides valuable feedback and assessment of the adequacy of the training and its usefulness as well as valuable guidance for its improvement. In turn, the student has the opportunity to get a quick, easy and timely access to the course content, the tools for testing and assessment, as well as the possibility of direct contact with other participants in the training or the trainer. Modern e-learning platforms allow for the presentation of the educational content in a more attractive way and thus adding a strong motivational aspect [3].

This possibility is explored through the blended education at university level and its context of understanding. Due to its broad continuum, the term "blended education" does not have a unified understanding and there is no consensus on its context of understanding, thus allowing for the syntagmas "blended education", "hybrid education", "mixed education" and "integrated education" to be used interchangeably in the literature, which at times is unfounded.

Some see "blended education" as a relatively new methodology and a system of teaching and learning that combines the inspiration and motivation of traditional teaching in the classroom with the fun and flexibility of e-learning to create courses that are accessible and motivating for today's adult students. This implies adequate distribution of hours spent in the classroom and online and the opportunity to find the best combination between the ability of teachers to correct students' work online, and the ability to efficiently do group work, share experience, homework and last but not least adequate social communication with varying degrees of subordination.

This combination of face-to-face training and the online possibilities provided by electronic platforms and training resources varies depending on the educational content, motivation and needs of students; also on and teachers' opportunities to design and implement the blended education in an adequate educational environment.

Traditional teachers and trainers usually use different techniques to facilitate training. The idea for mixing approaches including lectures, group discussions in a different format, game elements, videos, and various tasks and role-playing games is not a new one. Blended education has been present for many years, although the term has been extended and purposefully used in the technologically enriched learning and education. In this context, the term is used to describe an approach that combines the "traditional" education with the "e-education" [2].

Blended education suggests preserving the general principles of building of the traditional educational process. The idea for applying elements of asynchronous (occurring later in time) and synchronous (occurring in real time) distance learning in the blended education lies in the supposition that students learn a particular part of the courses in the traditional ways, and another part via the technologies of network training [1].

According to J. Hoehn & P. Rietsch blended education is the result of the convergence of two archetypal learning environments - the traditional face-to-face learning: on the one hand online training on the other. Although blended education can be seen in a variety of forms, the authors believe it is not a simple combination of online and offline (in person) training and education, not only because the media and education in the classroom should be combined, but also because forms of learning depend on the learning objectives [2]. According to the authors, the leading mechanisms for the implementation of blended education in universities are as follows:

- the need to enrich the face-to-face teaching and e-learning by increasing the degree of interactivity and thus enhancing the requirement for a significant commitment to training with self-direction;
- the need to increase the availability and flexibility of learning in the context of lifelong learning;
- The need to increase cost efficiency because universities are looking for ways to use technology to achieve both improvement of the quality of education and reduction of costs [2].

The search for opportunities to fully design and implement blended education requires systematization of several of its main models, which play the role of conceptual frameworks. They enable its operationalization and technological realization in practice. Although the "patterns are abstract in their nature, they facilitate effective learning, which requires a specific understanding of the needs of learners, the educational content, the target groups and the organizational conditions and environment" [2].

The authors define seven basic models of blended education depending on the accents and ways of mixing the following context of understanding:

- **Mixing, which empowers** - focusing on the access to education and flexible learning, which in most cases is manifested by offering the same courses online and offline, and students are the ones to choose which type fits better their individual needs and at what point of time they are to use it;
- **Enrichment mixing** – it is characterized by the introduction of systems for learning management (LMS), through which teachers promptly enrich their courses with a specific level of technology by including traditional teaching in the classroom with additional online resources;
- **Transformation mixing** - it requires changes in the learning environment, in which students actively create knowledge through a dynamic interaction in the spirit of constructivism. The training is based on solving educational and cognitive tasks, which requires a new level of communication between the entities;
- **Blending of components** - all the components of the program are independent and each of them is fully applicable independently of the others - i.e., for each module there can be a set of independent components (the context of modular training);
- **Integrated mixing** - all components are integrated in the structure of the content and each component belongs to another or is based on other or others (context of the integrated education);
- **Mixing through cooperation** - a version of the integrated mixing, which has an additional collaborative environment (online conferences and discussions, consumer groups and other social software)?

- **Expensive mixing** – it involves formal education outside of the usual conditions [2].

These blended education models do not provide the whole range of options for its implementation, but represent a good basis for defining the features in accordance with the objectives, resources and opportunities for its practical implementation.

The implementation of the blended education through a specific e-learning platform and selection of appropriate media and design of the learning environment is in the context of Gane‘s theory, which outlines the following instructional events and the corresponding cognitive processes:

- attracting attention (reception)
- informing learners of the objective (expectations)
- stimulating the recall of prior learning (retrieval)
- presentation of the stimulus/a (selective perception)
- providing guidance on the education (semantic encoding)
- provoking action (response)
- providing feedback (reinforcement)
- assessment of the performance (recall)
- increasing the absorption and transfer (generalization).

These events must meet or provide the necessary conditions for learning and serve as a basis for designing the training and selection of appropriate media [4].

There are studies that characterize the blended (electronic and traditional) education from the perspective of students as its subjects and bring to the fore aspects such as:

- Blended education requires mechanical connection that has low social and scientific code;
- Blended education is a type of innovatory, but not innovative education, which deprives it of the real heuristic power and creativity, because not every novation is a guarantee for innovation;
- Blended education aims at changing the structure of the curricula, which is a component of the technology of education, but not a complete change of the learning and social interaction with students;
- Blended education requires informational environment and resources as a condition for technologizing the process, but not the humanization of the educational environment and space;
- Blended education is impossible outside of the availability of resources, but only as a type of savings, not as investment of time, money, efforts as a condition for future educational investment;
- Blended education and its possible outcomes are an indicator of the level of awareness and the way of information, but they are certainly not to change the spiritual basis of communication with students [7].

The idea for the implementation of blended education is directly related to trends in higher education in the European educational area, or more specifically:

- making the learning environment more learner-centered in the spirit of constructivism;
- active learning based on social cooperation;
- access to educational materials anywhere and anytime;
- complementing the possibilities of classical education these of the electronic platforms and learning resources.

II. The electronic platform Blackboard Learn – possibilities for blended education

The developing of software, which can meet the requirements of the modern tendencies in education as well as the supplementary services allowing its successful installment and application for life-long learning, guarantees the quality of the educational environment and the quantity of the education product. Blackboard Learn is a web based platform for e-learning whose main goal is an integral solution for the improvement of students’ achievements and their commitment in the educational process using various tools for interactive teaching and assessment. The platform provides the educators with tools for the creating of effective and attractive courses and activities, which encourage cooperation and improve the possibilities for a successful organization and realization of both curricular and extracurricular activities.

The platform effectively combines the possibilities of e-learning and provides faster learning for a smaller price, an increased access to education and a clear accountability for all participants in the process. Another advantage of e-learning is that teachers and students change their positions. The educator turns from an active part into a mediator who facilitates the process of acquiring information and the forming of skills and competences in the students. Meanwhile the students also take an active position.

Blackboard Learn for Academic Collaboration (Blackboard Learn) provides the possibility of managing courses online, a broader management of rights and roles on the platform, a centralized space for management of the content with maximum control over the content's elements, access, updates and links and integration of the platform to external sources**.** The platform is fully equipped with on-line trainings, video lessons on how to use the platform, i.e. how to access it or navigate your way through it, how to create, edit and delete courses, how to upload and use course content, how to manage an electronic journal, how to use the early notification system, etc. There are also the options of uploading photos, presentations and video content from various social networks without leaving the educational environment and without needing specific web programming knowledge. The system possesses modern and intuitive interface web 2.0, with an option for personalization of the view of the interface by the users through the changing of colors, fonts, designs and contents.

In general, **Blackboard Learn** provides the options for:

- creating of catalogues of courses, searching for courses and visibility of courses according to priory set roles and rights for the individual users of the system as well as a change in the settings of the course, accessibility or inaccessibility to certain tools and contents set by time and date;
- uploading of public information related to the teacher or the course;
- uploading of updates accessible to all students through the setting of certain rights;
- uploading of examination topic lists for students who have certain access rights;
- creating, editing and designing educational content even without the possessing of a specific web-programming knowledge;
- creating a number of section within a course;
- setting the order in which certain educational content is accessed and determining the sequence of its acquisition;
- providing a plan for a lecture or a seminar with a detailed description, guiding lines and assessment criteria provided by the professor;
- individual orientation through the options of accessibility to differentiated content based on the performance and advance of each student;
- automatic notification of the users for new activities, uploads, homework, examinations, tests or changes in the course schedule or content;
- verification and statistics of users' activities and access to the system along with option for them to be personalized;
- communication and interaction, including calendar, notifications and messages, email, tasks, chat, groups (allow control of membership, rights and accessibility to various tools);
- setting homework, doing test and exams on-line;

Test assessment made easy by the multiple options for creating of test questions and tasks which can also be defined by additional descriptive information (meta data); this allows their grouping by certain criteria in order for them to be further used in tests, quizzes, or in order for the question to be given a particular weigh when the course grade is formed; the platform also provides options for reviewing and correcting a grade, assessing the work of the professors, doing tests multiple times, self-evaluation, creating a questionnaire date base, etc.

III. FUNCTIONAL PROFILE OF THE PLATFORM

As the platform has been designed to provide a communication channel between the main subjects of education in higher educational institutions, it is to be viewed as a complex electronic didactic means whose functional definition has two sides**: technological and didactic.**

The technological functions derive from the options provided by the platform's software. It allows quick access and achievement of high levels of interaction between the main subjects in the educational process- the professors and the students.

The university server provides the option for the creating of a personal account for both students and professors. The procedure requires logging in Blackboard Learn by copying the URL address in the browser, registration of a user name and password [5] In this way **the identification** of the subjects of the training is carried out which defines them as participants with certain roles and not simply users (which is commonly made mistake in the attempts at blended education processes we have observed).

The next function is related to the orientation of the subjects of teaching and the subjects of learning in the modules, which contain the tool for the organization of information, and the links related to the particular courses. For example, the module 'My course' contains the section 'My institution' where the students can view the courses, which they have been enrolled in and the professors can view a list of the courses they teach. The full range of the orientation function is carried out through the modules 'My notifications', 'My calendar', 'My tasks' which allow access to up-to-date information for the courses, the upcoming events and the tasks assigned.

When accessing the panel of global navigation, the subjects of the educational process are granted access to the User Menu and My Blackboard, which are in fact the 'personalized view of the educational environment'.

The User Menu provides access to the educational courses and certain other links and provides the options for changes in personal settings related to text volume or personal information, for example.

My Blackboard shows the connections between the different courses as well as the set deadlines for the various tasks, the way they are assessed, etc. Bearing in mind that this section has all the complex information from the whole platform and the students can use different tools to view the activities in a certain course, look through events, grades, etc.; this function of the platform can be therefore defined as an **integrating** one. And since it is space where access is provided to all new elements on the platform we can say that it also has two more important functions: **communicative and coordinating.**

The basic details related to the stages of designing and manifestation of the technological functions of the platform is as follows:

- Profile – identification of the subjects in the education process;
- Bb beginning – an overview of the activities in the various courses;
- Posts/ uploads – reviewing the latest post of the students;
- Actualization – reviewing all the notifications for all the courses, sorting and choosing the types of notifications the user wants to receive;
- My grades – each student can see the grades for the tasks/activities/tests s/he has accomplished and the arguments that stand behind them;
- Calendar – the section allows viewing of all events and deadlines;
- Messages – the section allow sending messages out of the environment of a particular course;
- People – the section allows interaction among a broader circle of students and professors in the academic network of Blackboard;
- Places – allows the creating of places or groups for studying or team work on projects (as a part of the extracurricular activities)

IV. DIDACTIC FUNCTIONS

It is necessary to define the didactic functions of the platform Blackboard Learn within the conceptual framework of the model of blended education. The difficulties in this respect are based on the fact that there is a blending of elements of various education methods, which have already been mentioned above. The preliminary suppositions are that the introduction of the platform would lead to some of the didactic functions of the traditional model being transferred to some of the technological functions. This, however, is a small deception because the electronic platform is a means of supporting the educational process in a particular educational subject that helps both students and professors and this means has been previously defined in the syllabus of any possible course which syllabus suggests a number of educational means including electronic ones. As far as the tools, which the platform provides, are concerned, optimizing of the didactic functions can be mentioned i.e. there is a greater efficiency in the educational interaction as teaching and learning form an uninterrupted continuum.

The foundation of the existing multitude of theoretical generalizations about the didactic functions of the educational environment can, in this case, be modified as follows:

- Informational-related to the preparation, providing and acquisition of educational information defined by the curriculum;
- Systemizing–connects logically the contents' components in the curriculum and ensures the transition from a lower to a higher degree of education;
- Differentiating–related to the possibility to differ among the personal achievements and advance of the students in both curricular and extracurricular activities;
- Assessment and self-assessment– meant to sustain the objectivity in the assessment of knowledge, skills and competences of the students, as well as the procedures of students' self-assessment;
- Stimulation – related to the encouraging of media literacy in both students and teachers and the stimulation of the so-called 'double unlocking' i.e. the educational contents is unlocked for students and students are unlocked, stimulated to learn [6].

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THE USE OF QR CODES IN EDUCATION

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Abstract – Quick Response Codes (QR codes) are one of the features of smart phones that allow connecting the physical and virtual content for the user to get additional information. QR codes are already in use for various purposes in different areas, but there are not yet sufficiently applied in education.

The aim of this research is through the development of educational games that use QR codes, to popularize and expand the idea for their use in education as a support tool. For this research, various educational activities, for children of different ages were designed and tested. The results of the evaluation have shown that this type of learning is interesting and at the same time motivating and encourage collaborative learning.

I. INTRODUCTION

The possibilities of the computer technology and mobile devices with wide spectrum of additional functionalities became an everyday need in different areas of the modern living. Education is an area in which rapid development of information technology has a great impact and therefore the challenges for its use are vast. In order to use modern technologies in education some changes in the way of realization of education process are needed. Teachers should organize their lessons in a way that the students take active role during the classes.

The use of mobile phones in education is often disputed. However, numbers of studies indicate that the proper use of smart phones could increase student collaboration and engagement. Learning through playing games causes large interest among students.

In this context, we decided to use the QR (Quick Response) codes, for various educational activities, in order to explore the benefits and challenges of their use in education as a support tool. Evaluation was done with children of different ages. The results of evaluation are shown in this paper.

II. QR CODES

QR codes are 2D barcodes (matrix made of square black dots laid in a square scheme on white background). Designed for the first time in 1994 for the necessaries in the automotive industry in Japan, in short time they have spread all over the world due to their quick readability, small printout size and immense capacity of storing information unlike the standard barcodes [1]. A useful way of thinking of QR codes is that they link the physical world with the virtual (electronic). This adds value through improving the potential of making access to information more efficient and effective.

QR codes can be generated with different 2D barcode generators, but previously we need to know what we want to be coded and choose the appropriate QR generator. The information that the QR codes carry could be read with the software-QR Reader that should be installed on computers or smart phones. In addition, the devices need to have a camera installed in order to read the QR codes [1], [2]. Various QR codes generator and reader exist in the market today, but their specifics are out of scope of this paper.

Speaking of where we can put the QR codes, we can freely say everywhere. Printed QR codes can be placed in newspapers, magazines, brochures, books, flyers, different printed materials or business cards. They can be also put on products as labels, on billboards, in television commercial, or on web site [3]. By scanning the QR code user can get immediate access to the information that the code is carrying.

Figure 1. Using QR code for accessing information on Internet.

III. QR CODES IN EDUCATION

The study of QR codes in education can be placed in the context of mobile learning [4], [5], [6], [7].

The trend of the educational development is to focus more on student-centered education. Considering the characteristics and the opportunities that QR code offered, they really accords with this trend. QR code has a great potential for being integrated into the curriculum because they are incredibly simple and quick to use - a feature that makes them ideal for teaching and learning [8].

There are many reported examples of use of QR codes, in recent years. Rizzo [9] reported the use of QR codes during the chemistry class, where a periodic table with each chemical element represented by a QR code was designed. Chen & Choi [10] reported history learning with QR codes. Liu, Tan & Chu [11] designed QR codes to support language learning. Chaisatien & Akahori [12] used QR codes for classroom management. QR codes was also used in the library, associated each record on a library catalogue with a unique QR code [13].

IV. CASE STUDIES

For this research, we introduce three specific examples of using QR codes in education: using the Treasure Hunt game, Web Quest method and Self-assessment activities.

The survey was conducted among 34 eighth grade students and 32 sixth grade students, who expressed their attitude towards the implementation of the QR codes in regular classes. Before the survey, students were asked if they have seen or heard about QR code. Only minority of them (20.80%) revealed that they have heard about QR code, but only several of them have ever scanned a QR code. This fact encourages us even more to conduct this research.

The major disadvantage for using the QR codes was the fact that not all the students possess smart phones. This deficiency was overcome by creating groups where at least one of the students owned a smart phone. Each member of the group took an active participation in solving the final task.

A. Treasure Hunt game

This game is one of the most interesting and creative games which can be used in the process of learning. It encourages the students to participate actively during the class, increasing the mutual collaboration at the same time.

One of the versions of the game is to create a map on which different positions are marked. On each position, one QR code, which represents one task, is placed. To find all the QR codes, you only need to follow the map. Every task need to be solved, in order to reveal the final goal, the “hidden treasure”.

QR codes for this game could be created in a few steps with the program QR Treasure Hunt generator. In the first step, questions and answers for the game are entered, and in the second step, the codes are created for every question. Next, the QR codes need to be printed and putted on the previously chosen positions.

The game Treasure Hunt was implemented during the Programming class. Every QR code carried a task, which represent one command line of an actual program. The students need to reveal all the tasks in order to reassemble a program. The students work in groups and only one smart phone for a group was used.

B. Web Quest method

Web Quest is a research activity in which the students use Internet network as source for finding different types of information.

With this method instead of using URL addresses for searching specific information, students used QR codes that lead them to different information on Internet (videos, images or photographs). This method was especially useful for the younger students who have difficulties in writing the URL addresses in a given browser.

C. Self-assessment activities

Self-evaluation is an activity that is identified as an opportunity in including students in the process of evaluation. One of the most commonly used strategies of self-evaluation and mutual evaluation is comparing the tasks. The students get worksheets with the tasks that need to be solved and after solving them, they compare the results with already solved or partially solved model saved as a QR code. In this way, the students locate their mistakes and self-evaluate their work. QR codes can also be saved on mobile phones and can be used for solving tasks at home or as a link that could be forwarded to the students in the class.

V. Evaluation

During the research, we received a positive feedback from the students about using QR codes in education. Students were asked whether they were satisfied with the use of QR codes for learning and their reasons for saying so. The majority were satisfied, explaining that the QR codes were easy to use, learning was fun and motivating, and that they would like to utilized QR codes more in education.

Near 76% of the students agreed that they learned new things about phone use, 86% agreed that QR codes are very useful for research activities, and 22% of the students somewhat agreed that they needed help with QR codes (this is mostly due to technical problems with the used smart phones).

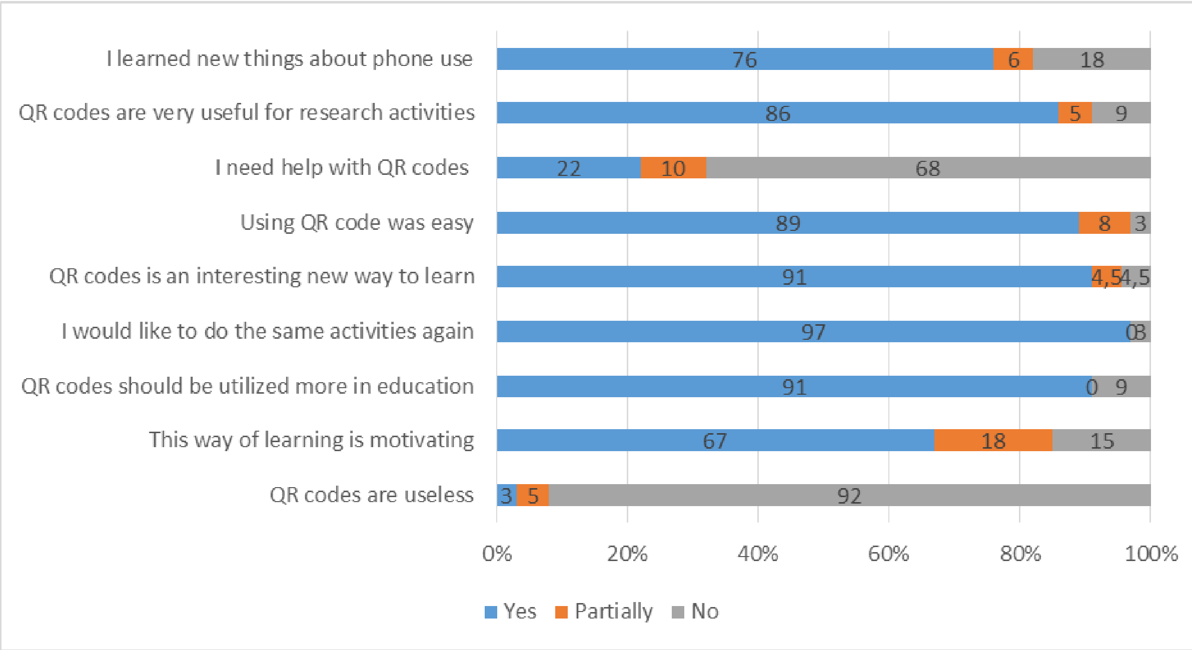
89% of the students agreed that it was easy to use QR codes, 91% of them agreed that using QR codes is an interesting new way to learn and near 97% of the students would like to do the same activities again.

91% of the students strongly agreed that QR codes should be utilized more in education. 67% of the students agreed that this new way of learning is motivating. Only 3% of the students thought that QR codes are useless.

The results of the evaluation are showed in Table I.

Interesting fact is that students have shown most interest in the first activity, The Hunting Game. This shows that the students are most motivated and active when learning through play.

Table I. Results from evaluation



VI. Conclusion

The purpose of this paper is to determine students' level of awareness and acceptance of QR codes, at a same time exploring the benefits of its use as a support tool in education.

The activities conducted by using the QR codes have encouraged the collaborative learning and have a positive impact on student motivation and engagement in their learning process.

QR codes demonstrate a good potential for application and promotion in the area of education, especially when they are properly integrated into the education process. We can say that applying the QR codes in education, represents a step forward towards integration of a new technologies in learning process.

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EXPERIENCES WITH VIRTUAL REALITY TECHNOLOGIES IN EDUCATION PROCESS

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Abstract - This paper presents our experiences in education of virtual reality in both ways: as subject of study and also as study tool. At the Department of Computers and Informatics, Faculty of Electrical Engineering and Informatics TU Košice (DCI FEEI TU Košice) students can study virtual reality technologies and systems. This subject is relatively young. The study is focused on the acquirement of theoretical knowledge and practical experiences about 3D computer graphics, virtual reality and its technologies. On practical exercises students work in our laboratory (LIRKIS) with the latest virtual reality technologies (e.g. augmented/mixed reality, head-mounted displays, 3D scanning or 3D printing) and create content for them (such as 3D models or appropriate applications). For education purposes it is also important to know what students know about virtual reality and its technologies to correctly adjust lessons to the students' knowledge and to the needs of practice.

I. INTRODUCTION

New technologies in education are very important either as education tools or as study subject. At DCI FEEI TU of Košice (Department of computers and informatics, Faculty of Electrical Engineering and Informatics Technical university of Košice) we focus to both ways. Our new laboratory LIRKIS is also one way for education support. LIRKIS (Laboratory of Intelligent inteRfaces of Communication and Information Systems) is the excellent laboratory for research, development and teaching applications in area of parallel, distributed and network computing systems for solving computational processes in the processing of graphics data and virtual reality with a primary focus on information systems and visualization, intelligent interfaces a interaction human-computer (HCI), including the development of network communication environments, allowing searching and quality access to distributed multimedia resources (knowledge stocks) and services and their use in creating and delivery of new knowledge and services including the development of online platforms to access to multimedia content.

It is excellent laboratory for systems of scanning and visualization of input/output data for management of information systems in the context of communication human-computing system in its parallel, distributed or networked implementation environment. Special attention is devoted to research and development of new flexible and intelligent interfaces of systems based on virtual reality technologies designed to work in the following areas:

- systems for a scanning and a creation of input data (tracking systems, 3D scanning, modeling, simulation)
- visualization engines for rendering the outputs in various forms and controlled using higher level languages for easy handling of objects, including script handling
- parallel, distributed or network systems implementation environments
- human-computer interaction and virtual communication infrastructure and their use in educational practice

Generally, in the laboratory we (and also students) can work at all levels of virtualization sequence, as is depicted in Fig. 1. We work also on some laboratory infrastructure adaptation for handicapped persons in present time.

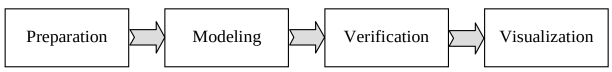

Figure 1. Virtualisation sequence

Modeling and visualization phase is improved by using virtual reality technologies. Modeling phase is improved with 3D scanning and visualization phase with 3D displays and 3D printers.

II. LABORATORY AND VIRTUAL-REALITY TECHNOLOGIES

Basic infrastructure in the laboratory is depicted in the Fig. 2. In this environment students can work during practices or on their bachelor, diploma or PhD. thesis. In addition to this infrastructure other devices listed below are also available.

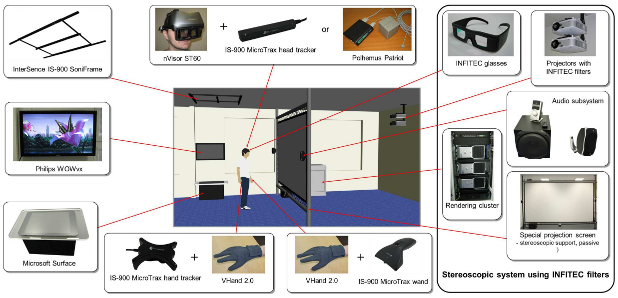

Figure 2. Basic LIRKIS laboratory infrastructure

A. 3D Scanning

3D scanner is a device that analyzes a real-world object or environment to collect data on its shape and possibly its appearance (i.e. color). There are several types of 3D scanners, which differ in the technology used for obtaining a data. They can be divided into two main categories: contact and non-contact scanners.

Contact scanners require a physical contact with the object being scanned. Non-contact scanners use radiation to acquire required information about objects. They are of two basic types: passive and active [1].

B. Augmented Reality

There are several definitions of augmented reality (AR) [1]. One was given by Ronald Azuma in 1997. Azuma's definition says that Augmented Reality: combines real and virtual, is interactive in real time and is registered in 3D. Another one was given by Paul Milgram and Fumio Kishino: Milgram's Reality-Virtuality Continuum. Continuum is visualized as line that is between reality and virtuality.

C. Head-Mounted Displays

A head-mounted display (HMD) is a display device, worn on the head (or as part of a helmet), that has small display optic in front of one (monocular HMD) or each eye (binocular HMD). HMD are used in virtual reality and augmented reality applications. Another classification of HMDs is based on how the user sees real world. This classification divides HMDs into two categories: immersive and see-through. See-through HMDs have two subcategories: video see-through and optical see-through.

D. 3D/stereo Displays

3D displays use several technologies to create 3D image. Each technology has its advantages and disadvantages. There are several types of 3D displays [3]: holographic displays, volumetric displays (swept-volume and static volume displays) and stereoscopic displays (passive, active and autostereoscopic).

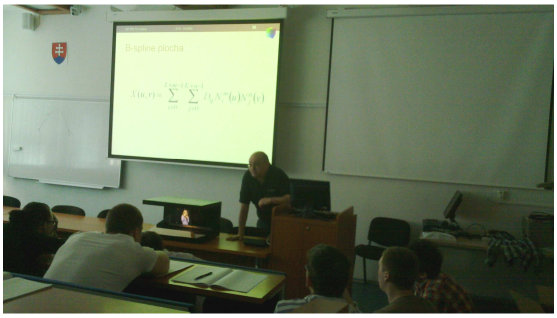

Figure 3. Holographic display presented during lecture

E. 3D Printing

3D printing is a form of additive manufacturing technology where a three dimensional object (3D model) is created by laying down successive layers of material. 3D printers are generally faster, more affordable and easier to use than other manufacturing technologies. 3D printers offer developers the ability to print 3D models for visualization, testing or direct parts creation.

III. LABORATORY AND VR TECHNOLOGIES EDUCATION

Creation of a 3D model for visualization needs a lot of effort. Everything begins with collecting of information and analysis (preparation phase). When the data are prepared 3D model creation begins (modeling phase). A check of model for errors comes after 3D digital model creation (verification phase). The visualization of the final model is the last step. Students learn about each step on practical exercises, where they create and visualize 3D models. Also students learn how to work with virtual reality technologies and how to use them to improve 3D model creation and visualization process. Practical exercises (based on virtualization sequence) are divided into 3D model creation, 3D scanning, 3D visualization and 3D printing.

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A. 3D Model Creation

In this section students learn how to create 3D models, which are used in 3D visualization (using 3D displays) and in 3D printing. As 3D modeling applications are used SketchUp [5] and Blender [6]. During practical exercises students learn 3D modeling basics, how to create model using photos, sketches or blueprints, how texture created 3D models and how to set up scene for rendering of single image or entire animation

B. 3D Scanning

In this section students learn how to manipulate and work with 3D scanners Leica ScanStation 2 [7] and NextEngine - e.g. finding the right scanning position, setting the best parameters for scanning or joining multiple point clouds together. Students also learn how to use scanned data to speedup their 3D model creation. Students working with mentioned 3D scanner are shown in Fig. 3.

Figure 4. Students work with 3D scanner

C. Data processing - modeling

Data processing consists of several parts. First, the point cloud (from 3D scan) has to be meshed, i.e. the points have to be connected into a collection of triangles (called faces). The next step is to align the scans from various angles to create the whole object surface. The aligned scans then have to be merged into one continuous mesh, so that no overlapping parts occur. The merging process also involves filling the eventual “holes” (unscanned parts) in the model. Aligning and mesh creation step can be switched if it is required for data processing. Additionally, there is an optional step to simplify the mesh, which consists of reducing the number of triangles in order to save memory needed to visualize the final 3D model.

D. 3D Visualization

3D visualization section is divided into four subsections where students work with:

- anaglyph images – this subsection teaches students how to correctly create left and right image of selected real object (scene) for subsequent easy creation of anaglyph image.

Figure 5. Students work with anaglyph glasses and images

- autostereoscopic 3D display Philips WOWvx [8] – in this subsection students learn which method this display use for 3D content displaying (2D-plus-depth) and how to create content for this autostereoscopic 3D display.
- virtual reality system – in this subsection students acquire theoretical and practical knowledge about 3D virtual reality system that combine together 3D displaying system (passive stereoscopic system using INFITEC technology [9]) and position tracking system (InterSence IS-900 SimTracker [10]) to create immersive VR environment (see also Fig. 2). Students also learn how to create content for this VR system with 3D modeling applications (SketchUp or Blender) and 3D scanning.

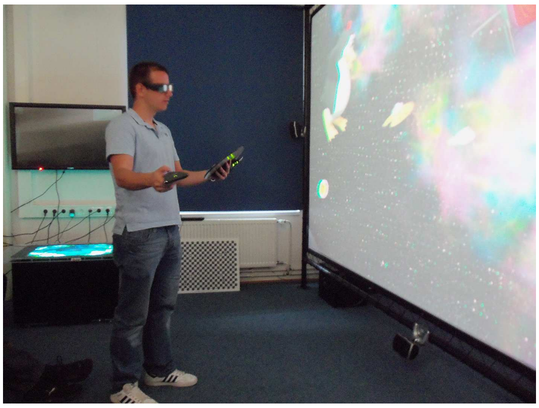

Figure 6. Student works with virtual-reality system

- augmented reality – this subsection teaches students how AR works and how to create content for AR applications. Fig. 7 shows student working with augmented reality system that use for displaying see-through HMD NVIS nVisor ST 60 [11]. Some results are used also for optimalization of workplace in industry praxis [15].

Figure 7. PhD. students work with augmentd reality system

E. 3D Printing

This section teaches students how 3D printing works and how to manipulate with 3D printer 3D Systems ZPrinter 450 [12], how to prepare 3D models for printing and how to finalize printed models. A students use for printing their 3D models which were created in SketchUp or Blender.

Figure 8. Student works with 3D printer and printed model of university campus

IV. Laboratory and Education Methods

It is important for us to know what students know about VR problematic and what they think about virtual reality education at the DCI FEEI TU of Košice. We started to watch this issue 3 years ago. Our first experiences were published in [14]. Based on these results we improved our education process. And now, we collected new results. For this purpose were created two questionnaires. A students of the Virtual reality systems (SVR) course participate in this survey again. The questionnaire (given to the students at the end of the semester) had also three questions. Its purpose was to determine students' satisfaction with the quality of the SVR course. Questionnaire also focused on the students' satisfaction with the VR systems and infrastructure with which they work during the semester and their ideas how these VR systems and equipment can be improved in next time. The questions in the questionnaire were:

- Q1: Rate VR systems and devices with which you have met in the LIRKIS laboratory. (4 – best, 0 – worst)
- Q2: How would you modify / improve VR systems and devices in the LIRKIS laboratory?
- Q3: What would you add, change or remove from SVR course?

Evaluation of the results obtained from the questionnaires:

Q1: Best three average rate gain system for AR system with HMD (3.71), autostereoscopic 3D visualization (3.22) and 3D printer (3.04). Worst average rate gain MS Surface 1.0 (1,63) and stereoscopic displaying system using anaglyph technology (1.47). This result represents a growing student interest about advanced augmented/mixed reality technologies.

Q2 and 3: Suggestions obtained from students were used for the improvement of SVR course and created VR systems. Results obtained from the questionnaire are shown in the following tables (Tab. I and II). To evaluated results from the Q2 and Q3 was used again SWOT analysis with some different results compare to two years old analysis.

TABLE I. SWOT Analysis of the Answers to the Question Number 2

Strengths	Opportunities
• new technologies • intuitive and human oriented interaction with VR systems • easy and simple visualization of 3D models and other data	• development of application that use 3D interfaces • creation/modification of VR systems using students ideas • simplification in the process of creation of new VR systems and devices (3D interfaces) • possibility of usage for handicapped persons
Weaknesses	**Threats**
• high complexity of software for development • HMD needs to be connected to the PC with cables • high price of 3D interfaces • high price or insufficiency of material for 3D printing	• high price of the latest 3D interfaces • insufficient funds for purchase of new 3D interfaces • expansive repair of damaged hardware

TABLE II. SWOT ANALYSIS OF THE ANSWERS TO THE QUESTION NUMBER 3

Strengths	Opportunities
• satisfaction with the teaching of VR and 3D interfaces • large interest of the students in the problematic of VR (VR technologies) and 3D interfaces	• preparation of students for their future work with the VR technologies and 3D interfaces • increase of the teaching hours • building a stand workplaces for individual exercises
Weaknesses	**Threats**
• fast interpretation of problematic dedicated to 3D modeling • a few devices for massive education • relatively small space of laboratory	• high price of the latest 3D interfaces • decrease of the teaching hours • a few qualified teachers or their turnover

V. CONCLUSION

Virtual-reality technologies and similar technologies have the greatest progress in present. These technologies allow the creation of previously impossible procedures. These procedures especially their visual aspect and interactivity may change streamline and shorten the process of interaction between human and computers (e.g. also in understanding of formal methods). Our experiences say also that most students have met with 3D/stereo displays (98.9%), touch screens (100%) and position tracking (73.4%). Approximately 61% of students have met 3D/stereo cameras. 25% of students met mixed/augmented reality. Also most students have met with 3D interfaces at shop (53%). Worst percentage has information about these technologies in previous school or education process (only 19%). Anyway this represents a growth compared to the previous results. Students' interest is growing. It confirms the right step to put this subject into education process at our department.

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MOBILE INTERACTIVE APPLICATION FOR EDUCATION SUPPORT OF PRESCHOOL CHILDREN

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Abstract - The increasing pervasiveness of mobile digital devices, cause rapid explosion of various games, videos and educational programs designed for children. The growth of haptic interfaces is also exposing these young learners to more intuitive interactions with digital devices. Various studies conducted in recent years indicate that interactive games can be very motivating for young children, so they need to have more practical role in learning process. Considering these facts, we decided to develop an educational and interactive mobile application that will be used for education of children of preschool age. Through this application, kids will learn how to write letters in Macedonian language, simultaneously improving their motor skills. The application is designed for Android operating system, using OpenGL ES 1.0 version, which support all Android devices. The application interface is made using various colors, sound and animations appropriate for children's age.

The developed mobile application is tested and evaluated and the results are shown in this paper.

I. INTRODUCTION

Today's children grow up with information and communication technology (ICT) embedded in their daily lives. In this context, mobile digital devices are especially interested, because of the features that they offer to their users and because of their mobility. They can be used for various activities, but the most popular activity for preschoolers is games.

Games have a potential to keep the children's attention for a long time, so they can play one game for hours. Playing is an important part of children's cognitive and social development. A child learns through playing with others, creating, and improving his or her stage of development [1], [2], [3]. The process of playing games is engaging. Kids are motivated via fun [4], via challenge and via instant, visual feedback [5], [6].

Prensky identified a combination of 12 elements that make computer games engaging [5].

TABLE I. THE ELEMENTS THAT MAKE COMPUTER GAMES ENGAGING (PRENSKY 2001)

Characteristics of computer game	**How characteristics contribute to players' engagement**
Fun	Enjoyment and pleasure
Play	Intense and passionate involvement
Rules	Structure
Goals	Motivation
Interaction	Doing (i.e. the activity)
Outcomes and feedback	Learning
Adaptive	Flow
Winning	Ego gratification
Conflict/competition/challenge	Adrenaline
Problem solving	Sparks creativity
Interaction	Social groups
Representation and story	Emotions

Number of studies indicates that game-based learning may have a positive effect on learning quality [8], [9], [10], [11]. When learning content is combined with game elements, motivation of the learner is positively affected [12].

Designing games for young children presents unique challenge, because of the pedagogical approaches that should be taken into account, as well as learning tasks that should be presented. Games should encourage children to develop imagination and creativity, develop an ability to manage emotions, thinking skills, sensory-motor skills and language skills. Graphics, sounds and animations are also very important part of game design because they capture children's interest more than text and pictures that can be found in traditional books.

Considering these facts, we decided to develop an educational and interactive mobile application that will be used for education of children of preschool age. Through this application, kids will learn how to write letters in Macedonian language, simultaneously improving their motor skills. Application was developed for devices with a touch screen, as a standard characteristic of modern mobile devices. This feature allows children to interact with technology at a younger age than ever before. Preschoolers, who used to have problems using a mouse or joysticks for playing, now can navigate with a touch screen intuitively and with ease.

The developed application was tested and evaluated and the results are shown in this paper.

II. APPLICATION DESIGN

For the purpose of this work an interactive mobile-based application, using OpenGL and Android OS, was developed. There are no official statistical data on how many devices is running on Android in Macedonia, but we analyze the major suppliers and came out that more than 80% are tablet devices that have an Android OS. Because of this, we decided to develop application for Android OS. OpenGL ES 1.0 version is available on all Android devices therefore; we have decided to use it for building the game graphics.

The game itself was made using colorful design and animation in order to keep the attention of the children. Various cheerful sounds were also added while playing the game. The touch-based interface for this game is intuitive for this age group.

User interface of a game showing the first letter of an alphabet is shown on Fig. 1

Kids should move red circle located inside the letter at one of the ends to the other end (as they write a displayed letter with a pen). They need to follow the arrow and to stay in bounds that define each letter. Checkpoints are created to mark the key position of every letter where the children need to change the direction in order to draw properly the letter. If the player crosses the border and if there are multiple reached checkpoints then the red circle is returned to the last one.

With positioning the finger on the red circle and start moving it, the timer that measure the time needed to complete the trial is activated. When the children reach the last point of the letter, the timer stops and the time needed to complete the trial is saved on the device memory for further analyses.

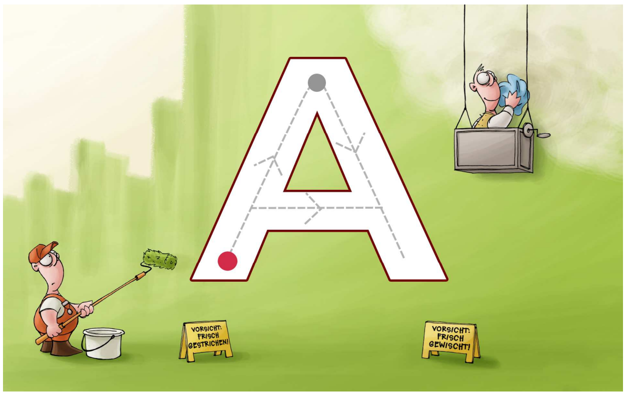

Figure 1. User interface of developed game showing the first letter of an alphabet.

III. EVALUATION

The main idea of this research is to demonstrate that children of preschool age can learn and practice motor skills for writing the Macedonian alphabet while playing an educational game using a tablet PC. The experiment was conducted in one kindergarten, where a total of 18 preschool children (from 4 to 6 years) were participated. The children were randomly selected and divided into two groups. The first group of 10 children was learning on tablet PC, while the second group composed of 8 children was practicing in a classic way (with a pan on a paper).

In the experiment, they tried to learn the following letters "А", "И", "Е ", "М ", "О", "Ц", "З ", "В". The experiment was conducted in two steps:

- **Training phase -** In this phase the group of 10 children was given a tablet PC with the game installed. Every child taught two letters a day, while repeating the letters in 10 attempts. This phase lasted four days and time required to draw each letter separately in all 10 attempts was measured. At the same time, the other group of 8 children was given coloring books and drawings with the same letters as in interactive application. Caregiver at kindergarten worked with them to help children through these materials to learn the letters by writing and coloring using the classic way.

- **Testing phase –** In this phase children from both groups were tested in order to see their progress in writing the letters from the alphabet. Each child was given 5 randomly selected letters (from the set of letters taught during the training phase). Time needed for completing each activity, as well as number of successful and failed attempts for writing the given letter were measured.

The obtained data were summarized and processed during the phase of data processing.

From the results, it can be observed that the children learn significantly more in the first trial when the error is greater, so they need more time for writing the letter. According to results, the satisfactory level is achieved after the 6th attempt, when the learning rate and the error are small.

Data from the last attempt have been summarized and the average value and standard deviation were calculated. These data are shown in Table II.

From the table it can be observed that children write the given letters in a remarkably short time with small deviations that vary between each child. This confirms the fact that they have successfully mastered the writing of letters by using the developed application.

The data analysis also showed dependence: the children that previously have used tablet PC are making fewer mistakes and write the letters faster than those children who do not have. This confirms the fact that new technologies have significant impact on children especially of this age group, so it is very important how and for what purpose they use it.

TABLE II AVERAGE VALUES AND STANDARD DEVIATION OF LAST TRIAL

Letter	Average (sec.)	Standard Deviation (sec.)
А	9.18	1.36
И	8.36	1.70
Е	8.68	1.92
М	9.15	1.53
О	7.93	1.99
Ц	9.64	2.3
З	9.65	1.71
В	11.038	3.64

At the end of the test, a survey with several questions for children from the first group (the group who used the developed application) was conducted. Results are summarized and presented in Table III.

TABLE III USERS OPINION REGARDING THE NEW TYPE OF LEARNING (TOTAL NUMBER OF PARTICIPANTS = 10)

Survey question	Yes	No
Is it fun to learn and write letters in this way?	9	1
Is it easy to write in this way?	8	2
Would you like to learn the other letters?	9	1
Do you want to compete with friends in collecting points?	7	3
Do you have device with touch screen at home?	5	5

Results show that children's commitment in learning the alphabet with the use of new technology is very high. Nine out of ten children responded affirmatively that this way of learning is interesting, and that they also want to learn the other letter. This is due to ease of use of the developed application, good graphics and animation that keeps the children's attention for a long time. The game also allows them to compete with each other allowing them to collect points.

It was also noted that the children's interest while someone was playing the game was very high. They encouraged the one currently playing the game, thus contributing to his/her improvement.

IV. CONCLUSION

Nowadays, devices such as mobile phones, PDAs, and tablets are fully integrated into our life. Children are exposed at a very young age to these new technologies that affect the way they learn. Learning through playing games causes largest interest among children especially among preschoolers. Studies indicate that game-based learning have a positive effect on learning quality. However, there are some specifics that must be taken into consideration, when designing educational games for preschoolers. Properly designed games for preschoolers should motivate children to use it, at a same time having positive effect on memory enhancement and motor skills coordination.

In this paper, we have presented the design of an interactive mobile educational game for preschoolers. The developed application was tested and the results of the evaluation are presented and discussed.

The results have showed that the developed application motivates children to use it and that the application offers sufficient learning opportunities to create a learning effect. From the evaluation results, we can also state that this type of learning is interesting and fun for this age group, and that they would like to practice this way of learning more often.

The conclusion is that this type of informal learning should be considered as an addition of the formal school learning.

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STANDARDS FOR DISTANCE LEARNING (EXPERIMENT OF THE SOUTH-WEST UNIVERSITY ”NEOFIT RILSKI”, BLAGOEVGRAD)

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Abstract - This article looks at issues affecting the need of implementing standards for distance learning. The subject of discussion is their function and meaningful methodological argumentation. A model of standards for e-learning is provided, which are developed by the author and received in e-learning system, based on the platform BlackBoard at South-West ”Neofit Rilski” in Blagoevgrad.

I. INTRODUCTION

The development of modern information and communication technologies includes the meeting of higher education institution with e-learning, with the result that a spiritual institution is associated with both technology transmission and acquisition. Information and communication technologies play the role of an effective tool in creating some educational content, adding new essential possibilities. Furthermore, they allow adaptive managing the processes of its reaching the users. Their essential feature is that they can change learning process, while allowing training schemes to be modeled in advance and followed consistently. As far as changing content, process and control the term “e-learning” is concerned.

E-learning is about more than a new technology, although counting on a great number of new electronic and communication technologies. A set of possibilities confers it this new quality and advantages.

II. SOME OF THE ADVANTAGES OF E-LEARNING

E-learning is able to overcome temporal and physical limits of traditional learning process[1]. The last one represents organizational and functional unity of the activity of trainer and learner, which is always confined within certain time intervals of directly pedagogical interaction.

Information and communication technologies as a physical basis of e-learning put it in a constant state of ambiguous relevance and opportunity to request (synchronous and asynchronous type). If technology is functioning properly, this type of learning is always “within an arm’s reach” that must only be required to become a reality. E-learning brings with it the freedom to be requested at all times and by anyone, which will result in better motivation for learning and contribution to the success of the learners. This freedom is restricted by some conditions - a technical one and two personal one: availability of network connection, initial cognitive interest, competence to operate with technology[22]. It also provides a wide range of multimedia forms, with a choice of own pace, time of assimilation, support tools, by developing the motivation of learners, aimed at promoting their self-reliance and reflexivity.

For many researchers e-learning compared to traditional one enables to achieve higher quality and efficiency of education. This is achieved using more information resources such as (text, sound, image, movement), which could be updated frequently without much higher costs. It is capable of being pre-set by users, adhering to teaching/learning models, with a particular emphasis on a constructive approach, including social constructivism.

In its essence, e-learning enables more opportunities for learners to be an active and independent subject of study: to shape situations,

[1] One of the aspects of this quality is specified by the term *M-learning*, „mobile learning”, including „unrestricted access to suitable, in context and personalized learning content according to innovative paradigms and interfaces by Internet through mobile connections and devices” [3: p. 1].

[2] **2**A survey, of April 2005, by European Centre for the Development of Vocational Training (CEDEFOP) among 601 respondents from 25 EU countries indicates as a main obstacle for e-learning development, learners, teachers and trainers show self-discipline (48%), savings in time (29%), high level of technical skills (16%), but 29% from respondents consider that they have no difficulty [1: p. 24]

to play the role of "virtual researchers", to make virtual experiments where they can re-create and eliminate omissions, to change evaluation criteria, etc.

It overcomes the limits of reproductive education, having regard to the individual style and pace of learning. Consequently, it contributes to the development of important personal qualities such as initiative, autonomy, organization, pragmatism, etc. [6].

III. DISTANCE LEARNING

If e-learning stands out in its dual sense using technology – technical-technological and pedagogical- technological, distance learning highlights the pedagogic sign of division of trainers and learners. Distance learning represents "activity in formal learning where students and trainer are separated by geographical distance or by time. On the whole, it uses communication technologies such as: television, videotapes, computer or e-mail" [4]

The Regulation on the state requirements in higher schools in Bulgaria for organizing distance learning also highlights these signs. It is stated under article 1, paragraph 2 that this type of learning is a form of organization of the educational process "where student and trainer are separated by location, but not necessarily by time, while created distance may be offset by technological tools" [7]. In fact, distance learning last generation (4^{th} level according to the classification of Regulation on the state requirements – article 9, paragraph 2) is based only on technological resources – presence of specially designed platforms such as BlackBoard, WebCT[3]; Moodle, ATutor, Ilias, Claroline, COSE, Sakai, Fle3, dotLRN.

Assessing the weakness of e-learning with regard to the study progress gives rise to development of blended learning, which combines advantages of on-line delivery of educational content with the best characteristics of traditional learning in the classroom and live instructions, so that education can be personalized and training can be differentiated between student-student" [2].

[3] BlackBoard, WebCT (until the merger with BlackBoard), eLSe (developed by University of Ruse) are paid, commercial platforms and open-source software are: Moodle, ATutor, Claroline, COSE, etc.

IV. NEED OF STANDARDS FOR DISTANCE LEARNING IN HIGHER EDUCATION

In its essence, standard includes "requirements, specifications, guidelines or characteristics, which may be used in a consecutive way to ensure that materials, products, processes and services are suitable for their use" [5]. Standards may be written, documented and non-written, implicit and acting on "second plan".

Generally, each activity, which gives a product if quality and efficiency are achieved, requires standards that regulate the requirements as regard conditions and relations, influencing on the quality of the product and the efficiency of the whole activity.

Education creates mass product with higher requirements provided its quality. One more reason: higher public participations as well as serious public and private investments are intertwined. Evaluation of the implementation of expectations and the efficiency of investments also demands on standards. The most important in the need of standards for distance learning is related to the fact that it has a complex technical environment (a variety of means of communication, specific educational resources, particular organization of learning process, and typical conditions for assessing the learners' achievements). It is necessary for the environment to accomplish minimal requirements, in order to function normally that form of organization of learning process.

It is important that distance learning engage many people with different positions and responsibilities in its functioning: creators of e-learning content, administrators of e-learning systems, specialists who are in charge of technical system maintenance. The coordination of efforts of these specialists and the achievement of pedagogic and economic efficiency is not based on ad hoc decisions, but on institutional rules and standards, which play a different function – take part in creating hidden culture of education institution. On the other hand are the learners. The need of standards for distance learning comes from the fact that it is an alternative for plenty of people who do not have any time resource or other possibilities for classical training. For them standards must be a sign of certainty that chosen learning form is justified with regard to the achievement of their aims and enables successful movement in educational and career system.

With respect to the Bulgarian education, system standards for distance learning are introduced by criteria for “assessing distance learning into professional direction” [16].

The National Evaluation and Accreditation Agency (NEAA) as regards the Regulation on the state requirements in higher schools for organizing distance learning [7] introduce them on document.

To sum up, internally, standards into distance learning by their implementation, undertake to fulfill the functions of quality and efficiency of learning environment, training tools, learning content, pedagogical interaction between subjects. Externally, they provide conditions for distance learning legitimacy in the education system, for its social status, for its social and economic efficiency.

V. STANDARDS FOR DISTANCE LEARNING: UNIVERSITY EXPERIMENT

Modern distance learning in Bulgaria has not a long history. By the Regulation on the state requirements in higher schools for organizing distance learning [7], issued in 2004, a major step in management has been taken towards the introduction of state requirements with regard to the distance learning. The document does not use the term ”standard” explicitly, but in essence it decrees requirements, which could be considered as standards concerning principal aspects of this learning form: admission, learning organization, resources management, maintenance.

Based on Regulation, the National Evaluation and Accreditation Agency has created Instructions and criteria for assessing distance learning into professional direction. Section I of the instructions ”Criteria for assessing distance learning environment in higher schools” on the field of educational activity introduces a requirement that higher school provides standards for: 1) ”curriculum development in relation to DLS”[44]; 2) ”quality content”, 3)”design and spread of e-courses” [16]. The most important is that Instructions do not define what the standard is, but in many cases, the criterion is a synonym of standard. It is a step forward that standard is considered to be a condition for quality and legitimacy as well as the fact that many spheres introduce the requirement of standard presence in order to receive distance learning accreditation.

Overall, with the start-up period of distance learning development, based on e-technologies, many problems are observed. Conceptual problems are related to the choice of learning model (oriented towards institutions, personality or groups/communities). There are also problems concerning the funding. At management, technological and legitimate level orderly standards for distance learning lack, which has influence on its institution legitimacy and on the consumers [9].

Under the EU’s Operational Programme for Human Resources, in 2011 launched a scheme “Development of electronic forms of distance learning in higher education”, budget line: BG051P0001- 4.3.04. It intends to ensure possibilities for acquiring ”qualifications, additional qualifications and re-training experts…, disadvantaged people study [8: p.7]. The scheme is a strong incentive for higher schools to develop distance learning, which are able to finance its initial steps by projects.

The developed two normative documents, financial incentive on budget line, student candidates market crisis, business needs for more modern learning forms, create a favorable environment for implementing distance learning. This process is internally related to the awareness of the importance of standards, to use foreign experience and their progressive implementation in educational practice. The review of documents published in Internet, by which higher schools regulate distance learning, give a basis for the following conclusions:

- Strategies for distance learning development are adopted. Development of standards for distance learning is foreseen in some of them, an example of which is Burgas Free University [15].
- Regulations for distance learning are developed (Sofia University [11], University of Veliko Turnovo [10], Technical University, National Defense Academy, South-West University, Medical University – Sofia [13].
- The Regulations introduce criteria, to which must correspond organization and teaching materials that play the role of standards.
- Some of these documents bring into use the term ”standards” without define it explicitly. For instance: The Regulation for distance learning of National Defence

[4] DLS - distance learning specialty.

Academy ”G. S. Rakovski”, referred to Chapter 3, introduces ”Internal standards for preparation of distance learning training materials” [12].

- There are higher schools that have developed their own standards for distance learning. As an illustration is New Bulgarian University.
- Adopted standards concern the following distance learning spheres: 1) training tools (textbook, electronic textbook, video lecture, film with educational content); 2) learning process; 3) consultation and 4) assessment [14].

VI. STANDARDS OF DISTANCE LEARNING AS A SYSTEM

Since the system of standards lack and it covers distance learning in all its dimensions, further, I will present the model which has become the basis for developed distance learning standards at South-West University ”Neofit Rilski” in Blagoevgrad. However, I will point out that the university has about 20 years of experience to implement such type of learning. The success mostly consists in the fact that in many specialties and professional directions by means of Moodle are organized electronic delivery of educational content, encouraging self-employment of students, control and assessment of their achievements.

An overall distance-learning concept, however, lacks, and of which the standards are parts. In these conditions, in accordance with the university work, the developed standards are based on the already mentioned scheme and budget line. They are considered a means of sustainable intra-system and institutional development of university distance learning.

The model of standards aims to cover the activity of the two learning parts: learners and trainers. The educational environment integrates their activity, involving model of learning content, training tools, software, technical tools, and appropriate organization. In addition, in the essence of education is the technical equipment provided by different information and communication means (servers, a network with one or more computers, smart phones, and other technical means of communication).

The model of learning content is set on three levels. At first level, there are the qualification characteristics. Standards related to it envisage description of a set of competences which students acquire during learning; institutions where graduates may be realized; positions they may occupy. At second level, there is the Curriculum (Educational Plan). Standards related to it envisage: procedures on its preparation, period of study, types of subject disciplines (compulsory, elective, facultative), and auditorium employment on subjects and on the Curriculum in general, credit courses, forms of examination procedures, of graduation. A description of all academic staff differentiated on degrees and administrative procedures involved in authorizing the Curriculum are required. At third level, there is the teaching curriculum. A description of goals, content according the themes for auditorium employment (lectures, seminars, practical exercises, etc.), number of hours, credits, extracurricular activities (number of activities, forms of control), control and assessment procedures, adequate bibliography for subject preparation (based and additional) are required.

Standards for training tools describe the requirements towards textbooks, training aids, etc. Traditional textbook is required to be full of themes (aims, approach for structuring main text, illustration material), applications, dictionary, questions, case studies and tasks for self-employment, model instructions for implementing tasks concerning extracurricular activities, tools for self-assessment and self-discipline. Specific requirements towards electronic textbook are: presence of interactive elements (graphics, tables, pictures, presentations, audio and video files), virtual resources, tasks with a specific period for implementing them, on-line forums, self-controlled tests. Video materials are provided: didactic typology, implementing different information resources and work environment, requirements towards the teacher’s speech, style of speaking, work with students, duration. Standards for organizing educational activity into distance learning include calendar of semesters, disciplines content (courses, practice, etc.), ratio between working and non-working employment (referred to the regulation working employment is no more than 30% of auditorium), ways to implement compulsory, elective and facultative disciplines, type of control and assessment, conditions for disciplines selection.

Assessing is standardized by defining the type of evaluation, number of current and semester exams, admission to examination, ways to implement them. The mentioned standards regulate a large part of learners’ activity (for example, working and non-working employment, forms of report, assessment). Special requirements are introduced for some of their activities (for example, concerning secure tasks: term and place of declaring themes, implementation period, and ways to check and feedback to students). The relationship between education parts is based on many of the mentioned standards as well as on rights and requirements of two parts (for example: admission to examination, work of missing tasks, objections to examination results, documentation and period of their storage.

It is paid serious attention to standards for supporting learners as provided type of consultation (presence and video consultation), number, dates and place, place in learning process (established, to explain learning content, to implement control and assessment procedures), requirements towards the organization of video consultation, programmes related to them, etc.

Standards *control* and *assessment* of education results concern the activity of the two subjects and their relationships. Requirements towards the oral examination are provided (place in the Syllabus, adequate content of discipline and learning goals referred to it, criteria for assessing, ways to document and record learning outcomes). For electronic examination are provided requirements such as: place in education, form of tasks, instructions for ways of work, permitted aids, time for work, number of experiments, scales of assessment.

Standards for *technical equipment* provide requirements towards the hardware and other means of communication, the instructions for work with them, maintenance, repair of damage, prevention.

A major role is given to standards for connection and security (requirements towards the web, registration and user access, storage of personal data and education results).

VI. Conclusion

The comparison of admitted university standards with the published ones shows that they have a broader and systemic scope and permit to regulate distance learning, so that to provide learning transparency, legitimacy in the internal and external auditorium; adequacy of modern technological achievements and user security; a high degree of regulation and efficiency of activities.

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MULTICAMPUS DISTANCE EDUCATION BASED ON VIDEO-CONFERENCING SYSTEM

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Abstract – This paper aims at evaluating the potentials of videoconferencing education as well as to understand students' perceptions and satisfaction with this kind of distance education compared to the traditional classroom environment, but also to understand the main challenges in this kind of setting. An experimental research conducted showed that this form of distance education could be equally good as traditional methods of teaching. It also leaded to several important conclusions that may help in creation of efficient teaching methodology.

I. INTRODUCTION

Up to several years, go two state universities were providing the higher education services overall territory of Republic of Macedonia. These universities, Ss. Cyril and Methodius and St. Kliment Ohridski, were located respectively in the cities of Skopje and Bitola. Considering their location as well as strong economy demands at one hand, and the economic circumstances preventing people from moving freely from rural areas to cities for studying, have risen important questions regarding the ease of access to academic institutions for people living in not developed regions, notably the east of the country.

Therefore, in order to offer equal possibilities for high education studies, state University “Goce Delcev” – Stip was established in 2007. Organized as an integrated university, according to contemporary standards, it perfectly fits the global worldwide trends in higher education. Namely, the University is located in Stip and has four campuses, integrating 13 faculties - covering almost all scientific disciplines, 10 university centers and three institutes. The studies at this university are performed in 12 units, dispersed in 12 different cities (mainly in the eastern part of the country).

“Goce Delcev” University is permanently growing both in number of students and staff members. This is constraining the university to enlarge its infrastructure as well. These growing trends are challenging the university itself to organize and support the education process with attention for communication and collaboration between the various campuses.

Although, this process is still mainly conducted through physical mobility of academic staff between different locations, the university is progressively supporting initiatives that replace or enhance physical with virtual mobility.

Considering the new challenges in higher education and understanding the importance of innovation in education through implementation of contemporary ICT technologies, the institution is doing permanent efforts to integrate various forms of distance learning with the traditional education.

Distance education has been defined as “a separation in time and/or space between the learner and the instructor. More than a geographic separation of learners and teachers, it is a distance of understanding and perceptions that must be overcome by teachers and learners” [1]. There are many types of distance-education models including online courses, interactive videoconferencing, videotaped lectures, and audiotaped lectures.

According to our preliminary evaluation, among other distance learning methodologies, videoconferencing is considered the most relevant and proven to stimulate collaboration between the various sites, to support and enhance student and/or staff communication, to enable flexible quality learning and accessibility, as well as to rationalize various costs.

Various research studies have been conducted in order to investigate the challenges of establishing a establishing a video – conferencing based distance education. Moreover, many studies have been conducted in order to understand the real benefits of video – conferencing as a form of synchronous form of education not only in higher education but also, also in other segments of the society.

For e.g. a pilot project aimed to deliver video-conferencing diabetes lessons to healthcare and allied healthcare professionals who provide basic level care for, and management of, people with diabetes in the Scottish Highlands region [2]. Feedback from participants indicated that the educational content was relevant and that the use of videoconferencing could provide accessibility to training where distance, cost and other issues may make access difficult. Student performance on the assessment instruments did not differ between those who received the training through video conferencing and those who received the training through face-to-face delivery.

Another, qualitative research study has been conducted in order to determine how students who are taking synchronous distance education classes via video conferencing perceive distance learning courses [3]. The results of the study have shown that the most important problems in synchronous distance education were the disconnection and sound problems, mainly due to hardware issues. Other very important issue evidenced in this study was that students became bored after some time because of limited camera angles and cameras. Besides these technical problems, the researchers observed, and the students expressed that the factors of teacher, environment, distance, course type and duration also caused the students' perceptions to change.

In [4] researchers focus on the issues how two separate classrooms that are connected to one instructional process can be handled simultaneously by one teacher.

The purpose of this study is to evaluate the potentials of videoconferencing distance education compared to the traditional classroom environment as well as students' perceptions and satisfaction in both settings.

II. RESEARCH METHODOLOGY

In order to compare the traditional face-to-face classroom course delivery to synchronous videoconferencing way of distance teaching an experimental research has been conducted. This research also aimed at evaluating the students' perception and satisfaction with this method of teaching using contemporary ICT technologies.

This research was conducted for an elective 6-credit hour Object – Oriented Software Engineering (OOSE) course delivered during the winter semester of 2012. This course was delivered to two separate groups of students, all of them regular students at the Faculty of Computer Science, University "Goce Delcev". To the first group counting 60 students, the lectures were taught face to face in a traditional classroom setting. These students were physically located in the city of Stip.

Second group, counting 42 students was attending the same course in asynchronous sessions via interactive videoconferencing. Students from the second group were enrolled at one of the dispersed campuses of the Faculty of Computer Science, University "Goce Delcev" located in the city of Strumica situated in the far southeast part of the country, and approximately 70 kilometers away in the city of Stip. In the latter course, the instructor was physically located in the city of Stip (Figure 1).

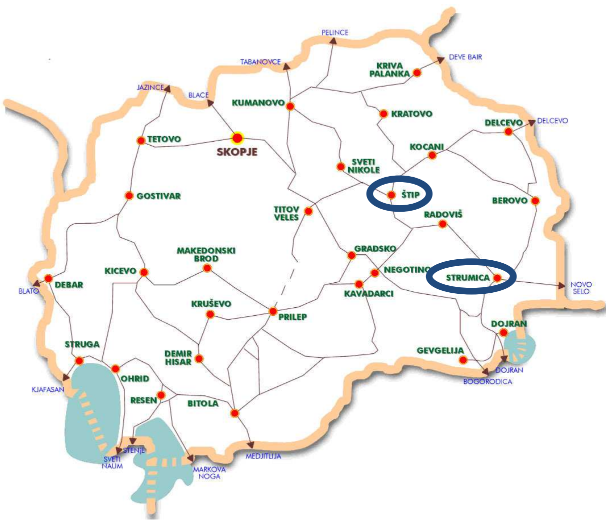

Figure 1. Campuses locations

Both courses covered the same topics and were given by the same instructor except for two lecture hours to the students in Stip, and two lecture hours presented in the classroom to students in Strumica campus given by external experts.

The distance-education lectures were delivered from a classroom equipped with Polycom HDX 8000 end-point (Figure 2), 36 computers, document camera, interactive whiteboard, two LCD projectors and monitor.

Figure 2. Polycom HDX 8000 end-point, with table microfon, multiview camera and remote controller

The lecturer had the ability to combine and to switch among three views delivered to the distant classroom: video image (e.g., the lecturer); computer screen (e.g., PowerPoint presentations); and the document camera (e.g., used to show hardcopies of figures and demonstrate working out calculations by hand). One LCD projector projected the image being transmitted to the distant classroom, and at the monitor, the image of the students in the distant classroom was presented. The distant classroom was equipped with Polycom HDX 7000 end-point, document camera, two LCD projectors and whiteboard. They were projecting picture big enough to be perceived clearly by all students. During transmission, the distant site also had a faculty facilitator present at least for the beginning of each class, and two technicians monitored the entire transmission.

The videoconferencing system used, allows setting up the camera in a number of different positions (e.g., wide shot of an entire class, close up shot of students in on the lower right quadrant) and store them as 'camera presets'. The presets are usually assigned to a button on the remote control. This allows the lecturer to easily focus in on a group of participants during the interactive portion of a session or just get a good overview of the level of engagement of varying groups at the remote site.

The traditional classroom lectures were delivered in a classroom equipped with a computer, a document camera, two video projectors and one interactive whiteboard. The synchronous distance education environment is summarized in Figure 3.

In this setting, the instructor may incorporate an alternative video source (e.g., a document camera, a VCR) for sending to remote locations, or may receive video from an alternative video source at the remote site. New feature “people on content” for example uses chroma key technology to allow lecturer(s) in a video call to become one with their content. Therefore, the potential for combining video inputs and outputs can seem endless.

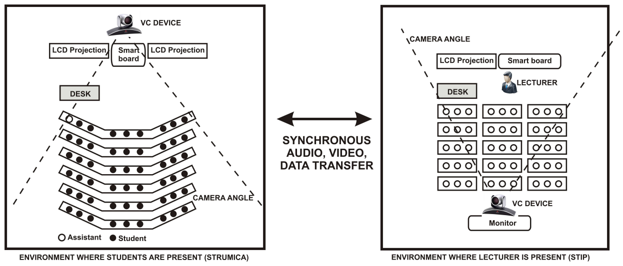

Figure 3. Synchronous distance education environment

However, with the introduction of more technologically advanced resources during classes, there is the increased danger of losing focus on the most important aspect of teaching - learning. Planning curricular objectives and concentrating on students as the major stakeholders, leads to a continuum in the life cycle of a technology based course. Evaluation at a personal level throughout the course but also at a curricular level can lead to improvements to better suit the needs of the students.

Course and instructor evaluations were administered to each group at the conclusion of the courses. The questions rated students' perceptions of the course and instructor using a 5-point Likert scale anchored at 5 = strongly agree and 1 = strongly disagree. The variances of the results were first analyzed using Levene's test for equality of variances. The evaluations were then analyzed using independent sample t tests based on the assumption of the equal variances or unequal variances where appropriate in SPSS v19.0. The final course grades were analyzed by the same method.

III. RESULTS

Students' demographic data are presented in Table1. The traditional classroom students had a higher computer science grade point average (GPA) (P = 0.012) at the onset of the 2 courses, and the distance-education students had a higher mean grade in the prerequisite Software Engineering Basics (SEB) and Software Analysis and Modeling (SAM) courses (P = 0.321 and P = 0.222 respectively) that preceded the OOSE course. No other significant differences were found.

TABLE I. STUDENT DEMOGRAPHICS

	Traditional classroom settings [Mean value]	*Videoconferencing distance education settings [Mean value]*
Age(years)	16.40	17.56
Overall CS GPA (on the scale 5-10)	8.67	7.44
Grade in SEB	8.80	8.15
Grade in SAM	7.90	8.83

Students who completed the course in the traditional classroom setting had an average final course grade of 8.92 compared to an average final course grade of 8.45 among students in the interactive videoconferencing group (P = 0.031). The response rate for the course and instructor evaluation was 95.24% (40 out of 42 students) for the distance-education students and 95.00% (57 out of 60 students) for the traditional classroom students. The mean evaluation score (Table 2) for the distance-education students was higher than for the live students (4.7 ± 0.6 and 4.4 ± 0.7, respectively; $P < 0.001$).

TABLE II. DOMAIN ANALYSIS OF STUDENT RESPONSES

	Traditional classroom settings [Mean(SD)]	*Videoconferencing distance education settings [Mean(SD)]*
General	4.4 (0.7)	4.7 (0.6)
Lecture content	4.4 (0.5)	4.6 (0.8)
Presentation/style	4.6 (0.5)	4.8 (0.4)
Student contact	4.3 (0.8)	4.7 (0.6)

During the videoconferencing lecture, the number of interactions between students, as well as between students and teacher were counted. The number of interactions is presented in Figure 4. As it may be observed from the figure the number of interactions is growing, which means improved synchronous communication.

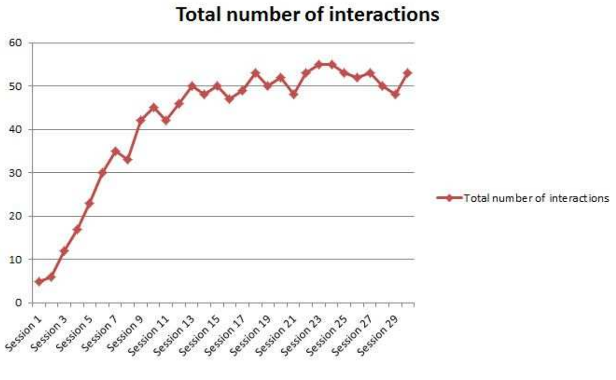

Figure 4. Total number of interactions during the synchronous videoconferencing lectures

IV. CONCLUSION

In videoconferencing distance education, it is often common for the distance students to feel a sense of alienation. In our case, students completing the OOSE course in a traditional classroom setting or by videoconferencing performed well and had a high overall perception of the instructor and courses. The distance-education course was rated higher by students than the same course delivered in a standard classroom. Several techniques were used by the instructor to facilitate the instruction via videoconferencing that may have influenced the distant students' perceptions of the course. Based on the results of the interview with the distance students the use of recitations was highly valued by the distant students. Therefore, the incorporation of regularly scheduled recitation-type sessions should be considered when developing a distance-education course. Moreover, encouraging interactivity with discussions between sites and group works were also highly appreciated. So, we can say, as a general finding from this research is the need for instructors to understand and acknowledge that using videoconferencing, as a delivery mode will have an impact on teaching styles and methods. Even though the term "interactive video-conferencing" is often used when discussing this type of technology-based, teaching, successful interaction does not take place unless lecturers plan and understand how the medium will alter their teaching approaches. Other findings also indicate that whether the course delivery mode is a traditional one or a technology-based mode, effective lecturers establish and maintain a highly interactive classroom community. Therefore, for efficient delivery of educational content through distance videoconferencing mainly depends on how much teachers are knowledgeable about their subject, about their learners, and about pedagogy.

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ON THE ROLE OF USER STORIES IN SOFTWARE ENGINEERING EDUCATION

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Abstract - User stories are an agile requirements engineering technique, which emphasizes communication and agile discipline. Its secondary aim is to keep things transparent. Last years, we used user stories in software engineering education as templates. These templates should have been filled out by the students during simulated customer interaction sessions. We identified the problem that the variance in personal soft skills of the students has a very high impact on the result, which is unwanted in our course. Because there is no unique course to increase students' soft skills at our Faculty, we improved our course. This paper presents the background and the resulting improvements. Improvements were also made in the lecture topics by adding a 'Hot-and-New' section. Later in the article, we also show our first results, which are promising. We finish our paper with results' analysis and conclusion.

I. INTRODUCTION

We focused our previous work on building a course structure, which contains the possibility of fast reaction to moving situation in the field of software engineering. This structure was applied in our courses 'Technologies of Software Projects' [1] and 'Software Engineering Basics' [2].

Our primary goal was to create a course structure, which is highly adaptive – using a modern word, agile.

Adaptive content was represented by planned invited lectures in selected software engineering topics. These lectures could be presented at any point of the semester, e.g. in the middle or at the beginning. Such an organization gives opportunity to the invited speakers to change the date of their lecture according to their workload. As presenters, experienced employees of local software development companies were invited.

Adaptive content of the labs was represented by changing topic and goals of the tasks as well as by their organization – students could choose 3 times to go to the other group's feedback. Another agility could be found in the presentation topics in the labs. These were chosen according to the actual activity in software engineering or development, respectively. We distinguish between engineering and development as we distinguish between methods and tools.

Our secondary goal was to teach agile software development methods and tools. As the students already had enough programming experience [3], [4], we could present less emphasis on this step. More organization, management and modeling was possible. In the case of the 'Software Engineering Basics' course we needed to also consider that the level and quality of knowledge of the students might be very manifold [5], [6], [7].

In this paper, we present an updated structure – a fine-tuning of the previous courses to solve several problems from the past while keeping the agile property. For this presentation, we describe user stories as our tools. Then, we present the old and improved course of 'Technologies of Software Projects.' Finally, we discuss our results and show future work of this research in teaching software engineering.

We do not use simulations yet, but a future idea could be using a simulation tool [8-11], [13]. We think, it is actually better to focus on the human factors such as communication [12] and teamwork than only simulating these artifacts.

II. USER STORIES AND FRIENDS

A user story is a lightweight expression of the required functionality. It is written from the user's perspective. The user story focuses on questions such as „who?" „what?" and „why?" but does not take into consideration the question „how?" [14], [15].

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Structure of the user story as presented in [15] and [16] is as follows:

- Story card (visible),
- Conversation (invisible),
- Acceptation criteria (visible) (see Fig. 1).

Story card represents the requirement. Conversation provides the necessary information. Acceptance criteria specify the goal of the user story. These criteria test several attributes of the completed user story.

User stories are the basic process of preparation and engineering of user requirements. The goal is to record the ideas of perspective users in a structured form, which form does not influence the users' idea itself but it helps to extend this idea into a couple of sentences. Next, the stories serve as basis for further discussion to verbally clarify details of the requirements.

III. Our old course

During previous years, we focused on keeping the lectures up-to-date. We involved students into this process too – they had to shortly present an actual topic.

The secondary goal was to teach students the agile processes. Teaching by examples and case studies was chosen as the method. We focused on the beginning phase of software development – requirements elicitation.

We defined the following schedule for student projects [1]:

1. Get familiar with the domain,
2. Write user stories for the project,
3. Analyze the stories and model requirements,

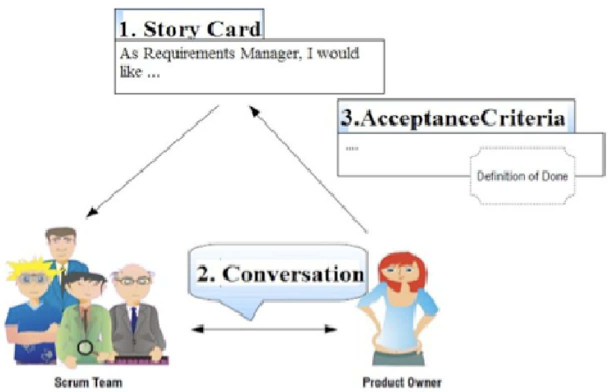

Figure 1. User story structure as presented in [16]

4. Design the system,
5. Implement it,
6. Deliver.

Healthcare was chosen as domain. Every year a different area of it was selected: mobile and e-health, information systems for hospitals etc. We assumed that everyone is familiar with this domain, because everyone is taking care of herself/himself. Social and mass media also emphasize some aspects and areas of it.

Requirements models were of lower quality, which resulted into less usable implementations and poor delivery.

What was wrong? Students failed at writing the user stories. They mostly copied the example provided, which was a part of a DVD store case study. Obviously, a modified DVD store related user story only poorly fits into the healthcare domain; in the most cases it does not fit into. The difference also showed that several students cannot distinguish between the patients' and the doctors' point of view. These problems started the development of the new course. Our goal was to eliminate the factor called domain as much as possible.

IV. The new course

With the new course, we started something different and unusual. Why? The user story is now given as presentation, to make it funnier, its style is like a comics. Example presented in Fig. 2.

The stories are now written by the teachers. This extra workload does not allow to drawing the whole comics. (At least not yet, because we are not so much skilled in drawing.) We use classical slides in our presentations. The comics' feel is achieved by font and color selection and by using hand-drawn style pictures to represent customers in the stories. These are our 'many faces' of requirements as shown in Fig. 3.

More action and activity is required on the students' side too – the students process the stories in two runs, where in between these runs a user feedback comics styled story is presented:

1. Analyze the user stories,
2. Design the system,
3. Implement it,
4. Deliver,

Figure 2. User story comics example

5. Analyze feedback user stories (and get over them),
6. Re-design the system,
7. Re-implement it,
8. Deliver version 2.

To make it a little easier considering possible domain-related problems with the user stories, we selected university education as domain of interest of the fictive customers. Our faces present a problem and require a fast and agile development and acceptable quality of the delivered system.

Within the lectures, students have the opportunity to present their research in selected areas. The presentation is also part of the grading.

V. Experience Gained in the First Year

The year 2013/14 was the first application of our renewed course structure.

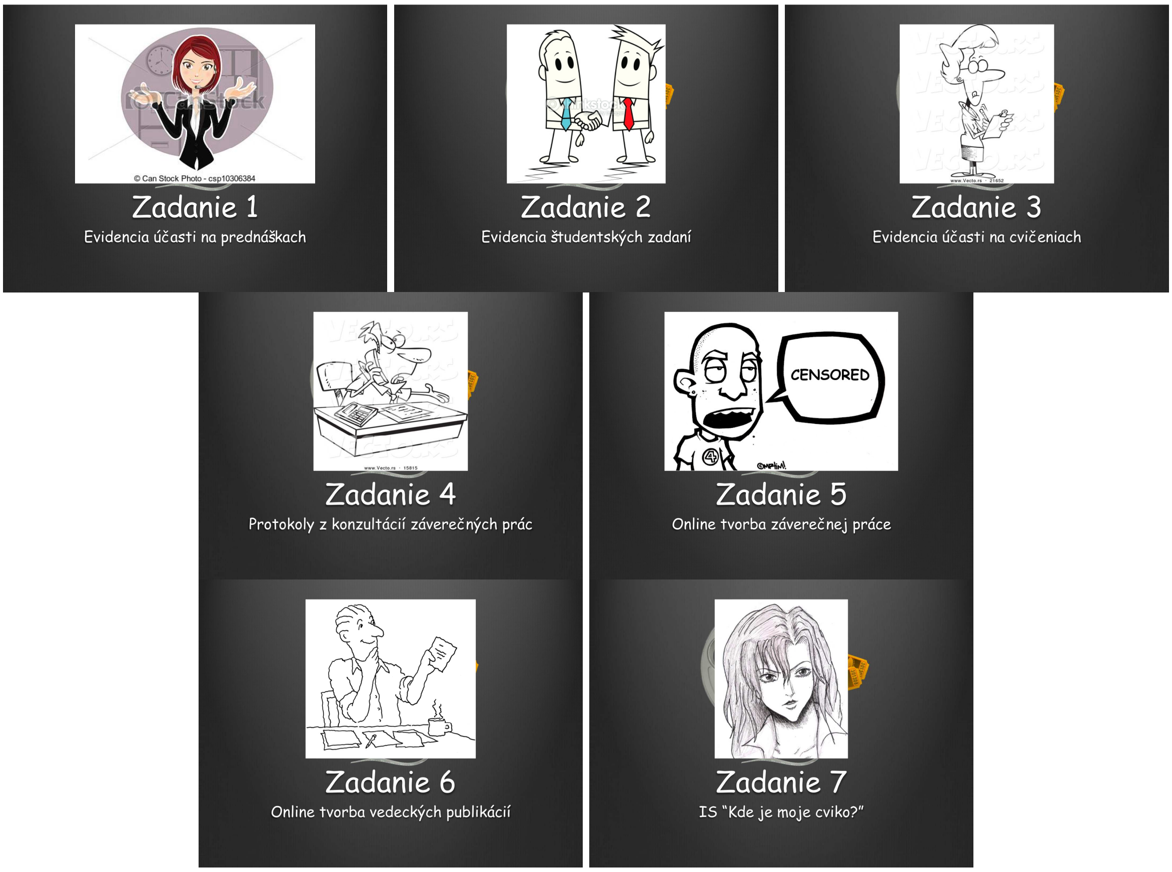

Figure 3. The 'many faces' of the course comics

There were 38 students enrolled to the course, but two of them were on ERASMUS mobility, which decreased the number of really involved students to 36. These students were in two groups of size 21 and 15, respectively, according to the room capacities.

In our experiment period, the following research topics were selected for student presentations:

1. IaaS
2. PaaS
3. SaaS
4. Documenting software architectures: views and beyond
5. Documenting software architectures in an agile world
6. Comparing the SEI's views and beyond approach for documenting software architectures with ANSI-IEEE 1471-2000
7. A Structured Approach for Reviewing Architecture Documentation
8. Architectural manifesto: Adopting agile development
9. Architectural manifesto: An introduction to the possibilities (and risks) of cloud computing
10. 4+1 architectural view model (Kruchten)
11. Software Systems Architecture (Rozanski and Woods)
12. Foundations for the Study of Software Architecture (Perry and Wolf)
13. Apache Thrift and SOA
14. Service oriented computing environment (SORCER)
15. Windows Communication Foundation (or WCF) and SOA
16. Web services and SOA
17. REST (Representational state transfer) in SOA
18. Agent-oriented programming
19. The Metodology Service-Oriented Architecture by Thomas Erl (MSOATE)
20. Pipe-and-Filter Architecture Style
21. Quality-Driven Architecture Design and Quality Analysis Method (QADA)

Grading of presentations was up to 19 points, average score was 16.38, which is very high and indicates that students did their best to pass the activity.

In the task implementation, the majority of the students had less activity. The teams were self-organizing, but this caused communication deadlocks in several cases, which required teacher interaction. The average score of 31 of 40 points for the credits is still high, but more idealistic. Based on these results, we derive that our students are better in individual theoretical studies than in team programming. This fact implies that we need to improve practicing teamwork and communication.

VI. CONCLUSION AND FUTURE WORK

The new structure has shown very useful; student and teacher workload is between the limits set by the faculty. Actually, for students it is 4 hours per week for our subject. Teachers' workload was distributed between 3 teachers, so that everyone's workload was 2 hours per week.

We successfully eliminated the problem of writing user stories without excluding this powerful technique from the syllabus. The increased number of the stories hopefully provides the required knowledge to the students. Now, they get examples from learn from instead of getting tasks. The disadvantage of our solution is that it does not allow students to learn from own failures. This disadvantage could be eliminated in the future by including user stories into the exams. We will work on it intensively.

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RESEARCH ON UTAUT APPLICATION IN HIGHER EDUCATION INSTITUTIONS

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Abstract - Information and communication technologies (ICT) have the potential to improve all aspects of our social, economic and cultural life. The ICT imposes inevitable positive changes upon the modern world. These changes are largely related to education as well. The introduction of ICT in institutions of higher education is clearly changing the way in which education is conducted. However, as much as important introduction is, the more important is acceptance of new technologies. For that purpose we shall use a unified theory of acceptance and use of technology (UTAUT) created by Venkatesh, which will explain the user intention to use information systems and subsequently to monitor the behavior of their use.

This paper describes the UTAUT model and the factors that affect it. Further, examples are given for the application of UTAUT in different educational environments. Then are given initial research for the application of UTAUT in our university "Goce Delcev"-Stip, Macedonia about acceptance and use of e-learning information system and ugd repository. Lastly, in the conclusion we note why the uptake of ICT is mandatory and should be undertaken in order to accept a new technology

I. INTRODUCTION

The presence of communication and information technologies in organizations today has dramatically increased. Some studies suggest that, by 1980, about 50 percent of all new capital investments in organizations are in information technology (Westland and Clark 2000). However, the technologies for improved productivity must be accepted and used by employees in organizations. The explanation of customer acceptance of new technology is often described as one of the most researched areas in modern literature information systems (IS) (Hu et al. 1999). Studies in this area have resulted in several theoretical models, with roots in information systems, psychology and sociology (Davis et al. 1989; Taylor and Todd 1995b; Venkatesh and Davis 2000).

One of those models was a unified theory of acceptance and use of technology (UTAUT) which is often used. UTAUT was tested using the original data and overcoming of the eight individual models was found. UTAUT has become a useful tool that managers need to apply in order to evaluate the probability of success while introducing a new technology and helps to understand the factors for its acceptance, in order to undertake more active interventions (such as training or marketing) targeted at users who may be less prone to adopt and use new systems (Venkatesh et al. 2003).

II. WHAT IS THE UTAUT

UTAUT aims to explain user intention to use information systems and subsequently to monitor the behavior of their use. Figure 1, illustrates the UTAUT model that collects all variables from the eight existing models and their additional constructions (intermediaries).

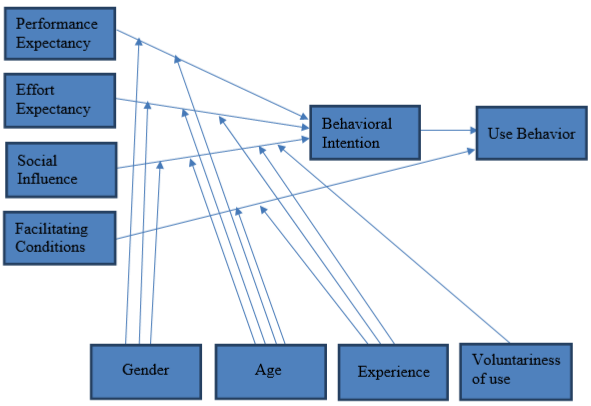

Figure 1 Diagram of UTAUT theory (Venkatesh et al. 2003)

The UTAUT theory considers that three key factors (performance expectancy, effort expectancy and social influence) are direct determinants of behavioral intention for use technology, whereas the facilitating conditions are direct determinant for usage behavior. The model integrates four intermediate factors like gender, age, experience and voluntary use, which have different impacts on basic constructions. By one sentence, we can say that, the UTAUT model condenses 32 variables from eight existing models into four main effects and four intermediate factors.

TABLE 1 UTAUT COMPONENTS

Construct	Description
Performance expectancy (PE)	the degree to which an individual believes that using a particular system would improve his or her job performance
Effort expectancy (EE)	the degree of simplicity associated with the use of a particular system
Social influence (SI)	the degree to which an individual perceives that others believe he or she should use a particular system
Facilitating conditions (FC)	the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of a particular system

TABLE 2 UTAUT MODERATORS

Construct	Description
Gender	Gender roles have a strong psychological basis and are enduring.
Age	Age has an effect on attitudes.
Experience	Effort is expected to be more important in the early stages of new behavior.
Voluntariness of Use	Is usage voluntary or mandated

III. Application of the UTAUT

At the University of Jos Plateau, Nigeria, a pilot – study was conducted which contained 23 UTAUT survey questions and 9 demographic statements in the total amount of 32 questions (Oye et al. 2011). Respondents were university academics. The survey showed that, 57% of respondents were male and 43% were female. By using the pilot study questionnaire part of the demographic statements, they were able to give answer to the following questions (a) Was ICT mandatory or voluntary in their institution. (b) What were the greatest barriers for using ICT for academics? The following results were obtained: the majority of the full-time lecturers (89%) responded that ICT was mandatory. Question, which talked about barriers of using ICT, had the majority of the respondents (42%) which said that their problem was the time; on the other hand, (31%) said that the problem was the training. Others respondents (4%) said that the cost was their problem; another group (20%) said that they needed the compensation and the final group (3%) said that, it did not fit their programs. This implies that the university ICT made task more easily accomplished, thereby making them more productive. Hence, result from the survey showed that 86.5% agreed with that. Therefore, this determined the level of expected adoption of ICT by the respondents. Among the four UTAUT constructs, performance expectancy exerted the strongest effect. Therefore, Performance expectancy was the most influential factor for the acceptance and use of ICT by the respondents.

Recommendations that were made were that, all employed teachers in Federal, State and Private universities should undertake mandatory training and retraining on ICT programs. This study used the models TAM and UTAUT to understand the teacher's behavioral intention on the acceptance and use of the technology.

TABLE 3 RESULTS FROM THE STUDY IN NIGERIA (WITH UTAUT CONSTRUCTS OF RELIABILITY OF ABOVE 0.70.)

Results from the study in Nigeria (Number of respondents N = 100)		
Gender	Male	57%
	Female	43%
Use	Mandatory	89%
	Voluntary	11%
Barriers for using ICT	Time	42%
	Training	31%
	Cost	4%
	Compensation	20%
	Do not fit with the job	3%

Another survey was conducted in a large public university in the Midwest area. The revised questionnaires were distributed to 394 undergraduate students in a business administration course. There were 294 returned responses, for an overall response rate of 74.62 percent. The demographic data of respondents were also collected. Table 2 demonstrates sample characteristics.

The subject of the questionnaire was the assessment of the students' intention to use Blackboard (named MyGateway at the survey institution) which is a Web-based software system used to support flexible teaching and learning in face-to-face and distance courses. Blackboard is an educational innovation that provides tools and facilities for the online course management, content management and sharing, assessment management, and online collaboration and communication between faculty and students or among students themselves.

TABLE 4 SAMPLE CHARACTERISTICS FROM THE STUDY IN MIDWEST AREA (P-VALUE <= .01)

Sample Characteristics	Results
Academic Year	Freshman 30.38 % Sophomore 15.00 % Junior 40.77 % Senior 13.08 % Other 0.77 %
Gender	Male 50.38 % Female 49.62 %
Age	Mean 22.12 S.D. 5.19
Application Experience	None 50.77 % 1-2 Semester 30.77 % More than 2 Semester 18.46 %
Application Training	None 82.31 % 1-5 Hours 16.92 % More than 5 Hours 0.77 %
Voluntariness	Yes 50.00 % No 50.00 %

The last study attempted to understand factors that affected university students' usage intention of library apps in university libraries. The survey was administered in Taiwan in the context of adopting library apps in university libraries; the subjects selected were distributed across various departments, and undergraduate and graduate students in eastern Taiwan from each department and school were evenly distributed to ensure valid comparison.

All subjects participated in the study voluntarily. There were a total of 363 Participants, 168 males and 195 females. Within the sample population: 277 (76.3 percent) were undergraduate students and 86 (23.7 percent) were graduate students. The age of the participants ranged from 18 to 28 years. Most of the participants (69 percent) stated they were familiar with the term library APP before the survey.

TABLE 5: RESULTS FROM THE STUDY IN TAIWAN (P-VALUE <= 0.05; 0.01; 0.001)

Results from the study in Taiwan (Number of respondents N = 363)		
Gender	Male	168
	Female	195
Population	undergraduate students	277
	graduate students	86

IV. APPLICATION OF THE UTAUT WITHIN THE UNIVERSITY "GOCE DELCHEV" – STIP

Within the University "Goce Delchev" - Stip survey was conducted in February 2014. The survey was consisted of 74 modified UTAUT questions. We used a model that besides the four basic determinants contained three more determinants such as self - efficacy, anxiety and attitude towards using technology taken from other theories (Figure 2). The survey consisted of three sets of questions, the first group or 31 questions were intended for acceptance and use of the e – learning information system, the second set of questions were intended for UGD- repository (also 31 issues) and the third group or 12 questions were designed to test the demographic structure of the respondent.

From the 31 questions intended for the e-learning system and UGD repository, respectively, 4 were intended to determine the appropriate determinants and 3 were designed to determine the intention behavior.

The survey was conducted using Lime software for online survey and it was based on the determinants defined in this study. The time required to complete the survey was approximately 10 to 15 minutes. The survey included approximately 360 respondents, of which 138 responded, but 46 were partially and only 92 of the responses were completed. The following analysis is done only on those 92 responses.

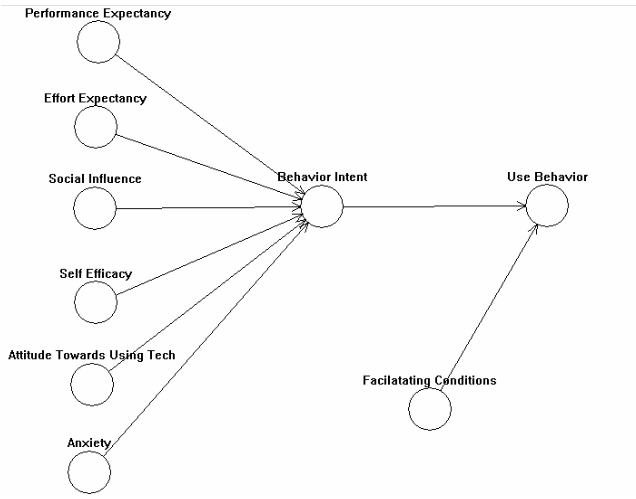

Figure 2 Our Research Model (Moran, 2006)

General demographics of the participants in the survey is shown in Table 6 and we see that most of the respondents are female, mostly between 30 and 44 years old and most of them have full-time work with more than 10 years' experience. Also, according to the analysis we conclude that most of the respondents are professors who teach more than 5 courses and use the e - learning system once or several times a day, but they use a repository usually once a week.

TABLE 6 DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Demographic characteristics	Responses	Occurrence	Percent
Gender	Male	37	40,22
	Female	55	59,78
Age	to 30	13	14,13
	from 30 to 44	45	48,91
	above 45	34	36,96
Working status	Part-time	5	5,43
	Full-time	87	94,57
Working experience	1-5 years	18	19,57
	6-10 years	28	30,43
	More than 10 years	46	50
Education level	Professor	54	58,70
	Assistant	33	35,87
	Lecturer	1	1,09
	Laboratory	4	4,35
Scope of work	0-1 course	1	1,09
	2-3 courses	13	14,13
	4-5 courses	35	38,04
	More than 5 courses	43	46,74
I use e-learning system	once or several a day	39	42,39
	once a week	37	40,22
	once a month	12	13,04
	once a year	3	3,26
	never	1	1,09
I use the repository	once or several a day	14	15,22
	once a week	25	27,17
	once a month	47	51,09
	once a year	5	5,43
	never	1	1,09

For the question, which is the largest barriers for using the e-learning system, most of the respondents, even 54.35% said that it is the time, which means that the respondents claim that they have no time to study and work on the system, because they have another work. Approximately 15.22% said that they needed technical support, 11.96% stated that the barrier is the low training etc. (Table 7).

TABLE 7 WHICH ARE THE LARGEST BARRIERS FOR USING THE E-LEARNING SYSTEM ACCORDING TO YOU?

	Frequency	Percent	Valid percent	Cumulative percent
TIME	50	54.35	54.35	54.35
TECHNICAL SUPPORT	14	15.22	15.22	69.57
COST	0	0	0	69.57
TRAINING	11	11.96	11.96	81.53
DOES NOT FIT MY PROGRAM	6	6.52	6.52	88.05
OTHER	11	11.96	11.96	100
Total	92	100	100	

That was for e- learning system, now in the following table (Table 8) are represented the largest barriers for using the UGD university repository. 52.17% said that it is the time, 18.48% said that they needed technical support, 8.70% stated that the barrier is the low training, 7.61% said that the system doesn't fit with the other systems they use, and the last 13.04% listed other reasons why they doesn't use the repository often.

TABLE 8 WHICH ARE THE LARGEST BARRIERS FOR USING THE UGD REPOSITORY ACCORDING TO YOU?

	Frequency	Percent	Valid percent	Cumulative percent
TIME	48	52.17	52.17	52.17
TECHNICAL SUPPORT	17	18.48	18.48	70.65
COST	0	0	0	70.65
TRAINING	8	8.70	8.70	79.35
DOES NOT FIT MY PROGRAM	7	7.61	7.61	86.96
OTHER	12	13.04	13.04	100
Total	92	100	100	

As one of the main reasons for not using e-learning, system is noted having many other commitments, and for the repository are listed technical inconsistencies of the system and the fact that the older professors have difficulty and ambiguities to work with the system, and they need many help.

These are initial results and detailed results will come in the following researches.

V. CONCLUSSION

We are living in a constantly evolving digital world. ICT has an impact on nearly every aspect of our lives - from working to socializing, learning to playing. The digital age has transformed the way people communicate, network, seek help, access information and learn. ICT in education is very important. ICT in education is the key to unlocking the skills and knowledge of our future generations of young people. It is the tool for learning for the 21st century (Kate McKenzie).

The quality of our work can be improved by using new ICT technologies we, if they are accepted and used by us. This and the factor time are the biggest reason why the uptake of ICT is mandatory in our University. That means that all the staff must have time to work with these systems.

Although the use of ICT is mandatory most of the staff says that they have no time, but that means that they don't want to do that and they have no reason about not using the corresponding systems.

About the issue what should be undertaken in order to accept a new technology, we can simple say that for one technology to be accepted by the employees, mandatory training, time, and above all perseverance and desire to learn something new are required.

From the results, we will also see whether and to what extent UTAUT will be accepted for this type of information systems, in environment and conditions similar to higher education in our country, in conditions in which there is a lower IT culture. As the second result we expect to identify influential factors for the theory that most stands out in our environment. Based on this and other studies may be suggested expanding the factors that affect the theory with other factors that affect the environment similar to ours.

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EFFECTIVENESS OF THE EVALUATION BY COMPUTER TESTS

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Abstract: This report examined and compared the methods related to evaluating students' knowledge by classical tests as well by the computer test system "UniTeSys". In order to verify the effectiveness of the evaluation by computer tests a series of experiments was conducted . Statistical processing of the results from the tests of students in the discipline Technical Documentation was made.

In conclusion it can be said that the objective of this work was acheived, namely to demonstrate the effectiveness of the assessment of students through computer tests in technical disciplines.

By choosing the computer test system "UniTeSys" the right choice of productive educational technology assessment was made, which increased the effectiveness of training and evaluating through the use of computer programs.

I. INTRODUCTION

When planning the pedagogical experiment hypothesis was devised that includes the basic idea whose authenticity needs to be verified by conducting the experiment.

The hypothesis of the study is:

“The computer test system UniTeSys used for evaluating students' knowledge in engineering courses will lead to a greater efficiency of the evaluation on the one hand and to higher level of understanding the material on the other hand”.

II. RESEARCH PLAN

The stages for conducting the educational research are a preparatory stage, a preliminary study, main study (natural and controlled experiment) and final experiment.

A. Preparatory stage

In the preparatory stage along with the study of the literature and the development of a concept is considered in what way the didactic experiment will be held, the key points in the methodology were marked.

The purpose of this stage is mainly gathering information about the suitability of the designated for the didactic experiment methods and tools. Purpose of the preparatory stage is also specification of the methodology and the organization of the work in the next stage.

B. Preliminary study

In this stage:

- the primary system (bank) of questions and problems was developed;
- pilot testing was conducted in which the assignments of the primary version of the test were tested;
- an analysis of the quality of questions;
- the difficulty of the assignments was analyzed;
- an analysis of the distractors was made;
- The test was tested and revised.

To establish the extent of conformity between the test assignments and the predetermined goal for the needs of the research an expert assessment was made.

The method of the expert assessment was applied twice. Once in defining the validity of the content of the compiled didactic tests and a second time in researching the experts opinion for establishing the conformity of the test assignments with certain parameters.

The expert assessment of the test assignments is an essential premise for creating tests regardless of the level of application. Once the assignments are prepared, their objectivity and their accuracy of the formulation should be checked. A task or a question can be considered objective or correctly formulated if the opinion of most experts match.

The analysis of the content validity of the test assignments by the expert assessment shows a high degree of conformity between the test assignment and the predetermined goal whose achievement it is intended to measure.

It is considered that the test is valid and it can be used to evaluate the students' knowledge. After examining and developing the test assignments and considering the results of the expertise it goes to the next stage of the test development: arranging the assignments and conducting their approbation.

According to the approbation results, some of the assignments have been removed.

During the preliminary "trial" experiment, in order to approbate the methodological apparatus, the central tendencies and the standard deviation for the entire experimental group have been calculated. The results are shown in Table 1.

TABLE1. CENTRAL TENDENCY

Statistics	Value
Arithmetic mean /Sr_ar_s/ $\overline{X}$	3,9793
Harmonic mean value /Sr_ha_s //Xh/	3,7327
Median /Med/ /Me/	3,9862
Mode / Mo/	4,00
Asymmetry coefficient in K.Pirsan / S_1/	-0,0214
Asymmetry coefficient in Dzh.Yul / S_2/	-0,0214
Excess /E/	-1,3439

The results of the test measurement in the prior study were calculated using the formulas established in the testing by the test system "UniTeSys". [1]

The analysis of the results of the preliminary study gives a reason to conclude that the test system "UniTeSys" is suitable for the main experiment and with its help, the goal will be achieved.

C. Natural experiment

During this study, the initial natural experiment for the control and the experimental groups took place. This experiment was conducted by the pedagogical diagnostics through accepted indicators for measuring students' achievements in each of the two groups.

The aim of the natural experiment was to determine the effectiveness of the developed system.

In this stage, following tasks were completed:

- A final selection of the assignments, the questions and the arrangement of test tasks was made;
- An experimental verification of the developed test assignments, methods of work organization of the students was conducted;
- The content of the used computer tests was analyzed;
- An experimental verification of the conformity between the electronic and the conventional tests in the education of students in technical disciplines was conducted;

- The results of the didactic experiment, support for the hypothesis, were summarized.

The results of the tests in the control and the experimental group are presented in figure.1.

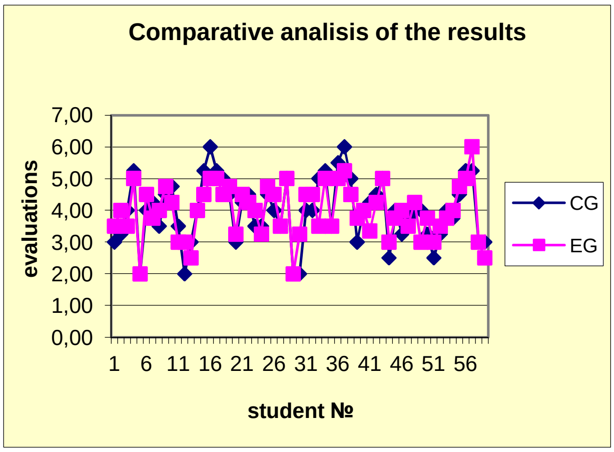

FIGURE 1. Results of the tests performed in the control and the experimental group

Testing the hypothesis

Testing the hypotheses implies estimation whether a predefined parameter value is plausible, i.e. concluding if the information obtained in the sample conforms to the expectations. In this way a decision whether to support or disprove the hypothesis can be made based on the results of the observations.

To solve the problem following hypotheses are formulated:

Ho: µ1-µ2 = 0 - Between the level of knowledge acquired in both groups there is no significant difference;

On: µ1-µ2> 0. 0 - Between the level of acquired knowledge in the two groups there is a significant difference;

For finding the test statistic and its critical values with predetermined level of significance a t-Test was applied, the results of which are presented in Table 2.

TABLE 2. TWO-SAMPLE ASSUMING UNEQUAL VARIANCES

t-Test:Two-Sample Assuming Unequal Variances	**Variable 1 /CG/**	**Variable 2 /EG/**
Mean	3,983050	3,9762711
Variance	0,986776	0,7017548
Observations	59	59
Hypothesized Mean Difference	0	
Df	113	
t Stat	0,040075	
P(T<=t) one-tail	0,484051	
t Critical one-tail	1,658450	
P(T<=t) two-tail	0,968103	
t Critical two-tail	1,981180	

Conclusions:

- As shown by the test statistics results / t Stat = 0,04007554 / does not exceed the critical value for a one-sided test / t Critical two-tail = 0,9681 /, therefore the null hypothesis is not disproved. This means that it can be assumed that between the level of education of the students from both groups there is no statistically significant difference at the significance level of 0.05.
- The innovative electronic tests for verifying and evaluating the knowledge of the students in technical disciplines are equivalent and comparable to conventional methods
- The test is valid because it leads to results that are comparable with the results of a similar measurement method / have similar results /.
- The test is reliable because in the two groups of students with the same level of competence the results are similar.

D. Controlled experiment.

As obtaining data on approximately equal performance of the experimental and control groups began forming experiment. It includes a special impact on certain qualities of the students. Quantitative and qualitative analysis of the results of the survey was made.

In this stage, following assignments were accomplished:

- In the experimental group two intermediate tests were conducted;
- In the experimental and control group were conducted final tests;
- Surveys were conducted to measure the effectiveness of the evaluation of computer-based testing;
- A comparison between the results obtained from the tests in the study was made;
- An experimental verification of the effectiveness of the method of evaluating the computerized test system was made;
- The results of the research in the learning process were implemented.

In this phase of the study were used quantitative methods, in which parameters of the study experiments were set in advance before their implementation as well as qualitative methods, through which the parameters themselves were sought and interpreted [2].

The study used interviews and written questionnaires because of their wide applicability in the teaching practice.

An analysis and research of experts' and students' opinion was made on the effectiveness of computer-based test evaluation, on the quality of education, on the need to improve the learning process including recommendations to the teaching, training and the teaching staff.

E. Final natural experiment.

The purpose of the final natural experiment is:

- Accomplishing a series of final tests to measure the final results of the survey conducted in all groups of the study;
- Providing information on the results of the education, the methods that have been experimented under accordingly variable conditions;
- Comparison of the results by groups and variants derived from the preliminary, the intermediate and other tests during the study;
- Experimental verification of the effectiveness of the method of operation or the suitability of the learning content.
- Implementation of the survey results

Conducting final tests and processing the results.

The final test was conducted in the experimental and in the control groups. The results are shown in Figures: 2, 3 and 4.

CG	
Bin	Frequency
0,00	0
2,00	2
3,00	7
4,00	26
5,00	21
6,00	11
More	0

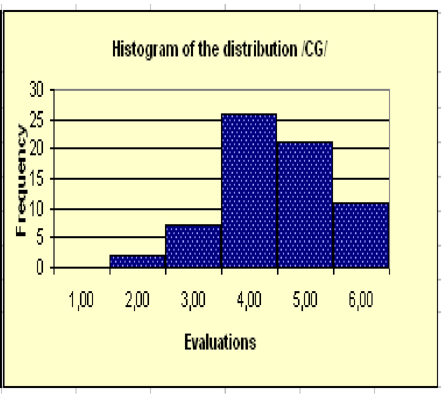

FIGURE 2. FREQUENCY DISTRIBUTION AND HISTOGRAM OF THE RESULTS OF THE CONTROL GROUP

EG	
Bin	Frequency
0,00	0
2,00	0
3,00	2
4,00	20
5,00	25
6,00	19
More	0

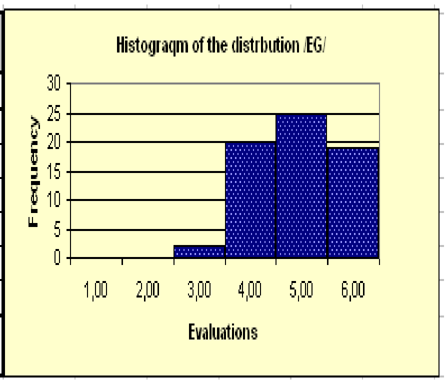

FIGURE 3. FREQUENCY DISTRIBUTION AND HISTOGRAM OF THE RESULTS OF THE EXPERIMENTAL GROUP

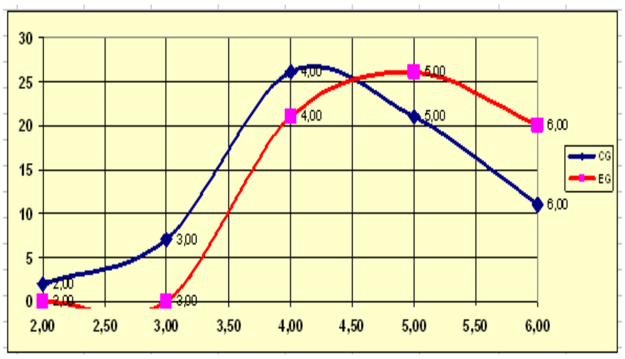

FIGURE 4. DISTRIBUTION OF THE RESULTS OF THE CONTROL AND EXPERIMENTAL GROUP

The results of the experimental group were statistically significantly better. In applying the method of parametric t-test to check the alternative hypothesis, the field of adoption is one-sided and the probability of error is estimated as a = 0.05. To find the test statistic and its critical values at a predetermined level of significance P = 0,05 t-Test is applied: Two-Sample Assuming Unequal Variances, whose results are indicated in Table 3.

TABLE 3. TWO-SAMPLE ASSUMING UNEQUAL VARIANCES

t-Test: Two-Sample Assuming Unequal Variances		
	Variable1 **/CG/**	*Variable 2* **/EG/**
Mean / μ / $\overline{X}$ /	4,018358209	4,48119403
Variance /σ^2/S^2/	0,852786658	0,40407431
Observations	67	67
Hypothesized Mean Difference	0	
df	117	
t Stat	-3,379253289	
P(T<=t) one-tail	0,000494038	
t Critical one-tail	1,657981659	
P(T<=t) two-tail	0,000988077	
t Critical two-tail	1,980447532	

Since t Stat = - 3,379253289 <1,980447532 / t Critical two-tail /, then the test statistic is outside of the field of adoption and the null hypothesis H0 is rejected in favor of the alternative. This is confirmed also by the probability: P = 0.00099 <0.05.

As a result, it can be concluded that the computer test is more effective for evaluating students in technical disciplines.

The results protocol which the "UniTeSys" system generates by teachers' request can be used for comparison of the results. The data from the survey can be used to evaluate the test subjects and to conduct a further statistical analysis of the obtained results. The system offers the possibility to display the data in text, tables and graphs.

III. CONCLUSION AND IMPLICATIONS

In conclusion it can be said that the objective of this work, namely to demonstrate the effectiveness of evaluating students through computer tests in technical disciplines has been achieved.

By choosing the computer test system "UniTeSys" the right choice of productive educational assessment technology has been made, which increased the effectiveness of educating and evaluating using computer programs.

Based on the implemented empirical research, from the qualitative and quantitative analysis of the results following conclusions and generalizations can be drawn:

1. The study content of technical disciplines offers great opportunities to build different versions of computer teaching tests and

their use in individual and differentiated work with students.

2. Several tools allow to obtain reliable data on the actual level of knowledge and practical skills of the students surveyed.
3. Based on the comparative analysis of the results of the didactic study is reasonable to assume that the computer test system leads to a full and lasting understanding of the material, activates the students' cognitive and practical activity and increases their success rate.
4. Testing using computer based testing environment ensures a reliable, objective evaluation and application of the same criteria for testing each student.
5. Once created and standardized the computer tests can be reused, shared and / or exchanged between different teachers and e-courses.
6. Through generated electronic tests can be created and maintained dynamic test packages in multiple areas much faster (compared to traditional approaches)
7. Trainees receive faster assessments on the progress of their improvement in studying.
8. Computerized tests are an effective way to implement the vetting and evaluating activity as they show the degree of mastering the educational minimum of the educational content with maximum efficiency and minimum consumption of resources and time.

The introduction of computer-based testing methods for evaluating students in technical disciplines, developed for specific educational content and theoretical and practical system of learning tasks, increases the efficiency of their activities in the acquisition of knowledge, skills and habits, and their creative application. The results of the study show that in the context of developing a system of classes and teaching model for acquiring knowledge the organized education of students contributes to improving the education of future professionals.

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STRUCTURAL EGUATION MODELING AND THEIR APPLICATION IN EDUCATIONAL RESEARCH - CASE STUDY OF ICT USAGE IN PRIMARY SCHOOLS IN SOUTH - EAST REGION IN MACEDONIA

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Abstract - A research was conducted in order to ensure valid and reliable assessment of the extent of ICT knowledge and skills of teachers in primary schools, to identify the factors in terms of teachers affecting the development of ICT competences, and to identify strategies to improve the development of effectiveness in the future.

The research surveyed 214 teachers from 10 primary schools in the Southeast region of Macedonia . The Technique Modeling with Structural Equations was used to determine the relative strength of influence of factors on ICT competencies of teachers and the relative strength of the factors affecting the frequency of use of ICT in teaching. The results show that 25% of the teachers have below basic ICT Competency, 17% of teachers have basic knowledge and skills to operate a computer, and the highest percentage, 58% of teachers with proficient ICT competence. The highest percentage of 58.4 % of the teachers often use ICT in teaching, 33.6 % rarely use ICT, 7 % of respondents use ICT at all times, and only 0.9 % do not use ICT for teaching purposes.

The survey results were analyzed using SPSS 19, Excel and Amos Graphics 18.

I. INTRODUCTION

Information and communication technologies (ICT) play a proven critical role in enhancing the quality of education. They are particularly important in helping teachers and students to perform more effectively. To make the best use of ICT, teachers must be equipped with adequate ICT competencies. In the process of integrating ICT into education, both teacher’s ICT competencies and how they perceive the role of ICT in their teaching/learning processes play key roles. Analysis, design, development, implementation, evaluation, and management of ICT in education require diversified competencies and knowledge (Kozma 2002, pp.1-6).

ICTs have become within a very short time, one of the basic building blocks of modern society. Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy (Daniels, 2002).

Today, improved communication technology has made time and space less complex. It could be observed that this modern age is the age of information explosion in which an average individual wants to explore the information system. Thus, the ability for timely acquisition, utilization, communication and retrieval of relevant and accurate information has become an important attribute for better teaching-learning process (Adebayo, 2008).

The new technologies have the potential to support education across curriculum and provide opportunities for effective communication between teacher and students in ways that have not been possible before. ICT in education has the potential to be influential in bringing about changes in ways of teaching (Dawes, 2001).

The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning, and research (Yusuf, 2005). A great deal of research has proven the benefits to the quality of education (Al-Ansari, 2006). ICTs have the potential to innovate, accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Davis and Tearle, 1999; Lemke and Coughlin, 1998; cited by Yusuf, 2005). As Jhurree (2005) states, much has been said and reported about the impact of technology, especially computers, in education The field of education has been affected by ICTs, which have undoubtedly affected teaching, learning and research (Yusuf, 2005) .ICTs have the potential to accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change (Davis and Tearle, 1999; Lemke and Coughlin, 1998; cited by Yusuf, 2005).

Teachers contribute toward the base of the education innovation, therefore ICT competencies of teachers in primary schools should be seen as an invaluable prerequisite to facilitate teaching and learning in this modern era of information and technology. [9]

ICT is not only a means of realizing the educational goals but important factor in a complete restructuring of the educational system, introducing new interactive and participatory models of education, new educational pedagogy, continuous and lifelong learning.

Macedonian context of computerization and digitization of education intensively developed after 2002 when the country received the first Chinese donation, which allowed a certaindegree of popularization of ICT in the education. Starting in 2003 through the e-school project teacher training the use of ICT were conducted in two phases. With changes in education that occurred with the intensive introduction in education, resulted in a need to develop national educational policies and strategies that will contribute to the social and educational development. In 2005 was created the draft program for the development of ICT in education (2005-2015) which covered the process of computerization and digitization of education.

Macedonia entered the world of ICT innovation with the introduction of the program "Computer for Every Child" initiative and investment by the Government of the Republic of Macedonia to modernize Macedonian education. This project provides a computer for each child, software solutions and tools for each subject, advanced ICT skills among teachers and students, a national system of testing students and the interactive online teaching.

In the academic year 2009/2010, primary schools were equipped with portable Classmate PCs for every student from first to third grade. In 2010 teacher trainings were conducted for Edubuntu operating system, the programs for integration of mathematics and sciences, ToolKid program and SSTC of using “thin clients”. Furthermore, despite the software electronic grades were introduced. Also attached is training for class teachers for the program and Green G Compris suite-junior. [5,6,8]

Starting from the academic year 2013/14, all teachers were required to integrate at least 30% of ICT in the curriculum.

II. METHODOLOGY

In the survey every teacher had to report their ICT knowledge and skills, the ways in which they use ICT in teaching, ICT trainingthey have attended, frequency of ICT use in teaching and to evaluate motivational attitudes of the ICT use in teaching, and the attitudes of the school towards ICT. The main parts of the survey are shown in Table 1.

This research is done in order to ensure a valid and reliable assessment of the extent and nature of ICT knowledge and skills of teachers in primary schools, and to identify factors that affect the frequency ICT usage in teaching.

The survey was conducted in the academic year 2012/13, in 10 primary schools in the Southeast region of the Republic of Macedonia in the municipalities of Strumica, Vasilevo, Bosilevo and Novo Selo. The survey was conducted on 214 teachers, a representative sample in given that 610 is the total number of teachers in those municipalities.

TABLE I. STRUCTURE OF THE ICT SURVEY IN TEACHING FOR TEACHERS IN PRIMARY SCHOOLS

part	Title of section	Information	Number of issues
I	General information	environment, age, experience, sex, teacher	5
II	Using the computer for personal needs	personal computer, type of computer, Internet at home, years of experience with computer	4
III	Personal and professional development	training classes at school, additional training, self-improvement	3
IV	Using computers at school	implementation of ICT programs, type of computer, hardware, use of computer	6
V	Motivation for using ICT in teaching	motivational view with scale assessment	21
VI	ICT knowledge and skills	navigation in the operating system, email, Internet, text editor, multimedia presentations, spreadsheet calculations, blogs, databases	8
VII	ICT in school	assessment scale for the application of ICT in school	3
		Total Questions	33

III. RESULTS AND DISCUSSION

The survey results were analyzed using SPSS 19 programs, Excel and Amos Graphics 18. The tables below present the demographic characteristics of the surveyed teachers.

TABLE II THE LOCATION OF THE SCHOOL

Location

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rural	105	49,1	49,1	49,1
	Urban	109	50,9	50,9	100,0
	Total	214	100,0	100,0	

Table II shows that almost equal number of teachers are from urban and rural areas.

TABLE III AGE STRUCTURE OF THE SURVEYED TEACHERS

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<=25	5	2,3	2,3	2,3
	>=56	24	11,2	11,2	13,6
	26-35	59	27,6	27,6	41,1
	36-45	55	25,7	25,7	66,8
	46-55	71	33,2	33,2	100,0
	Total	214	100,0	100,0	

TABLE IV WORK EXPERIENCE AS A TEACHER.

Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<=5	46	21,5	21,5	21,5
	>=26	51	23,8	23,8	45,3
	11-15	29	13,6	13,6	58,9
	16-20	22	10,3	10,3	69,2
	21-25	19	8,9	8,9	78,0
	6-10	47	22,0	22,0	100,0
	Total	214	100,0	100,0	

TABLE V GENDER OF SURVEYED TEACHERS

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	177	82,7	82,7	82,7
	Male	37	17,3	17,3	100,0
	Total	214	100,0	100,0	

TABLE VI TEACHERS FROM PRIMARY EDUCATION.

Teacher

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary education teacher	85	39,7	39,7	39,7
	Subject teacher	129	60,3	60,3	100,0
	Total	214	100,0	100,0	

In the survey the teachers responded regarding their use of eight most used ICT applications:

- Navigation in OS
- Electronic mail
- Internet
- Text editor (Word, OpenOffice Writer, ...)
- Multimedia presentations (Power Point, OpenOffice Impress, ...)
- Spreadsheets (Excel, OpenOffice Calc, ...)
- Blogs
- Databases

For each software application was given a list of skills that teachers chose the ones they posses.

The use of ICT applications by teachers is different, as shown in Table 7.

TABLE VII USE OF ICT APPLICATIONS BY TEACHERS

	Percentage of use *
Base: All respondents	n=214
Navigation in OS	90%
Email	89%
Internet	94%
Text editor (Word, Open Office Writer ...)	94%
Multimedia presentations (Power Point, Open Office Impress ...)	81%
Spreadsheets (Excel, Open Office Calc ...)	79%
Blogs	10%
Databases	4%

* Percentage of teachers who said they use the application

The Basic ICT applications which are used by 94% of the teachers are online and text editor. The application navigation in operating system was used by 90%, email by 89%, and multimedia presentations by 81%. Then, spreadsheets used by 79%, and blogs used by only 10% of the respondents. The lowest percentage of respondents 4% are using databases for the purposes of teaching.

In order to provide an easier way of applying statistics, the results of the survey were summarized for ICT competencies. Each of the answers for the given eight skills to work with a computer was assigned a score. The total number of points gives the result for ICT competence.

The results of ICT competences are given in Figure 1. The graph shows that 25% of the teachers have the least ICT Competency, with less than 40 points. 17% of teachers have 41 to 70 points for the knowledge and skills of computer operation, and the highest percentage, 58% of teachers got 71 of the 129 points for ICT skills. So we can conclude that most teachers have high ICT competence, then teachers who have acquired basic knowledge and skills to work with a computer, the teachers in the middle are the least.

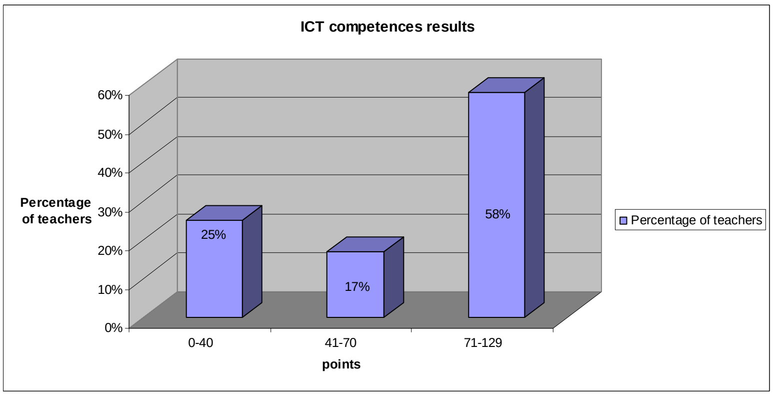

Figure 1. Graphical representation of the ICT competences results

When analyzing the results of ICT competence we came to some key factors that influence the teachers' ICT knowledge and skills. This decision is useful for the future when providing recommendations for the development of ICT knowledge and skills.

Factors found to affect the ICT knowledge and skills of teachers will be considered as:

- demographic factors and
- other factors.

The following demographic factors have a significant relationship with the teacher's ICT competence.

- **Gender:** Men are more likely to have higher ICT competence than women .
- **Age:** ICT competence score decreases as age increases for teachers .
- **Work experience:** The results of ICT competence score decrease as the experience of teachers in years increase, this undoubtedly is due to the relationship between age and experience of teaching.
- **Subject / elementary teacher:** The teachers teaching subjects are more likely to have higher scores in ICT competence than teachers in elementary school.

A factor which is not significantly associated with ICT competence (ie no statistically significant relationship exist between this factor and the results of ICT competence) is:

The location of the school (urban or rural)

Technique Modelling with Structural Equations was used to analyze the relationship between ICT knowledge and skills of teachers and the factors that influence them. Structural equation modelling examines the strength of the relationship between variables and assigns weight ratio, which could be anywhere between 0 and 1. It was found that the strongest factors related to ICT knowledge and skills are: professional use of ICT, school ICT capacity, personal computer, teacher attitudes and motivation. These relationships are shown in the model below.

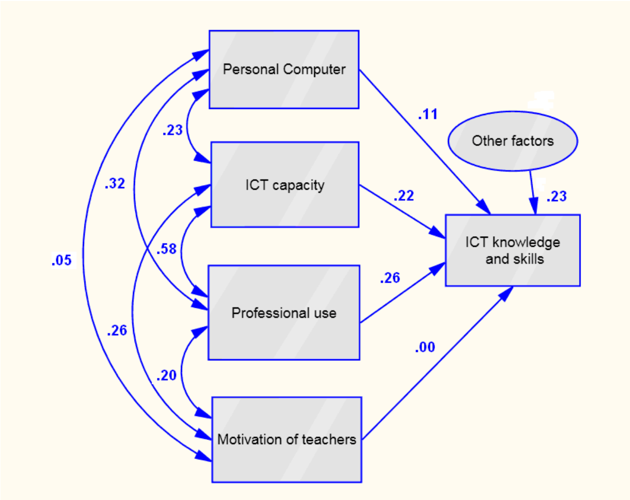

Figure 2. Relative strength of influence of factors on ICT competencies of teachers

From Figure 2 we can conclude that the professional use is the strongest impact factor of ICT knowledge and skills, which measured 0.26, then comes ICT capacity of 0.22, personal computer measured 0.11, but the motivational factor, which measured 0.004 is negligible. The impact of other factors on ICT knowledge and skills is 0.23.

When we collect the results of all factors that influence the ICT knowledge and skills we get a value 0.604 (0 to 1). This means that all these factors are 60.4% of the variance of ICT knowledge and skills and suggests that these factors describe well the impact on ICT knowledge and skills.

TABLE VIII REGRESSION WEIGHT FACTORS FOR ICT KNOWLEDGE AND SKILLS

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
ICT knowledge and skills	<---	Personal Computer	13.443	7.510	1.790	.073	
ICT knowledge and skills	<---	ICT capacity	5.043	1.723	2.927	.003	
ICT knowledge and skills	<---	Professional use	4.024	1.158	3.475	***	
ICT knowledge and skills	<---	Motivation of teachers	.208	3.663	.057	.955	

TABLE IX OVERVIEW OF THE MODEL IN SPSS

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,480[a]	,231	,216	33,734

a. Predictors: (Constant), Motivation of teachers, Personal computer, ICT capacity, Professional use

Table 9 gives us a summary of the model in SPSS, where we can see that the value of R Square is 0.231 indicating that the model is correct.

Figure 3 is a graphical representation of a given application of ICT in teaching. The question: Do you use ICT in teaching, teachers had to answer whether they do it all the time, rarely, never, or don't know what it is. The largest percentage of 58.4% reported that they use ICT often, 33.6% rarely use ICT, 7% of the respondents use ICT at all times, and only 0.9% do not use ICT for teaching purposes.

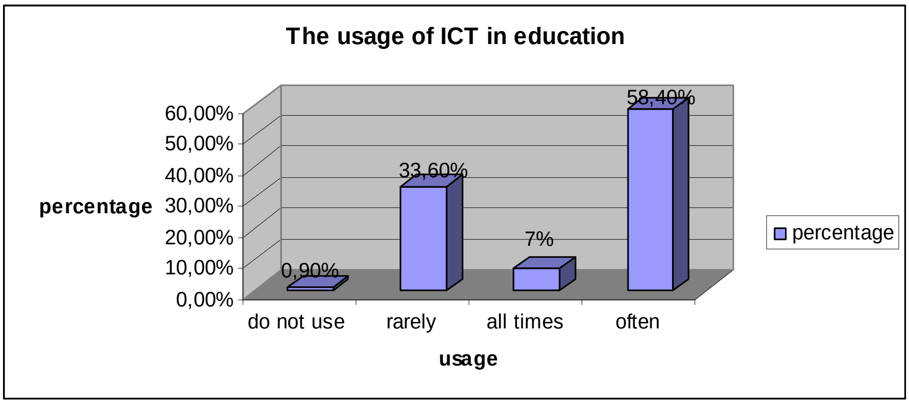

Figure 3. The usage of ICT in education

The survey asked teachers who use ICT in teaching to also assess the frequency, i.e. if they apply it daily, weekly, monthly, or a few times a year. Figure 4 shows the frequency of ICT usage. The largest percentage of 49.10 % applied ICT weekly, 20.60 % applied ICT monthly, 17.80 % a few times a year, and the smallest percentage of 11,70 % use ICT every day. The frequency of ICT usage in teaching depends on the nature of the subject that the teacher teaches and the requirements for the application of ICT in the teacher's curriculum.

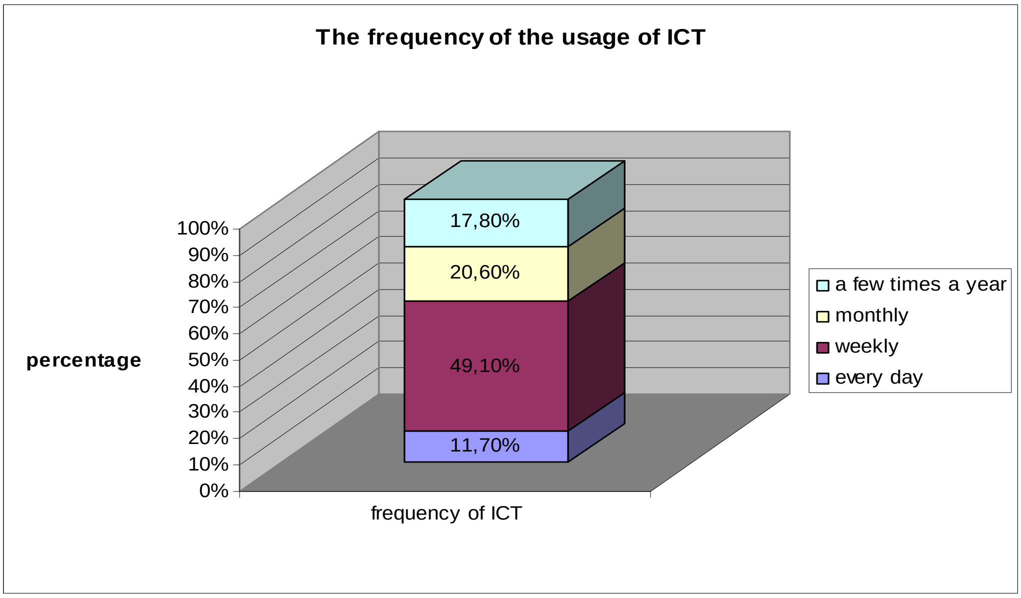

Figure 4. The frequency of the usage of ICT

According to the frequency of ICT usage, the teachers can be classified into three categories: low, medium and high. The low category, 34.1% of the surveyed teachers, includes teachers who rarely or never use ICT and if they do use it, it is a few times a year or month. The medium category, involved the highest percentage of respondents 52.3%, includes teachers who often use ICT in teaching. The high category, involved the lowest percentage of 13.5 % respondents, includes teachers who use ICT at all times, or every day.

By analyzing all demographic factors such as gender, environment, age, seniority, years of experience, and the kind of teacher we cannot single out any demographic factor that shows statistically significant correlation with the frequency of ICT usage in teaching.

The technique of structural equation modeling was used again to analyze the relationship between the frequency of ICT usage and the other factors.

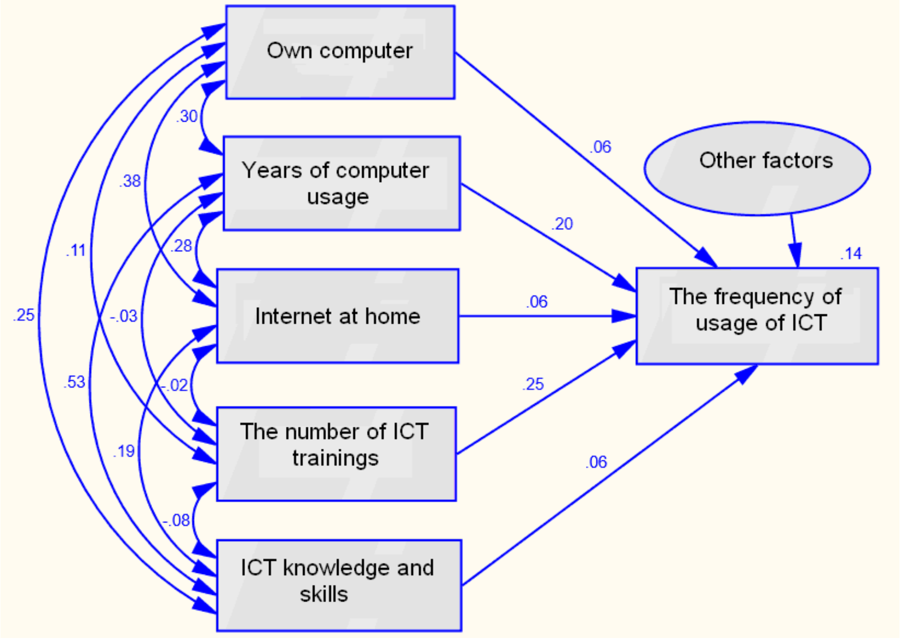

Figure 5. The relative strenght of influence on the factors on the frequency of usage of ICT

From Figure 5 we can conclude that the number of ICT trainings is a factor with the strongest influence on the frequency of ICT usage - measured 0.25, then comes years of computer usage - measured 0.20, and the remaining three factors: own computer, have Internet at home, and have ICT knowledge and skills - measured 0.06. The impact of other factors on ICT knowledge and skills is 0.14.

When we add the results of all five factors that influence the frequency usage of ICT, we obtain value 0.63 (0 to 1). This means that all these factors are 63% of the variance in frequency of ICT usage, suggesting that these factors describe the impact on frequency of ICT usage well.

TABLE X THE REGRESSIONAL WEIGHT OF THE FACTORS FOR THE FREQUENCY IF THE USAGE OF ICT.

Regression Weights: (Group number 1 – Default model)

			Estimate	S.E.	C.R.	P	Label
The frequency of ICT usage	<--	Own computer	.266	.325	.818	.414	
The frequency of ICT usage	<--	Years of computer usage	.289	.110	2.636	.008	
The frequency of ICT usage	<--	Internet at home	.373	.464	.804	.421	
The frequency of ICT usage	<--	Number of ICT training	.238	.060	3.964	***	
The frequency of ICT usage	<--	ICT knowledge and skills	.002	.003	.758	.449	

Table 10 is a textual display of the results using AMOS Graphics. As we can see only the factor *Number of ICT training* has a significant positive effect on the frequency of ICT usage, with value of p <0.001. Years of computer usage have a positive significant effect on the frequency of ICT usage, with value of p <0.05. The rest of the factors have a positive insignificant effect on the frequency of ICT usage, with a value of p greater than 0.05.

TABLE XI OVERVIEW OF THE MODEL IN SPSS.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,380[a]	0,144	0,124	1,376

a. Predictors: (Constant), ICT knowledge and skills, Number of ICT training, Internet at home, Own computer, Years of computer usage

Table 11 gives us a summary of the model in SPSS, where we can see that the value of R Square is 0.144, indicating a good model.

TABLE XII ANOVA table for the cumulative effect on SPSS.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	66,457	5	13,291	7,018	0,000[a]
	Residual	393,917	208	1,894		
	Total	460,374	213			

a. Predictors: (Constant), ICT knowledge and skills, Number of ICT training, Internet at home, Own computer, Years of computer usage
b. Dependent Variable: The frequency of usage of ICT

As we can see from the ANOVA table, the cumulative effect is significant.

TABLE XIII TABLE OF COEFFICIENTS IN SPSS.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,060	0,479		2,213	0,028
	Own computer	0,266	0,329	0,058	0,808	0,420
	Years of computer usage	0,289	0,111	0,204	2,605	0,010
	Internet at home	0,373	0,470	0,056	0,795	0,428
	Number of ICT training	0,238	0,061	0,255	3,917	0,000
	ICT knowledge and skills	0,002	0,003	0,057	0,749	0,455

a. Dependent Variable: The frequency of usage of ICT

From Table 13 we see that the the Beta coefficients of all predictors are positive, but only Number of ICT training and years of computer use are significant, the rest of the factors are insignificant.

IV. Conclusion

Since the ultimate goal is to achieve a higher level of ICT competence of teachers, then using the factors that contribute as a guide is a step forward. The increase in professional use of ICT will positively affect the increase of ICT competencies of teachers. The key areas are:

- contacting colleagues online
- creating class materials by using web resources, consumables, software etc.
- administration

Continualy improving the technical equipment in the schools that will positively affect the use of ICT by teachers. Access to hardware and computers contribute to greater development of ICT competencies of teachers.

Motivational attitudes of teachers in general are positive and indicate a need for small improvement.

Training teachers regarding spreadsheets, multimedia presentations, blogs and databases will have a positive impact on ICT knowledge and skills of teachers in the corresponding areas.

Since the ultimate goal is to achieve higher frequency of the ICT usage in teaching, then according to the factors that contribute to it, are moving a step forward.

- Increased ICT competencies of teachers positively influence the increase of frequency ICT usage in teaching.
- Certainly the experience of working with computer positively affects the increase of ICT competencies of teachers, and thus the frequency of ICT usage in teaching.
- Increased number of training courses and similar improvements increase the frequency of ICT usage in teaching.
- The use of Internet at home does not limit a teacher to work in preparation for teaching and contributes to increase of the frequency of ICT usage in teaching.
- Having computer certainly has a positive influence on the frequency of ICT usage in teaching.

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QUALITY VALORIZATION OF UNIVERSITY STUDY PROGRAMS USING LINEAR PROGRAMMING APPLICATION

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Abstract - Measuring quality of education is one of the most important issues of the Universities management. The final result of the good quality evaluation gives precise guidelines of improvements and what should be done to increase efficiency in the high education productivity, whose target is to deliver knowledge and skills to students and future academic individuals as base of the society overall development. Of course, this production (knowledge as output) requires certain investments of resources (teachers, equipment, conditions), that can be treated as input. In such manner, measuring the output/input ratio, using specific LP technique known as Data Envelopment Analysis can give perspective of efficiency of the study process.

The application includes precise input/output model represented in all courses within the analyzed study program that collect all real input resources and all real output indicators done by complex survey. In such an environment, the result is represented in efficient and non-efficient courses within the study program. Through a comprehensive review of the results, discussion is done for the reasons of inefficiency. In addition, using DEA perception, concrete guidelines are proposed for management in order to optimize and increase efficiency to the non-efficient detected courses.

I. INTRODUCTION

Mathematical programming is an approach of selecting the best of the offered / possible alternatives to solve a particular problem (alternatives normally belong to a particular set). If a particular problem that is being analyzed is presented as a mathematical model reflecting certain real production function, the problem boils down to determining the optimum (minimum or maximum) value of the same. Linear programming which is a special case of mathematical optimization is an effective method that finds a huge application for solving optimization problems in the fields of industry, education, transportation, economy and etc. Application of LP involves pre modeling phase of the problem being analyzed and optimized, with its perception as part of the input / output system with inputs and outputs, represented by variables with their own characteristics, which have some specific linear constraints and ultimately through them, objective function can be represented mathematically (which is actually the subject of optimization, in the form of a linear equation). What is very important for correct application of LP is the generation of precise and clear reality reflecting mathematical model. In this context, LP is used as a powerful mathematical tool in the optimization process of the objective function, where it is meant to be a mathematical representation of the interdependence of the parameters that reflect the operation / production entity that is subject to analysis and optimization. and inequalities that reflect the reality. Nevertheless, some mathematical models have high complexity level and can not be solved through known mathematical optimization models. Then, not optimal, but “good enough” solution is the subject, using orientation and heuristic models [1].

A. LP and DEA

There are several important phases applied in this work (LP modeling):

1. Definition and problem formulation;
2. Model construction;
3. Model solvation;
4. Results and sensitivity analysis, and
5. Model evaluation and further implementation.

The general mathematical representation of the problem which is the subject of optimization using mathematical programming is:

- Finding extreme value (maximizing or minimizing) of $f(X)$ (where $f(X)$ is the objective (target) function), and
- The restrictions: $g_i(X) \leq 0,\ i = 1, 2, \dots, m;\ X \geq 0$, where $X = (x_1, x_2, \dots x_n) \in R^n, f(X), g_i(X), i = 1, 2, \dots m$ are functions of real values vector X. If $f(X), g_i(X)$ are linear functions (linear equations and inequalities), then the problem can be solved with linear programming techniques. Otherwise, it is a problem that is subject to nonlinear programming (out of our scope).

More expanded, LP problem can be noted as follows:

- Objective function (minimize of maximize):

$$F(x_1, x_2, \dots x_n) = c_1x_1 + c_2x_2 + \dots + c_nx_n = z$$

- System of restrictive (in)equalities:

$$a_{11}x_1 + a_{12}x_2 + \dots + a_{1n}x_n \leq b_1$$
$$a_{21}x_1 + a_{22}x_2 + \dots + a_{2n}x_n \leq b_2$$
$$\dots\dots\dots\dots\dots$$
$$a_{m1}x_1 + a_{m2}x_2 + \dots + a_{mn}x_n \leq b_m$$
$$x_1, x_2, \dots x_n \geq 0$$

Here, $a_{ij}, i = 1, \dots, m; j = 1, \dots, n$ are called technological coefficients, $c_i, i = 1, \dots, n$ are called weight coefficients (or just weights) and the variables $x_1, x_2, \dots, x_n$ are called decisive variables. By definition, optimal solution is the solution that belongs to the set of allowed solutions that maximize (minimize) the objective function.

One concrete application of linear programming is implicitly presented in DEA technique (Data Envelopment Analysis). By the books, frontier analysis is designed for organization quality measurement and performance improvement, as main intention of the management. Frontier analysis uses DEA as powerful tool in this manner. It is nonparametric non-statistical multi-criteria method that allows handling heterogeneous data. Based on LP, it is used for measuring technological efficiency. DEA declares as effective those entities which produce a certain or more output parameters with fixed inputs or use the same or a smaller quantity of inputs to produce a certain output, compared with the other subjects within the same group being analyzed. Entities are called DMUs (Decision Making Units) and they have to be homogenous. All DMUs have same inputs and outputs in different quantities. DMU can be institution, bank, human, production line, vehicle, part of vehicle etc. Maybe one of the biggest DEA advantages is that inputs and outputs can be heterogeneous and completely independent in manner of quantity and perception.

B. DEA Equitations

Technical efficiency of a single DMU is defined as:

$$\theta = \frac{Output}{Input}$$

and is termed as pareto efficiency, if allocation of the resources (input and output) is such that better performances are not possible for the entity analyzed. Pareto efficient subject is the subject (entity) with best possible allocation of the resources. Here, it is impossible to improve the output (and increase the DMU's efficiency) without worsening the input.

In set of n DMUs with m inputs and s outputs of each DMU, the efficiency of k-th DMU is defined as:

$$\theta_k = \frac{u_1y_{1k} + u_2y_{2k} + \dots + u_sy_{sk}}{v_1x_{1k} + v_2x_{2k} + \dots + v_mx_{mk}}$$

where $x_{1k}, x_{2k}, \dots, x_{mk}$ are the inputs of the k-th DMU, $y_{1k}, y_{2k}, \dots, y_{sk}$ are the outputs of the k-th DMU, $v_1, v_2, \dots, v_m$ are inputs' weight coefficients and $u_1, u_2, \dots, u_s$ are outputs' weight coefficients, with mathematical limitation (in connotation of the reality):

$$v_1, \dots, v_m \geq 0, u_1, \dots, u_s \geq 0.$$

From here, DEA CCR CRS is interpreted as follows [2]:

- Find $max\ (\theta_k = \frac{u_1y_{1k} + u_2y_{2k} + \dots + u_sy_{sk}}{v_1x_{1k} + v_2x_{2k} + \dots + v_mx_{mk}})$,
- Having limitations:

$$\frac{u_1y_{11} + u_2y_{21} + \dots + u_sy_{s1}}{v_1x_{11} + v_2x_{21} + \dots + v_mx_{m1}} = \frac{\sum_{i=1}^{s} u_iy_{i1}}{\sum_{j=1}^{m} v_jx_{j1}} \leq 1$$
$$\dots$$
$$\frac{u_1y_{1k} + u_2y_{2k} + \dots + u_sy_{sk}}{v_1x_{1k} + v_2x_{2k} + \dots + v_mx_{mk}} = \frac{\sum_{i=1}^{s} u_iy_{ik}}{\sum_{j=1}^{m} v_jx_{jk}} \leq 1$$
$$\dots$$
$$\frac{u_1y_{1n} + u_2y_{2n} + \dots + u_sy_{sn}}{v_1x_{1n} + v_2x_{2n} + \dots + v_mx_{mn}} = \frac{\sum_{i=1}^{s} u_iy_{in}}{\sum_{j=1}^{m} v_jx_{jn}} \leq 1$$
$$v_1, \dots, v_m \geq 0, u_1, \dots, u_s \geq 0;$$
$$x_{ij} \geq 0, y_{rj} \geq 0; i = 1, \dots, m; r = 1, \dots, s; j = 1, \dots, n.$$

DEA finds such weights that maximizes each DMU's efficiency, no matter of the real input or output values and in correlation of all other DMUs. In this way, it forms frontier line consisted of best DMUs with efficiency = 1. All inefficient DMUs have efficiency below 1 and are called inefficient.

Often, as in this paper, the dual DEA CCR model is used. It is represented with following equations:

- Find $min\theta$
- Having limitations:

$$\sum_{j=1}^{n} \lambda_j x_{ij} \leq \theta x_{i0}, \qquad i = 1, \dots, m$$

$$\sum_{j=1}^{n} \lambda_j y_{rj} \geq y_{r0}, \qquad r = 1, \dots, s$$

$$\lambda_j \geq 0, \qquad j = 1, \dots, n$$

where index 0 represents each DMU that equitations are solved for (in order to maximize its efficiency – observed DMU), lambdas are weighted coefficients that are used to represent the so-called composite DMU for each real DMU that will be located as inefficient. The composite DMU for each inefficient real DMU is consisted as sum of the ERS (efficiency reference set – efficient DMUs used for interpretation of the composite DMU for the observed real DMU) multiplied with its lambda coefficients. If A and B and efficient DMUs (m inputs, s outputs) and belong to the ERS set of observed inefficient C DMU, its composite DMU C' can be interpreted as:

$$\lambda_A \begin{bmatrix} y_{1A} \\ \dots \\ y_{sA} \\ x_{1A} \\ \dots \\ x_{mA} \end{bmatrix} + \lambda_B \begin{bmatrix} y_{1B} \\ \dots \\ y_{sB} \\ x_{1B} \\ \dots \\ x_{mB} \end{bmatrix} = \begin{bmatrix} y_{Composite} \\ \dots \\ y_{Composite} \\ x_{Composite} \\ \dots \\ x_{Composite} \end{bmatrix}$$

DEA offers approach that is different from traditional optimization techniques, that analyze the profit / investment ratio and allows creation of "learning from the best" policy [3]

II. Problem and Model Formulation

The quality of a single process is reflected in the efficiency of the entity that is generator of that process. Having this approach in mind, the Universities can be perceived as generators of knowledge. More precise, the study programs and the courses within itself, through its theoretical and practical realization have function of production of knowledge and skills that should prepare the future academic person for the real sector. ECTS implementation should be implemented according to home legislative and with all procedures and steps for insuring study programs quality needs [4].

The model is based on forming the input of parameters whose increase will reduce the DMU's efficiency and output of parameters whose increase will increase the DMU's efficiency. The production of each course can be reflected of the type of the skills and knowledge delivered, as well as within the quality of the delivery (what did the student learned and the quality of the knowledge delivered). They form the output of the model. The input parameters are consisted of the resources spent for the realization of the study program, in terms of financial structure (gross salaries) for the teachers and assistants, financial structure for the equipment and inventory used and number of classes held. This builds the model:

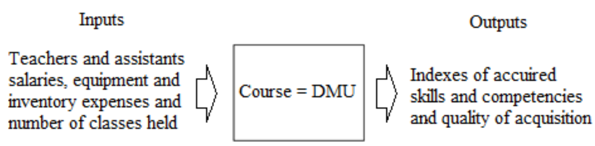

Figure 1. DEA Model

A. *Input and output definition and characteristics*

The model is applied on study program of informatics (Faculty of Informatics, generation 2007), at 24 courses from all the semesters. The selection of the courses is random, with no specific influence of observation.

Input is consisted of:

- Number of classes held, starting from the fact that classes load is often very important issue in terms of study program structuring as well as in forming groups of students and organizing the real implementation of the course - (1).
- Expenses that University had with equipment and inventory used for this study program. This is done by calculation of the degree of utilization, i.e. the ratio of annual depreciation of computer equipment and inventory used, in accordance with their gross purchase price and the legislation. Percentage of load / utilization in terms of number of students of the observed course and all students that used

the same equipment and inventory is considered – (2).

- Expenses that University had of hiring professors and assistants, no matter whether they are employed or external. Expenses are calculated in terms of gross salaries / expenses, with consideration of three months length (12 working weeks) of the semester (period of knowledge delivery) and the percentage of load in terms of number of students of the observed course and all students that the concrete person (teacher or assistant) covered during those three months. All increases and salary / expenses fluctuations are considered also – (3).

Two indexes represent the output:

- Index of the level of contribution of each course in skills, competencies and knowledge delivery, prescribed with the accreditation elaborate of the study program (IP-KKV). Massive survey was realized at representative sample of 28 (of total of 88 students graduated at the study program), that generated indexes' values – (4).
- Index of the quality of skills, competencies and knowledge delivered (IPKS-KKV) through the study program. This parameter, represented by the average grade of each course is calculated using the reporting module of the student information system of Goce Delcev University, fully automated for students' e-administration. – (5)

B. *Total input / output table*

With notation of the previous text, the numerical DEA model is represented with table 1:

TABLE 1. NUMERICAL DEA MODEL (ALL DMUs)

(1)	(2)	(3)	DMUs / Courses	(4)	(5)
24	28737,71	83066,86	English language 1	3,5714285715	9,0227
168	31190,88	122253,1	Electrical engineering	3,910742855	7,8181
252	28737,71	87609,05	Math 1	3,928571429	7,1705
168	31190,88	105634,6	Programing	4,267857143	6,8522
24	25154,8	79832,87	English language 2	3,571428572	8,8160
252	24766,98	101473,2	Linear algebra	3,875	7,5568
252	27093,87	101473,2	Math 2	3,982171427	7,0795
168	27093,87	107276,6	Objective programing	4,267857143	7
108	31979,06	36434,47	Probability and statistics	3,785714286	6,943181
96	31979,06	78218,35	Digital logic	4,285714286	7,1136
60	218481,7	51455,4	Operational systems	3,875	7,7045
96	218481,7	131314	Software processes	3,964285714	7,2954
96	218481,7	117407,6	Data structures and algorithms	4,25	6,9545
96	154104,2	187273,8	Computer architecture	3,678571429	7,1477
96	227342,5	62070,34	Data bases	4,321428572	7,318181
72	118954,8	65492	Internet programing	4,339285715	7,2386
72	12381,86	62527,75	Microprocessors	3,571428572	6,7954
72	13413,68	64872,67	Software analysis and modeling	3,928571429	7,125
48	128867,7	65273,13	Graphics and visualization	4,160714286	8,1704
72	128867,7	95668,31	Multimedia	3,982142857	7,6931
72	87132,91	64428,28	Visual programing	4,339285715	7,0568
72	7203,188	90306,62	Intelligent systems	4,142857143	7,6931
72	7536,731	67004,76	Distant learning systems	3,196428572	7,60227
72	7536,731	57935,99	Software projects management	3,821428571	7,0113

DEA technique takes all inputs and outputs of each course separately and tries to "optimize" it, i.e. to set its weight coefficients in such values to make it efficiency equals to 1, using linear programming / equations elaborated before. If it is not possible in this environment, their efficiency is calculated bellow 1. Courses not mentioned in the table 1 and all other influences and conditions are totally excluded. Whether there is need to include other factor, model needs to be changed and all calculations need to be done from the very beginning.

III. Results and Discussion

With processing of the input and output parameters in DEA software solution (there are many available open source applications that can be used for this purpose / here is used Open Source DEA Application), results give picture of efficient and inefficient courses:

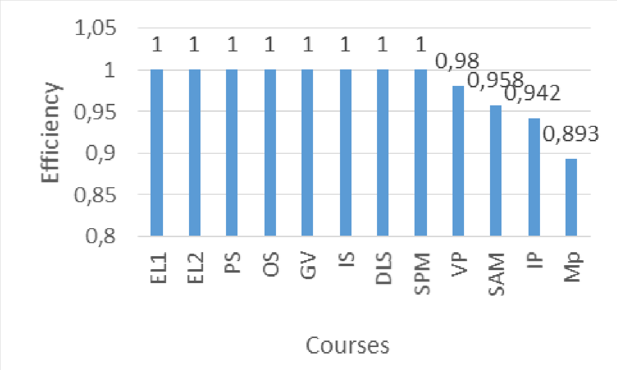

Figure 2. Efficiency of courses (part 1)

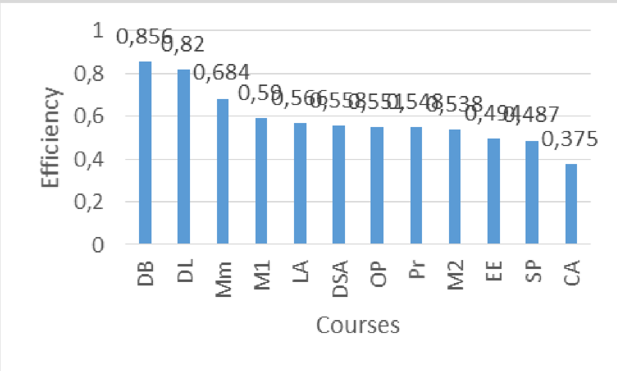

Figure 3. Efficiency of courses (part 2)

Courses with efficiency = 1 are noted as relativly efficient courses and are set of representative courses for the courses with efficiency bellow 1, noted as inefficient courses. Most efficient courses are used in most of the cases of composite courses. Table 2 shows number of use of every efficient course (consisting Efficiency Reference Set – ERS) in creating composite courses.

TABLE 2. ERS COURSES (DMUS)

ERS Courses	Number of times used
English language 1	0
English language 2	6
Probability and statistics	12
Operating systems	2
Graphics and visualization	10
Intelligent systems	0
Distance learning management	0
Software projects management	16

Three courses are used most often in creating composite units: Software projects management, Probability and statistics and Graphics and visualization. This means that they form the “best” part of the frontier, or that they have the best resource allocation in this conditions and constellations. Worst resource allocation has the course Computer Architecture, with worst (biggest possible) input constellation and worst (smallest possible) output constellation.

Table 3 illustrates the composite units for each inefficient course. DEA propagates that, in order to make inefficient DMUs efficient, changes have to be made that will cause for each inefficient course to became as closer it is possible as its composite DMU / course, that lays on the frontier (set of best possible courses, virtual or real). For constant output, every composite entity is consisted as sum of the multiplications of lambdas and inputs of the ERS entities, qualified as efficient.

Further analysis can be made, in order to present clear picture to the University management and propose changes for efficiency increase. Figure 4 pictures the ratio between expenses for teacher and assistants and the efficiency. It illustrates that the efficient courses are located in lower right corner of the diagram, and the most inefficient courses are located in the upper left corner of the diagram. Exactly the course Computer Architecture is located as most inefficient, especially in terms of teachers and assistants expenses. Given this fact, in opposite, the course Probability and statistics is located as most efficient course. This type of ratio can be shown for all inputs and outputs of the model applied. The difference is in case of the outputs ratio – the best DMUs will be located in the upper right corner and the worst will be located in the lower left corner.

TABLE 3 COMPOSITES OF INEFFICIENT DMUS

Composites	ERS					
	EL2	PS	OS	GV	SPM	
Inefficient course						Production levels
EE	0,0865 14754	0,2302 96305	0	0	0,7782 29001	
M1	0	0,3755 90319	0	0	0,6559 57254	
Pr	0	0,3258 30999	0	0,0093 57358	0,7838 48429	
LA	0	0,2402 52428	0	0	0,8398 84745	
M2	0	0,2745 388	0	0	0,7700 90534	
OP	0	0,2658 67267	0	0	0,8534 39903	
DL	0	0,0559 3835	0	0,1357 79195	0,9182 45408	
SP	0,0806 24363	0	0	0,8047 43829	0,0858 40258	

DSA	0	0,0476 4483	0	0,9306 4462	0,0516 78035	
CA	0,5322 10613	0	0	0,3386 2454	0,0965 34391	
DB	0	0,3085 39831	0,8137 76755	0	0	
IP	0	0,2737 56379	0,0101 98233	0,7843 37473	0	
Mp	0,1055 63595	0,0492 5189	0	0,0074 17073	0,7790 54684	
SAM	0,0976 14486	0	0	0,0276 00157	0,9067 58254	
Mm	0,1429 15191	0	0	0,6441 93784	0,2071 01916	
VP	0	0,1897 35113	0	0,5980 11357	0,2964 46308	
	Lambdas (production levels)					

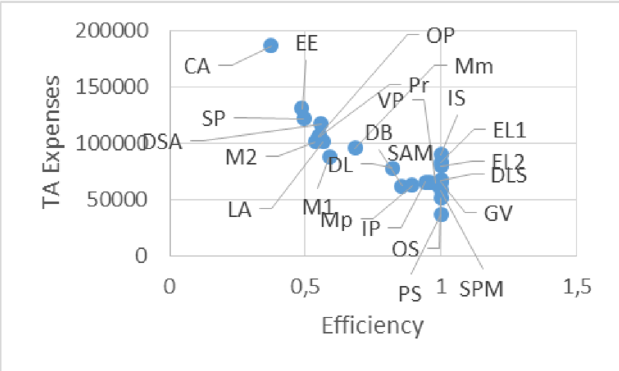

Figure 4. TA Expenses / Efficiency ratio diagram

IV. CONCLUSION AND OPTIMISATION SUGGESTIONS

Within this research, there is a factual quantification of the level of contribution and the quality of the acquired knowledge of one hand. Practically, we locate all items (in terms of courses) that invested more than necessary (and find its composite unit). In such manner, for efficiency increase, follow needs to be done:

- Reduce the cost of engagement of teaching and associate staff, as may be realized by increasing the effectiveness of the teachers and assistants that are is least burdened (and most “expensive”), by reducing the amount of gross financial structure / salaries and benefits for the teachers and assistants, consider the possibility of involvement of part-time teaching staff hired for a fee which in sum would be less than that spent on ineffective courses etc.
- Reduce costs for equipment and inventory, that for example can be realized through the purchase of inventory (computer tables and chairs) and / or computer equipment (computer units, projectors) in lower purchase price (though the trend is to reduce the cost IT equipment), by increasing the number of students who use the same computer (for example, two students per computer or summarized increasing availability of computers in the same number of students), increasing the rate of depreciation in terms of full time depreciation of material goods etc.
- Reduce the number of hours realized through reduction and convergence of study materiel in fewer hours, joining classes for lectures and exercises, reducing the number of groups of students (increasing the capacity of groups) and intervention within the study programs regarding the defined funds for hours for lectures, tutorials and student / practical activity.

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SWITCHING FROM INFORMIX TO ORACLE IN TEACHING DATABASE SYSTEMS

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Abstract - This paper presents our long-time experience with teaching database systems (DBS) on two platforms. These are Informix and Oracle relational database management systems (RDBMS). Our main goal is as to evaluate and compare usage of these RDBMS tools as point out the evolution within the teaching materials used at the subject. Ad first, we present past and current course structure, teaching examples and processes, which are similar to each other but differ in several important details. Comparison is provided between these static structures to find the differences and overlays. Next, another comparison is executed to express evolutionary aspects of present teaching materials. This time, a time-line based dynamic comparison is used. The comparison results are then discussed to evaluate switching from Informix to Oracle in teaching DBS.

I. INTRODUCTION

Usage of information systems and information technologies in all areas of economic life is an essential part of our day. Information systems provide today is not just in manufacturing enterprises, but also the operation of government, health care, finance, education and tertiary sphere. Work with information without using the information technology today is inefficient and unimaginable. A database system is the basis of any information system. Databases and database technologies are of great importance in computer science.

Teaching database systems and information systems has their tradition at our Department of Computers and Informatics. Syllabus of database systems course reflects industrial requirements that change as time flows.

Course of database systems is organized through lectures and exercises. The lectures are focused on fundamentals of database systems – architecture of database management systems (DBMS), data modelling and data models, relational data model, relational algebra, functional dependencies and normalization, primary file organization, index file organization, query optimization, transaction processing, concurrency techniques and recovery, and database systems security.

Within exercises, the students obtain base principles of Structured Query Language (SQL) and basic skills at work with database objects – their design and creation and manipulation with them.

Oracle DBMS is used in teaching for six years. In the past, we used Informix DBMS, Ingres and Magic in teaching. Other DBMS – PostgreSQL, MySQL and Microsoft SQL Server are available to students.

In this paper, we focused on two DBMS's used in training – Informix and Oracle.

II. RELATIONAL DATABASE MANAGEMENT SYSTEMS

Most of current database management systems are Relational DBMS (RDBMS). Relational DBMS is based on relational model that was introduced by Edgar Frank Codd [1]. E. F. Codd defined 12 rules, which are known as Codd's 12 Principles of Relational Databases. Most of them occur in the implementation of the relational model. These principles define a database approach, which is different of traditional file processing. Each user creates files for his specific application. Redundancy in data definition and data storing is typical for file processing. In database approach, data are defined once and more users manipulate with data. Data are presented as relations in tabular form. A table is the base object of relational model. The basic database features are [1] [2]:

- **Metadata** must be stored in database. Metadata are also known as system catalog or data dictionary.

- **Independence of data and programs**. Programs are separate from physical storage and access methods.
- **Views** are also called virtual tables. View is subset of database; it is derived from basic tables and reflects database changes.
- **Transaction processing** ensures shared data access to more users in the same time.

A. Informix

In 2001-2007 we used Informix Internet Foundation (IIF) Server and later Informix Dynamic Server 2000 (IDS2000). These releases supported multiuser environment, work with SQL and PL/SQL, automatic recovery, backup and archiving. Students worked in two development environments – dbaccess and r4gl.

Dbaccess is environment for creation of database objects such as database, table, trigger, stored procedure, user defined routine, tec.

R4gl is dedicated for development of 4gl applications.

B. Oracle

Our Faculty of Electrical Engineering and Informatics is member of Oracle Academy. From 2008 until today, we use Oracle DBMS in version 10gR2, from 2014 version 11gR2. g qualifier name stands for support of grid architecture. Grid architecture can be implemented on various levels [3].

Automatic Storage Management (Storage Grid) distributes database data across all disks; I/O operations are faster and cheaper. ASM relocates data automatically.

Real Application Clusters (Database Grid) is collection of servers connected together for running one or more databases.

Oracle Streams (Application Grid) provides a unified framework for information sharing, combining message queuing, data replication, event notification, data warehouse loading, and publishing and subscribing functionality into a single technology [3].

Enterprise Manager Grid Control is tool for managing grid operations – managing of software, users' management, cloning databases and managing patches.

The Oracle database management framework consists of three important components

- Database instance that is managed.
- Listener that allows connection to the database.
- Management interface.

Working environment consists of database server and tools on the client side. Each student has own username on database server side. SQLPlus and SQLDeveloper are software tools on the client side through which users connect to the database server. Figure 1 shows architecture of working environment. Learning Management System (LMS) Moodle contains study materials of database system course.

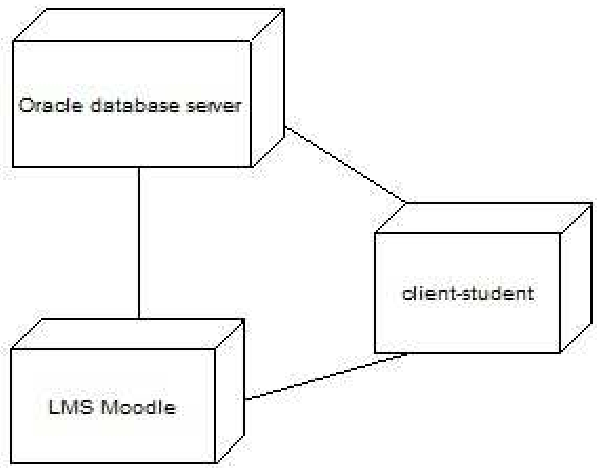

Figure 1 Architecture of working environment

Quiz module as a part of LMS Moodle is intended to test students' knowledge. These facts are described in next sections.

III. TEACHING DATABASE MANAGEMENT SYSTEMS

As we mentioned in introduction database system course is divided two parts – lectures and exercises. The lectures deal with theoretical foundations of database systems. The slides of the lectures are stored in LMS Moodle. The base content of the lectures is more or less the same during the whole period of teaching database systems. Of course, all changes, new technologies and techniques related with database technologies effects in updated lectures.

Contents of lectures can be divided into three areas – data modelling, primary file organizations and database management system.

The 1st area is focused on definition database concepts. The basic principles of data modelling are explained especially entity-relationship model and its mapping into relational model. Next, they are explained operations of relational algebra and their implementation and their relation with SQL statements processing. Understanding functional dependencies and normalization of the relational databases are very important for design of the optimal database schema. Techniques how to obtain from un-normalized table optimal database schema with tables in the 3rd normal form are explained theoretically and it is shown practical example.

The 2nd area of the lectures deals with file organization on the secondary storage medium. The students gain an idea of data storage – what is the structure of record, what is the file organization – such as head organization, hashing organization, index-sequential organization and B-tree organization.

The last area is focused on the architecture database management system and its functionality:

- Data dictionary as metadata storage, its structure and content in relational databases.
- Query processing.
- Transaction processing - meaning the transactions and their features (Atomicity, Consistency, Isolation, Durability) are explained.
- Concurrency techniques, recovery, and their understanding are very important for database consistency.
- Security police and database systems.

Content of exercises is varied depending on industrial requirements but it was always oriented on practical skills with Structured Query Language. SQL is nonprocedural language also called declarative language. It does not contain procedural constructions such as – if-then-else, loops, go to, etc. By SQL statements we specify what results, we want not how to get them. All materials related with exercises are stored in LMS Moodle. The students also upload their homework and individual projects to LMS Moodle.

A. Informix

An Informix syllabus was mainly oriented on Structured Query Language, understanding entity-relationship model and its mapping into physical model. Main topics of SQL were following:

- Creating of database objects, integrity constraints
- Views, access control, modifying data
- Creating and using stored procedures and routines, creating and using triggers
- Single table select statement, functions in select statement
- Aggregate functions in select statement, group by and having clauses
- Multi table select statement – inner, self, outer join
- Subqueries and set operations
- Transactions

In the beginning 4gl (4 Generation Language) was included in the skill exercises. 4gl and its framework – r4gl were intended to develop client-server applications. 4gl is procedural language also called imperative language. It contains procedural constructions and user must define how to get results.

In SQL-4gl period, students' projects were based on given entity-relationship (ER) schema of database and development of client-server application with required functionality. Students should have mapped ER schema into physical schema. Subsequently they should have created database objects – tables, triggers, stored procedures. Result of student's project was 4gl application with required functions and security policy.

In the next years, 4gl was dropped from syllabus and it increased the emphasis on Structured Query Language. Students could decide to use any programming language for development of application in their projects.

The examination consisted of written and verbal parts. Written part was focused on solution the practical problems – to create database tables and to write multi-table select statements. When number of students increased, examination was realized by automatized testing through quiz module of LMS Moodle. Test consisted of theory questions and practical examples. We designed and implemented new type of question for dynamic evaluation of select statement [4].

B. Oracle

In 2008 we changed database management system in teaching and we started to use DBMS Oracle 10gR2 and from 2014 Oracle 11gR2. The lecture syllabus is the same as it was in Informix era, of course with monitoring changes of database technologies.

We can say that exercise syllabus is nearly the same as the syllabus for DBMS Informix. Triggers and stored procedure language are excluded and they are taught in separate course – Programming in PL/SQL. It increased the emphasis on writing and optimization of queries and the individual work of students. At present in contrast to the past, each exercise material contains except solved examples also unsolved examples intended for homework.

The first version of individual students' project was development client-server application based on given ER model. It was similar as project in Informix era. For last four years, individual student projects have been oriented to create optimal database schema. Un-normalized form of table filled with data is given. Attributes, tables and relations constraints are also specified. The objective is to create optimal database schema with tables in the 3rd normal form respecting all given constraints. Next objective is to create views of the created schema and to write select statements related with views via operations of relational algebra. All students' activity such as homework, quickies and projects are evaluated.

Evaluation of students' knowledge has three milestones during semester. They are the 1st and the 2nd tests and final test. The score obtained from all activities and tests make up student evaluation in semester.

Examination is automatized. We use quiz module of LMS Moodle that is extended by DBS component [4]. Test contains standard types of questions – matching, multi choice, short answer or true/false questions. These types of questions are used for assessment of students' knowledge of database system fundamentals and SQL knowledge.

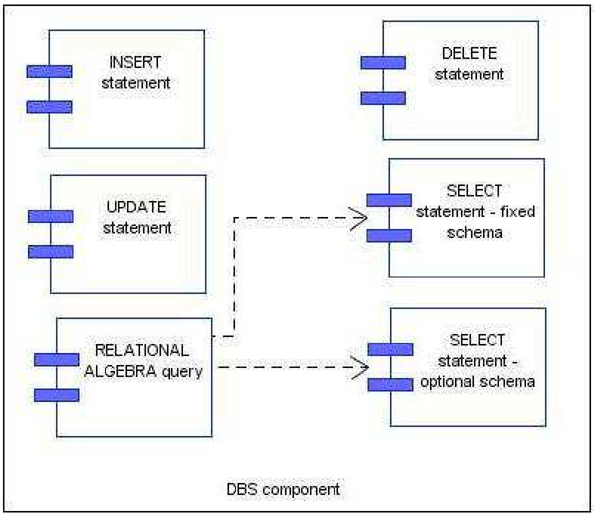

Figure 2. DBS Component

Special case is dynamic evaluation of SQL statements. DBS component provides dynamic processing SQL statements. Figure 2 displays architecture of DBS component. It consists of six subcomponents. Each of them is implemented as plugin to LMS Moodle and it is presented as new type of question. Each subcomponent processes one statement of data manipulation language (DML- SQL). There are select, insert, update and delete statements. Special subcomponent – Relational Algebra subcomponent evaluates queries written via operations of relational algebra [6].

SELECT statement - optional schema subcomponent is in real operation for several years. Other subcomponents are prototypes and they are in testing phase.

IV. COMPARING THE COURSES

Database technologies are still very important and they have a fixed place in information technologies. Therefore, they play the significant role in education.

A. Differences in the Static Structure

A content of the lectures was and is more or less the same when we compare past with the present. Of course, modern database technologies are presented in updated lectures.

A content of labs was and is continuously updated following industrial requirements and students' feedback.

B. Teaching Material Used

In the first phases, we used classical forms of teaching materials and supporting tools - blackboard, chalk and later slides and projector. At present, we use Learning Management System Moodle to store all materials of lectures, exercises, and homework and students projects.

In practical exercises, we have been using classrooms with personal computers during the whole period of teaching database systems. Usage of a particular database management system - transition from Informix to Oracle reflects the evolution in information technologies.

C. Teaching Processes Applied

It is a base requirement for students to get over fundamentals of database systems. It is not defined any prerequisites for database se system course.

In recent years, we have concentrated on structured query language, designing, and creating optimal database schema in labs.

The evolution is also visible in examination from paper form to automatized knowledge assessment. However, we could discuss the pluses and minuses of these approaches.

V. RESULTS AND DISCUSSION

Database system course is a mandatory subject and belongs among the core subjects in bachelor study. The lectures, labs and knowledge assessment passed their evolution as we mentioned above.

VI. CONCLUSION AND FUTURE WORK

In future, we are going to update students' projects and to prepare new upgrade version of DBS component.

ACKNOWLEDGMENTS

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TEACHING MODULAR SOFTWARE ARCHITECTURES

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Abstract - The modern object-oriented software architectures directly target the discovered weaknesses and problems that affect productivity in the development process of software applications and software engineering by using a combination of several known principles and guidelines. They are aimed to increase the productivity and foster the cooperation between developers of software solutions. It is commonly accepted that these problems have roots back in the past, in the universities educational programs for future software developers and the recognition of the new modern object-oriented software architectures can be achieved by their addressing directly and on time in the educational programs. Therefore, this paper presents an efficient methodology of teaching contemporary modular software architectures.

I. INTRODUCTION

Based on the needs for development of large scale systems that implement complex business logic, well designed and adapted user interfaces and data visualization, communication with many data centers, exchanges of heterogeneous data and interaction with different types of end users, raises the usage of modern object-oriented software architectures that are commonly known as architectures by which software applications are meant “built to last” and “built for change”.

The main stream of modern oriented software architectures is using the concept of modularity, accompanied by two main principles, "single responsibility principle" and "separation of concerns", both of them defined by the scholars during 1970’s and 1980’s.

The designs of modern object-oriented software architectures mainly deals with the principles of design easily extensible and easily manageable applications [1], and has as a main objective to give directions for changing the existing and generally accepted ways of software development by using modern object-oriented software architectures that can meet the challenges of development software solutions that rise up in the beginning of the second decade of the twenty-first century [2].

The analysis of current conditions and principles for developing software that are in common use, shows that there are problems that extensively contribute to lowered productivity in the process of software development. The main problem is the lack of standardized and functional methods for unlimited usage of functional components that have already been developed and generally because the functional components are tightly coupled with other functional components within the application. Additionally, documentation of the functionalities of the software applications is difficult due to the lack of independence of the functional components as well as their too vide range. Consequently, due to this the maintenance and upgrading of the software applications in the future becomes inflexible.

The implementation of the modern object-oriented software architectures in the lifecycle of software engineering in the typical software production companies mainly depends on the cost-benefit of their implementation. On the side of the benefits, the greatest ones are the properties of the software product manufactured by using modern object-oriented software architectures, "easy to maintain" and "easy to scale" [3]. These two combined, increase the productivity of the software engineers on a large scale and leave a space for future developments of the companies and easily extend and scale their products. In addition, it must be mentioned that cooperation and interconnectivity with other solutions and companies as well as acquisition with the top market IT companies is simplified to acceptable levels and as result of that, the general managers do not need to worry about it as a business risk. On the other side of the cost-benefit, analysis stays the great effort and cost of re-education of the personnel no matter it is personnel with working experience or nearly graduated students from university.

Current situation on the market show this as a great disadvantage of the implementation for usage of modern object-oriented software architectures, and the problem need to be addressed on time and directly in the educational system by providing a fast backward connection from the industry. Therefore, this paper presents a methodology of teaching contemporary modular software architectures.

II. Modularity principle by scholars of 20th century

The principle for creation of a software architecture that will target the productivity in the process of the software engineering was one of the focuses of the scholars in the past centuries. The term "separation of concerns" is firstly mentioned by Edsger W. Dijkstra’s publication [4] "On the role of scientific thought", where he defines the term as a process for logically separation of the software applications into set of elementary functional parts, taking in consideration their functionalities to overlap as little as possible.

Several years later Chris Reade will reactivate the basic idea of modularity [5] and defines the principle by defining the activities that must be covered by software engineers and set the separation rule of the concerns by these activities. In the following years, the idea of software architectures that implement modularity became more popular. Robert C. Martin [6] introduced the “single responsibility principle”, and as stated, it defines the elementary range of the modules with the basic rule, a module can be considered as elementary functional part of a solution only if there exits just one reason or need for future changes of the elementary module itself.

What is common in all the publications that objectives modern object-oriented software architectures in the past century are the architectural goals that must be met and as objectives, they are?

- Allow creation of software applications from modules that can be built, assembled and, optionally, deployed by independent teams.
- Minimize cross-team dependencies and allow teams to specialize in different areas, such as user interface (UI) design, business logic implementation, and infrastructure code development.
- Promote reusability across independent teams.
- Increase the quality of software applications by abstracting common services that are available to all the teams.
- Incrementally integrate new capabilities.

III. Modularity in 21th century – commonly accepted princliple

The modern trends of object-oriented software architectures are in line with the main and widely adopted operating systems architectures such as Microsoft Windows 8 version. The foundation principles on which they are built are parallel processing, portability and by that indirectly energy efficiency of the personal devices. Modularization of the applications by newly introduced object-oriented software architectures is commonly in use on every layer, data processing, user interface adaptations, synchronization with a goal the operating system of the devices to be able to suspend as much passive functionalities of the applications to preserve energy. On the other hand, modularization allows the processing to be done in parallel by more than one processing core because the functionalities of the software application are from scratch designed to communicate in loosely coupled mode.

These trends are enforced by the industry even more as new types of parallel processing system are introduced. Optical processing as a technology of the future resistible to electro-magnetic induction lies on the pillars of future development of parallel processing design and energy consumption.

IV. Modular-architecture teaching simulator – Show-case

In the context of better understanding of the given concept of modularity and eased process of learning object oriented architectures, a simulator shell application for module discovery, downloading, loading, initialization and dependency tracking was developed, as shown on Figure 1.

The foundation idea of the shell application is meant to be an easy to use tool with which modules, as projects with some specific functionality, developed by different isolated groups of students can be mixed into single application. In addition to this foundation idea and as support for the modularity concept the next task that was given to the groups was for them to develop different module with the same functionality that was previously given to another group of students. Evaluation process during the course Software Engineering was made on 50 students, with equal gender and average mark distribution students were separated in two groups. The first one with 24 students, used the multimedia simulations via the simulator shell application for modules as learning tool, and the second group with 26 students took the classic program for the course Software Engineering. The group that used the learning tool was then further divided in 6 groups each counting 4 students and received the tasks as planned. At the end of the course practice labs, the group finished with 6! Equals 720 different versions of one same application, and easily got the idea of loosely coupling between modules and functionalities developed by independent teams, as support for the modern concepts for software engineering. Overall result in comparison with the group that took the classic program for the course was 8.78 average grade for the first group and 7.24 for the second one. This evaluation is showing that nearly 1.5 plus average grade was achieved by the students that were using the modular tool and is a great proof for the thesis given on the usage of modularity principle as a learning tool.

V. THE BACKWARD CONNECTION TO EDUCATION SYSTEMS

Educational systems for teaching information technology have arisen mainly from other branches of natural sciences faculties during the 20th century, and primarily from electrical engineering faculties, mechanical engineering, theoretical and applied math etc. All of these fields from with the information technology sciences have separated from are "exact" sciences where more or less focus is on objective reasoning of the problems and solutions. These traditional sciences have roots back in the philosophies of the ancient scholars such as Empedocles, Plato, and Euclid and from that point in time until present days the theories of these sciences are supported by exact experiments.

In comparison to them information technology sciences are going on fast track, meaning that what were the objectives today most probably would not be tomorrow. Neither someone can define a set of experiments by which some theory can be accepted or not, leaving the space for greater creativity and fast adaptations to the newly arisen environment. Therefor the educational system, and by that I mean mainly faculties of information technology sciences cannot easily define what is popular today, or to predict what will be the trend in future or even harder to encapsulate the needs for particular professional profiles for the IT industry.

If modern trends are in position of supporting the modular approach as a modern object-oriented software architectures that does not need to be an exact fact for the years ahead, small changes in the environment can alter upside-down the modern trends so educational system that adapted these study programs with modern object-oriented software architectures from today will fail to match the needs of future.

Providing a backward connecting from the industry is simply not enough because of the mismatch, the average period of student education is four to five year and the average roll down of the technologies is two to three years. For the experienced software engineers the process of accepting newly defined architecture is harder if they managed to specialize certain technology of the past, and that is the main problem of current educational programs that needs to be solved.

VI. CONCLUSION

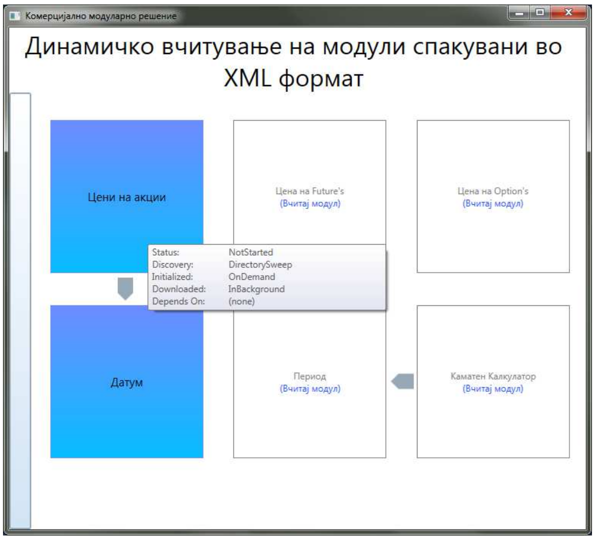

Figure 1. Module Shell Simulator

The usage of the modern object-oriented software architectures and modularity as concept in the information technology industry is inevitable due to the great cost cut advantages. The provider of the basic resource of the information technology industry, the educational systems formal or informal must comply with arisen needs of the industry. That means the educational systems does not need to address it directly in their teaching programs but they need to teach modern object-oriented software architectures by teaching with approach of simplicity. Acceptance of the modern object-oriented software architectures by the industry must be followed by acceptance of modern object-oriented learning techniques in the educational systems.

They must incept the idea of the two principles "single responsibility principle" and "separation of concerns" in the students minds just from the start and try to implement the same two principles in their teaching programs. The modern thinking and teaching of object oriented architectures must take in consideration the objective it needs to meet, fast changing requirements from the industry, maintainability, expandability, easy acceptance and adaptation of new trends as well as to give a way for future developments and subsidation of experimenting for support the theories. As already mentioned information technology science cannot be considered as a classical engineering science but more like a living organism that evolve quickly by the rules of natural selection [4] and therefor classical teaching for it cannot be implemented.

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ELECTRONIC TESTS IN HIGH EDUCATION-OPPORTUNITIES AND CHALANGES

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Abstract – Checking and evaluation of knowledge of the students is an important segment in educational process. Paper presents application of electronic tests in student's exams, its creation, scoring and evaluation by using web based software for creation of electronic tests. Electronic tests are implemented in April exam term, year 2014. Comparison is made between archived student outcomes in April exam term when electronic tests are used and February exam term when they were not used. This was a pilot project implemented on only one subject in one exam term but it has opened the wide doors for further implementation of information technology in high education especially in achieved knowledge evaluation since it has proved to be very effective, objective and time-saving way for student grading.

I. INTRODUCTION

Checking and evaluation of student knowledge in educational process is an important segment. This enables to be determined: the degree, the completeness, the depth, the applicability and durability of adopted knowledge and skills from student's side. With knowledge evaluation we are increasing educational discipline and we are improving the activity of students and their work. There are many different ways for checking student knowledge: systematic monitoring, frontal verbal check and individual check which can be implemented with control works, learning sheets and different types of online tests. Prior to the realization of checking the professor needs to acquire necessary preconditions for successful checking of knowledge and those are: checks needs to be on-time and planned, to be psychologically sustainable and of course, objective. Information technology is shaping the world we live today and it has it has changed dramatically the educational system world-wide with introduction of e-platforms for learning, distance learning and electronic tests where software program is identifying correct and incorrect answers and the professor role is evolving from instructor to mentor [1]. Educational institutions recognize that they must move apace with the technology-driven changes in the society. In today's information society, schools must ensure that learners possess the knowledge and competence to apply the new information and communication tools productively and they must equip learners with critical and analytical tools required of them to live and flourish in an information saturated environment [2]. Flexible access to learning time and locations are another features enabled by technology driven educational system where student can access remote classes from different locations [3].

In this paper we will put the accent on on-line tests, its creating, using scoring and evaluation by using software for web-based creation of electronic tests. Electronic tests are used for discovering "week" points in student knowledge and in the same time they tend to be fair and objective. Paper presents the process of creation of e-tests and its implementation in April exam term, year 2014 for subject Electro-technical materials. Furthermore, comparison is made between achieved student outcomes in April exam term when electronic tests were used and February exam term when they were not used.

II. METODOLOGY FOR CREATION OF E-TESTS

There are numerous web-based applications which can be used for creation of e-tests. Most of them are free and in the same time they provide sufficient level of quality. In this paper is used web page http://www.classmarker.com (Fig.1) which as a free version has some limitations [4].

Figure 1. Starting page of web-based application ClassMarker

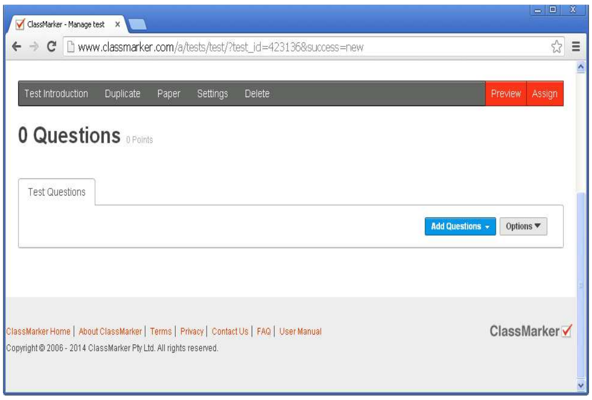

Figure 3. Web page for adding question in the tests

Registration to the class-marker web with valid e-mail address is a first step in creation electronic tests. All students who are tested must be registered in classes and system automatically creates user name. Only password is added by test administrator. Than by returning to starting page and pressing the icon Test a web page is opened where test can be created. By pressing the button for new tests (New Tests+) a procedure for test creation can be started (Fig.2). Name of the test is written in empty box and button for adding questions should be pressed (Fig.3). By clicking the button (Add Questions) a new pop-up menu is opened in which we can choose weather we want to create a new question, to import the question which is already created in some other document (Import New). The later option is not allowed if we are using the free version of web page. We can also add question created by ourselves which is already in data base of web page (Add from question Bank).

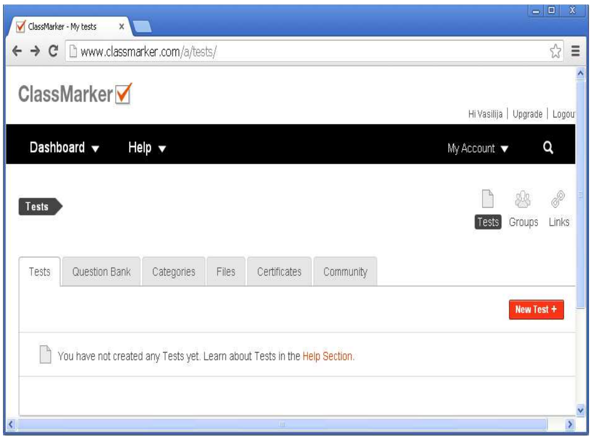

Figure 2. Web page for test creation

A question is created by choosing the option for adding new question. There are several types of questions which can be created: questions with multiple choices, true/false questions, questions by adding text (Free text), grammar text and essay. In our exam all questions were questions with one choice, i.e. to be chosen correct answer from several options.

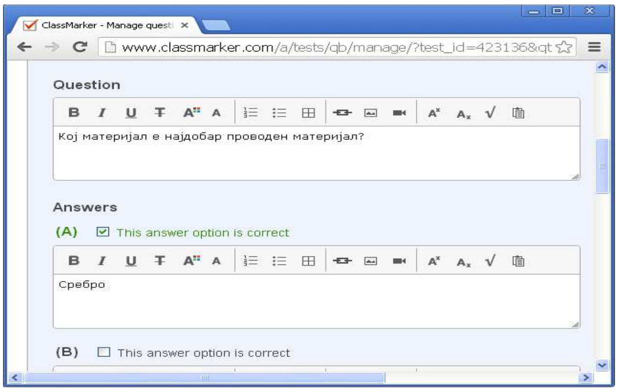

Figure 4. Creation of question and answers

In empty fields for questions, question is filled (Fig.4). Afterwards answers are input. Correct answer is marked with check mark. In other answers which are false this field is not checked. On the bottom of the page there is an information which notify us which answer is chosen to be correct. There is an option to randomize the answers and it should be turned on. In this case answers are appearing in different schedule, each time we open the test. Finally there is a possibility to preview the question, answer which is chosen to be correct and as a last step question is saved. Procedure is repeated until all questions are created. Next step is to assign the test to a certain group of students for which the test is aimed. Last menu in test creation is menu under name Settings in which several options regarding tests performance are defined (Fig.5).

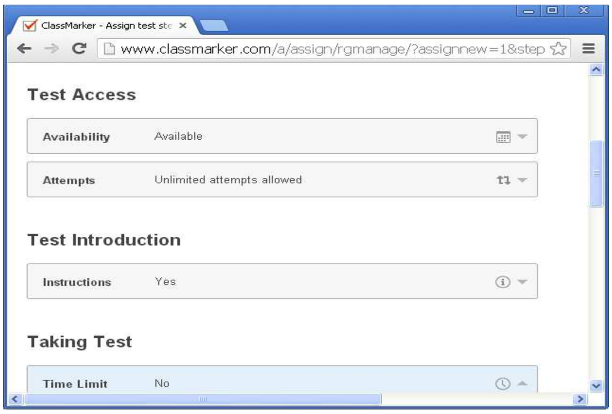

Figure 5. Web page for adding question in the tests

One of these setting is tests Access in which we define when this test can be accessible and how many time the same tests can be used. In our test we have chosen the option each student to access the test only once. After student exits the test it can not return again and continuing solving the same tests. Second setting is Test Introduction where on the beginning of the tests basic instructions are displayed necessary for proper test solving. In option Taking test, time for test performance is set and we have chosen for fifteen questions, thirty minutes available time for solving them. In menu Tests question we have chosen to have only one question per page and we have chosen questions to be displayed in randomized way at each starting of the tests. In that way we had minimized the chances students not to work individually on test solving. Final menu Tests Completion is giving information about number of scored points, and here we determine the level of correct answers in percentage in order test to be considered as passed. All these settings are saved and test is ready to be used on assigned group of students.

III. Implementation of E-tests

First precognition for use of created electronic test is to have available computer with internet access. Students register themselves to the web page with user name and password and web page is display where they can read the instructions for test, obtain necessary information from professor and by pressing the menu start, starts elapsing of time for test solving (Fig.6).

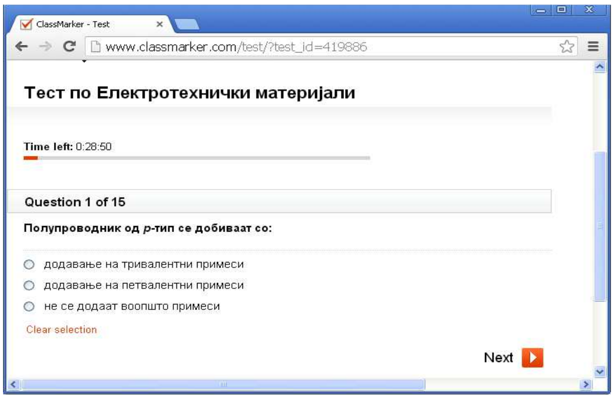

Figure 6. Display of questions in electronic test

Students should finish the test within assigned time limit of thirty minutes, if not test is automatically closed. After tests closing student have the possibility to see results in percentage and number of achieved points (Fig. 7).

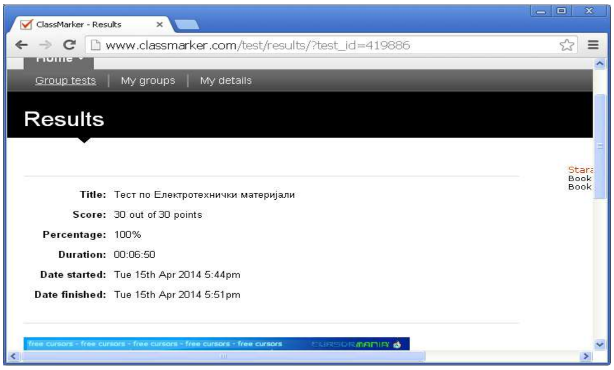

Figure 7. Results from testing available to students

Professor as administrator of test has possibility to view the overall results of the tests for each student but as well as group results (Fig. 8). From tests report average result from tests success can be viewed but as well success of each student separately as percentage of correct answers and as number of obtained points out of total number For each student there is a separate report where all questions are displayed and correct and incorrect answers (Fig. 9).

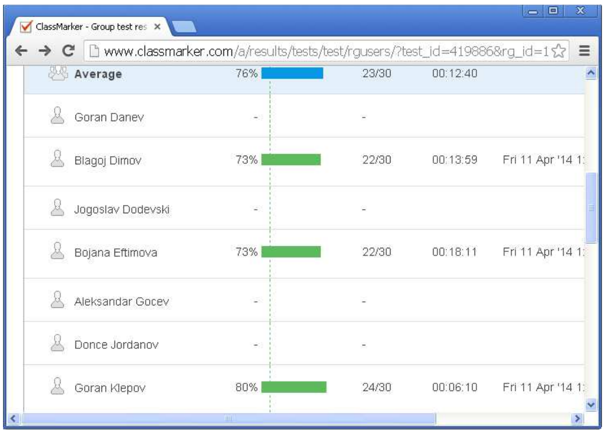

Figure 8. Display of results from test overall success

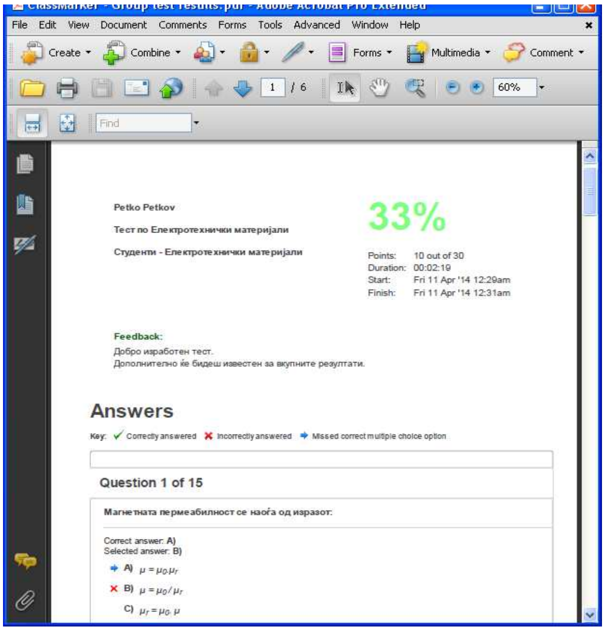

Figure 9. Display of results from testting individual results

On that way a complete overview of tests success is achieved, students get the results immediately, computer is calculating student achievements and it is displaying the results, thus avoiding subjectivity or possible errors in student grading. Electronic tests become a useful tool enabling complete, quick, easy and objective grading of all students with complete statistical analysis of the tests within the exam itself, and all complete documentation from testing is available for following student progress. Testing is done within certain time limit in average two minutes are allowed per question in order to be seen weather student can find correct answer for relatively short time among several similar answers. On that way is avoided answering of questions just by try and error system. Tests can be set not to allow returning to the same question, once the question is exit or input answer from student side is considered final.

IV. Result Discussion

In April exam term, year 2014, six students took the electronic testing. All of them have passed the testing and average grade was 8. In February exam term, same year fifteen students had took the exam without electronic testing. Number of passed students was six or 40 % of the students passed the exam. Average grade was 7.83. In Table 1 is presented comparison of obtained results in both exam terms.

TABLE 1. COMPARISON OF RESULTS FROM DIFFERENT EXAM TERMS

	Exam term year 2014	
	February	April
Nr.of students	15	6
Percentage of passed students [%]	40	100
Average grade	7.83	8

From results in Table 1 it is noticeable that all students have passed the exam and the average grade was improved for 2.17%. Although percentage of passed students is improved as well as average grade still student achievements should be monitored for longer period and when possible should be tested on larger series i.e. larger number of students. During exam performing it was noticed that sufficient time was available for going through the complete tests, all students have finished the test on time, results from testing were available instantaneously, any subjective professors' opinion was excluded enabling fair and objective grading.

V. Conclusion

In April exam term, year 2014 electronic tests were implemented for student testing for subject Electro-technical materials. Electronic tests were prepared in web-based software http://www.classmarker.com which enables creation of different types of electronic tests with different types of questions and answers: multiple choice, true/false answer, writing an essay etc.. Numerous possibilities of this software enable utilisation of different features in test preparation: time limitation for test answering , randomization of questions, randomization of answers, number of attempts for test entering, possibility to return to already answered question or not to return etc…Results from testing are instantaneously available for students as well as for professors, after test is finished. Further more complete statistic from testing is available for the complete exam as well as for each student individually. All these features make the electronic tests very useful tool for fair, objective, complete and quick knowledge examination. Comparison is made between achieved results from two different exam terms when electronic tests were used and when they were not. Improvement in percentage of passed students as well as in average grade is noticed although these figures should be monitored through several exam terms. This was a pilot project which opened the door for further implementation of electronic testing in student examinations since it was adopted by student's side with no objections. One of the limitations of proposed methodology for creation of electronic tests is that internet access should be available on all computers were testing is done. Further research should be in direction of exploring the opportunities of other software platforms for creation of electronic tests their possibilities, advantages and disadvantages.

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MOBILE AUDIENCE RESPONSE SYSTEM AS A SUPPORT TOOL IN EDUCATION

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Abstract - Audience response systems (ARS) allow participants at a meeting or in a classroom to respond to questions, thus increasing the attention of the attendees. These systems are suitable for events with a number of participants where decision-making or assessment must be conducted quickly. ARS can also be used in large classes to increase the level of student engagement and to provide prompt feedback.

In this context, we have decided to develop an audience response system that can be used in the educational process. The system contains two parts: server application designed for the teachers and client application designed for the students. Both, the server and the client application have been developed with Java. The first one can be installed on the teachers PC or laptop, the second one on students' mobile phones. The system support two possible answer's formats: simple text and image.

The developed system was tested at the Faculty of Law – Bitola, and the evaluation results are shown in this paper.

I. INTRODUCTION

An audience response system (ARS) is an interactive tool that enables participants and presenters to interact dynamically through question-and-answer polling in various environments. These systems are especially useful for events with a large number of attendees (meetings, seminars, conferences, classrooms, etc.), because of the immediate feedback that the presenter receives. ARS also enables the presenter to collect participant data, to display graphical polling results, or to use them in various reports and analysis.

Over the past decade, the rapid technology advances, have led to increase used of information systems in education process. Current literature overwhelmingly suggests that students have positive attitudes towards the use of modern technology during the classes. One of the representatives of this modern technology is undoubtedly an audience response system.

ARSs have been used to improve student interaction, engagement, and attention [1], increase student attendance [2], stimulate peer and class discussion [3] and provide feedback for both students and teachers allowing deepening the discussions about specific topics that were not grasped by the majority of students.

The purpose of this study is to explore the benefits and challenges of using the Mobile Audience Response System (MARS) in higher education in Macedonia (specifically at the Faculty of Law in Bitola). For this reason, a Mobile Audience Response System was developed and tested at the Faculty of Law – Bitola. The evaluation was done from students' and from teachers' perspective.

II. RELATED WORKS

A number of literature reviews on use of audience response systems in education, have been presented over the last years. The common conclusion is that using ARS has several benefits such as increased student engagement, increased interactivity, fast feedback, etc. [5, 6]. In addition, it leads to increased awareness of both students and teachers about students' understanding of specific topics [7]. According to Caldwell [8], Kay, and LeSage [9], students have positive attitudes towards the use of response systems. Hadzidedic et al. [4] have made a review of 67 papers related with an ARSs and summarize the reported benefits of their use, that are: increased attendance, attention, anonymity, participation and engagement levels, interaction, discussion, contingent teaching, quality, feedback, formative assessment and etc. Similarly, Pradhan et al. [10] found significantly higher levels of learning with an ARS versus traditional lectures in residency education. In addition, they found that both groups who showed high achievement in previous courses and those who showed low achievement in previous courses significantly increased their test scores with the use of ARS during the educational process. Some papers also show that students preferred ARS presentations to lecture presentations [11], [12]. They are also more comfortable responding to polls using an ARS than with traditional hand rising in class [13]. ARS utilization helped the students to focus on key points in the lecture, while the feedback helped the teacher to identify the areas for further review [14]. Sally et al. [15] also found that students were more engaged (83%), intellectually stimulated (85%), and motivated to think (89%) in lectures where an ARS was used versus lectures without an ARS.

III. SYSTEM DESCRIPTION

For this study, a Mobile Audience Response System (MARS) was developed and tested. The system contains two parts: server application and client application. Both, the server and the client application have been developed with Java.

The teachers use the server application on their laptops or PC. Using this application, they can establish new TCP/IP connection, manage questions and student answers, manage students etc. The application use mysql database for recording the data send from the client application. In other words, the students send data from their mobile phones (where a client application is installed) to the server application. The server application interface is shown on Fig.1.

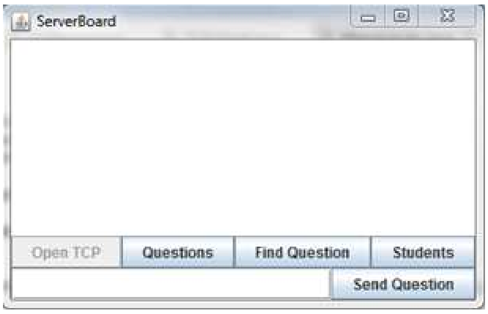

Figure 1. Server desktop application

The client application is a small application that needs to be installed on the students' mobile phones (Fig. 2). In the scope of this study, we have developed mobile application only for Android OS. After installing the application, the students need to login with their username and password and to wait for teacher questions. After the question is presented, they need to send answer to the server. There are two types of answers:

- Text: the student inserts text answer in the free text field – new record in the database will be added.
- Image: the students can browse for images, select the adequate image and send the image. Before sending, the students have preview of the image – new record in the database will be added and the image will be uploaded on the server.

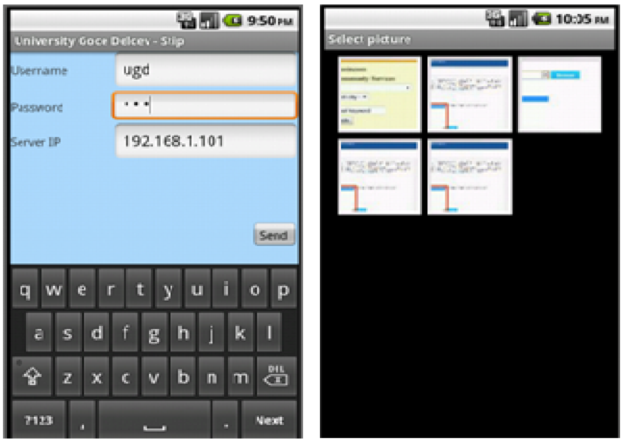

Figure 2. Client mobile application

Results are immediately transferred through a wireless connection and saved in a database. Then, the teacher can review the students' answers, present them and discuss them with the students.

Fig. 2 shows the system data flow.

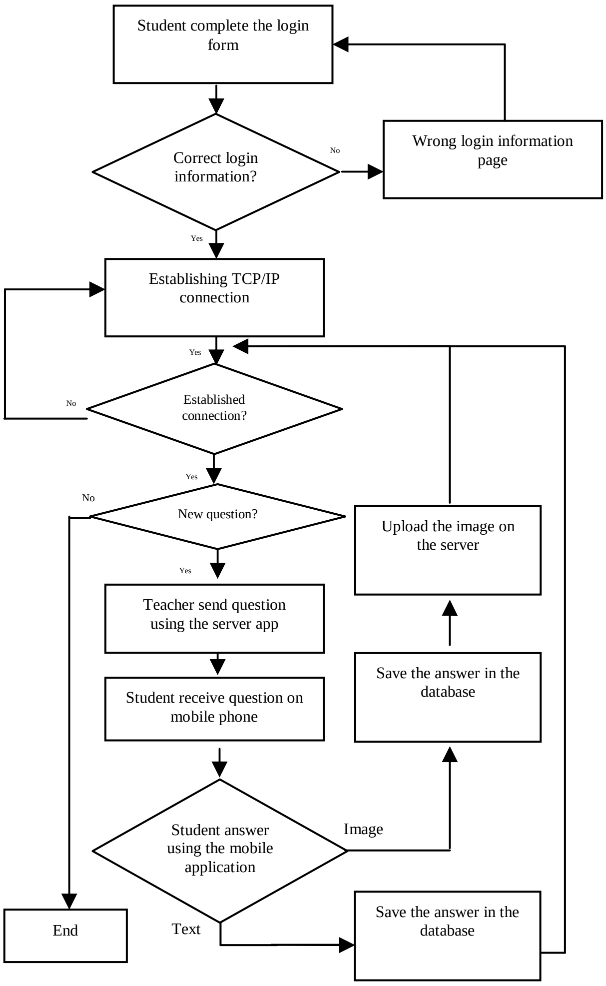

Figure 3. System data flow

IV. System Evaluation

The system was tested at the Faculty of Law in Bitola, as a part of the laboratory classes of two courses from undergraduate studies: Institutional Law and Introduction to computer science. The system was used from 97 students, 47 of them attended laboratory classes of Institutional Law, and the rest of them attended the laboratory classes of Introduction to computer science.

Developed system was used to gauge student comprehension, making overview at the end of each lecture, for students testing and for electronic survey. Electronic questionnaires were used to collect the data about students' and teachers' experiences from using MARS.

Table I shows the statistics from using MARS.

TABLE I. Statistics from using the system

	Activity	*Number*	
		Institutional Law	Introduction to computer science
1.	Number of students who used the system	47	50
2.	Number of laboratory classes	10	12
3.	Total number of sent questions from the teaching assistant	110	132
4.	Number of questionnaries	2	4
5.	Number of quizzes	8	10
6.	Total number of answers from the students as text	2385	2554
7.	Total number of answers from the students as image	1542	1784
8.	Percentage of correct answers	72.5%	68.9%

In order to overview the curriculum content from the laboratory classes, at the end of each lecture the teaching assistant inserted 15 questions related with the current lecture, using the system, while the students answered these questions using the client application installed on their mobile phones. After that, the teaching assistant discussed the results of each question with the students.

The results gained with the system were used by the teaching assistant to gauge students' comprehension and to adjust the direction of the lecture accordingly.

The common opinion was that using MARS during the laboratory classes the student engagement and attention raised and was higher than in traditional laboratory classes.

Students' experience was evaluated after using the developed system. The results from this evaluation are shown in Table II.

TABLE II. Questionnarie for the students

	Question	*Answers*			
		Institutional Law		Introduction to computer science	
		Yes	*No*	*Yes*	*No*
1.	Do you perceive any benefits to their overall learning experience as a result of MARS use in the education process	38	9	43	7
2.	Do you have positive attitudes towards the use of new technologies in classes	41	6	44	6
3.	The use of MARS stimulated me to be more active in the laboratory classes	39	8	42	8
4.	Improving communication	37	10	39	11
5.	The mobile application is user-friendly	40	7	41	9
6.	I would like to use the same system in other classes	43	4	45	5

For this study, we have also conducted questionnaires for the teaching assistants. The results from this evaluation are shown in Table III.

TABLE III. Questionnarie for teaching assistants using five point Likert scale (1: strongly disagree, 5: strongly agree)

	Question	**Answer**	
		Institutional Law	Introduction to computer science
1.	The teachers can receive immediate feedback about whether concepts were understood in class	5	5
2.	Impact on students attendance	4	4
3.	Improving the communication	4	5
4.	The desktop application is user-friendly	5	5

According to the results from the electronic questionnaire, students indicated that the use of MARS helped them to improve attention and interaction and to learn lecture material more effectively.

In addition, the teaching assistants agree that MARS utilization increased active learning, revealed student comprehension, and lead to more effective educational process. Furthermore, they agree that the implemented system is easy to use, and it could be a very useful tool for collecting students' feedback.

The results also revealed positive attitude of the students towards the introduction of a new technologies in education.

V. Conclusion

The main goal of this paper is to develop and evaluate a mobile audience response system as a support tool in higher education. The system was used in the educational process at the Faculty of Law - Bitola. The system was used for implementation of electronic surveys, making overview at the end of each lecture and introducing a new way of students' testing within the laboratory classes.

The results of evaluation show positive effects of using MARS on some important elements of the learning experience such as: student engagement, attention, interaction and motivation. Possibility of obtaining instant feedback, for both students and teachers, was also found very useful.

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VIRTUAL USER INTERFACE

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Abstract - This paper describes the usage of virtual reality in diverse parts of person's life mainly in area of human-computer interaction (HCI). The main focus lies on the user interface, with a target to design recognizing system for its usage on the base of augmented reality. In the introduction, there are described basic issues, such as virtual/augmented reality, user interface and color ergonomics. With the use of virtual markers and physical interactions, authors illustrate their own type of the virtual user interface. This interface will be used as one method for experimental education of handicapped persons.

I. INTRODUCTION

Augmented reality (AR) is used as a tool in the continuing strengthening of human abilities such as awareness or performance. Augmented reality was originally developed for military applications and subsequently was transferred to the civilian domain. Currently it is used in areas such as healthcare, automotive, industrial control and entertainment industries [1].

This technology can be also used as an interface in an interaction between human and computers systems – HCI (human-computer interaction). Virtual interface was developed at DCI FEEI TU of Košice (Department of computers and informatics, Faculty of Electrical Engineering and Informatics of Košice) in LIRKIS laboratory. Its name is VUIUG (virtual user interface using gestures) and it allows easy and interactive interaction using augmented reality system [7].

Paper is divided into three parts. The first part presents AR and its technological approaches. The second part in detail describes VUIUG (how it works and possible areas of its applications). This part also presents applications, which were created to present VUIUG possibilities. The last part describes analysis and solution of presented virtual user interface; it summarizes information presented in this paper about VUIUG, and its use possibilities as virtual user interface for training/educational process.

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II. AUGMENTED/MIXED REALITY

There are several definitions of augmented reality. Ronald Azuma [2] gave one in 1997. Azuma's definition says that Augmented Reality: combines real and virtual, is interactive in real time and is registered in 3D. Paul Milgram and Fumio Kishino (Milgram's Reality-Virtuality Continuum) gave another one [3]. This continuum is visualized as a line that is between reality and virtuality (Fig. 1).

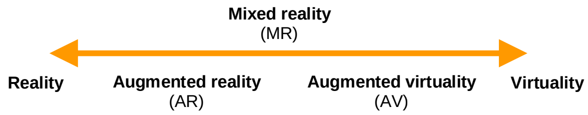

Figure 1. Milgram's Reality-Virtuality Continuum

Mann [4] extended this continuum into a two-dimensional plane of "Virtuality" and "Mediality" (Fig. 2).

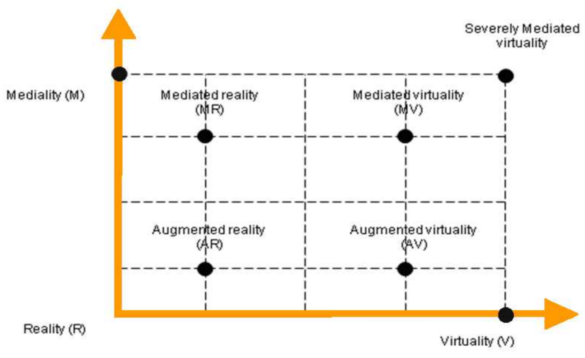

Figure 2. Mann's Mediated Reality continuum

For the creation of an AR system, it is also important to know which technology is used for visualization and aligning of virtual objects into user's view.

Based on how user sees augmented reality there can be two types of systems [1]:

- *Optical see-through systems:* user sees directly real world that contains added computer generated objects. This category of systems usually works with semi-transparent displays.

- *Video see-through:* user sees real world image with added virtual objects indirectly. Usually via camera – display system.

According to method how virtual objects are aligned with real scene image there are two systems used [1]:

- *Marker systems* – real scene will be added with special markers. These will be recognized during runtime and replaced with virtual objects.
- *Markerless systems* – processing and inserting virtual objects is without markers. Additional information is needed, for example image and face recognition, GPS coordinates, etc.

The presented solution uses this technology for mixing of user interface of computer to real world of user. It is also usable to user gestures recognition for computer/application controlling.

III. Virtual User Interface – System Overview

A. Parts of VUIUG

VUIUG consists from pico-projector, camera, and notebook and color marks [7]. These marks are used for better detection of the user's fingers in a 3D space. Hardware components (projector and camera) are connected to the pendant like mobile wearable device (see Fig. 7.). Both are connected to the notebook, which is in a bag on the back of a user. Visual information can be projected by VUIUG on various surfaces and physical objects. Schematic view of the interconnection between individual components is shown in the next figure (Fig. 3).

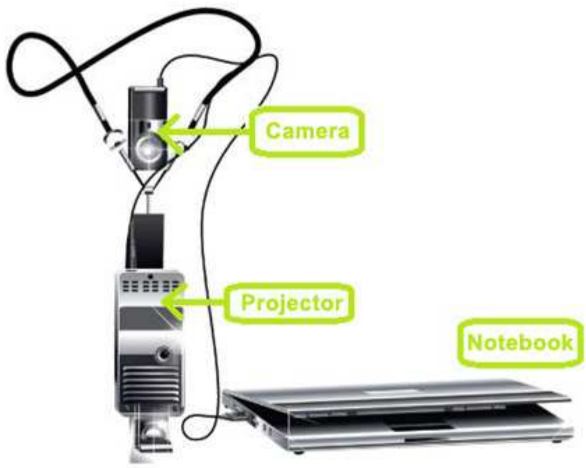

Figure 3. Schematic view of individual VUIUG parts

B. VUIUG workflow

The camera captures input image, which contains user's hand gestures and physical objects. The software processes the video stream data captured by the camera and calculates the location of the colored marks on the tip of the user's fingers using computer vision techniques. The movements and arrangements of these fiducials are interpreted in gestures, which act as interaction instructions for the application. The number of unique fiducials limits the maximum number of tracked fingers. This allows multi-touch and multi-user interactions.

The VUIUG workflow mentioned earlier can be divided into these steps (see Fig. 4):

1. camera captures the image and the user's hands gesture (fingers position)
2. application on the notebook process captured information and interprets hands gesture (fingers position)
3. processed information are used for interaction with the application
4. output of the application is displayed on a surface using projector

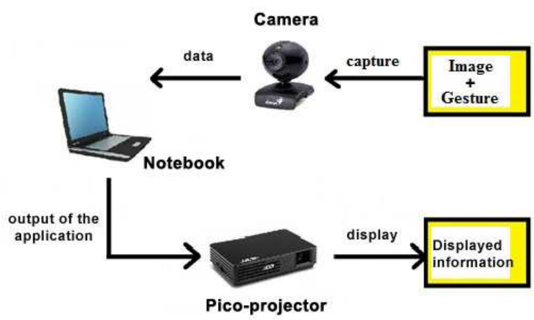

Figure 4. Workflow of the VUIUG

VUIUG can be used in many applications as their input/output interface. Two pilot applications were created to present VUIUG possibilities:

- application *Paint* – application tracks user's fingers (marked by color markers) and using these information draws shapes and objects selected by a user. Example of drawing using this application is shown in Fig. 5.
- application *Image* – display any image stored in the application. User can control image attributes using one marker or multiple markers.

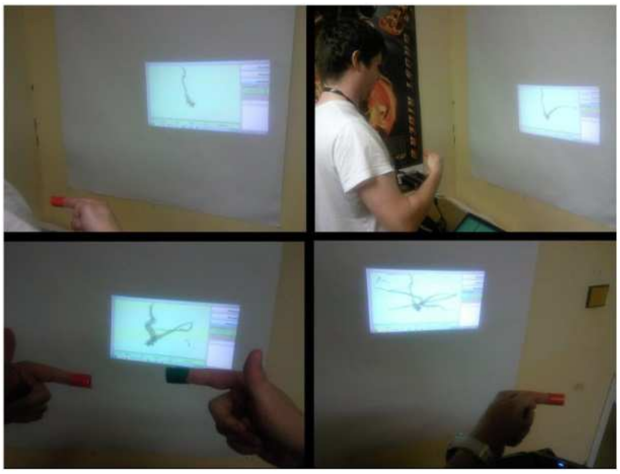

Figure 5. Pilot application using VUIUG (example)

IV. VIRTUAL USER INTERFACE – ANALYSIS AND SOLUTION

A. Analysis

As a first step, it was necessary to solve the main problem, which was the recognition of the implemented gestures. In this paper are described several ways in which recognition is currently being addressed. When deciding on the right method, the priority was for the necessary hardware to be easily affordable. One possible solution was to use systems such as MS Kinect [8] and its suite of tools for software development - Software Development Kit (SDK). In this case, however, it would be inevitable to have a user with the MS Kinect itself; otherwise, the created application would be unusable. Gesture recognition requires special equipment, such as infrared cameras. These sensors are used in most of the currently available solutions, because with their help, it is possible to recognize performed gestures without the necessity of putting on any other additional equipment. Other solution is usage of others sensors e.g. MYO [9] or Leap Motion [10].

B. Solution

In this case, it was focused on another direction and for easier recognition it was used the colored marks. They can be easily identified and monitored through the TouchLessLib library. Also important is the right choice of material, respectively hue marker, because the system recognizes worse colors that are more subdued. It is good to choose brighter, shinier shades respectively. In this case, it was a very good experience with four colors, namely: red, yellow, green and blue. As shown in the Fig. 5 or Fig. 7. with colored insulating tape, it was created a sort of foxgloves, which after the onset of the fingers allow better interaction with the application.

The system is designed for use in a combination with camera, projector and mobile computer systems. As it can be seen from (Fig. 4), using the projector, image can be transformed from the laptop on any chosen surface. The system detects the tags using a camera and monitors their processes and performed gestures. The system has a delay of about 0.4 seconds between gesture and response made by a computer. The ideal distance marks or rather the breastplate of hands from the camera is about 30 cm, but it depends on the quality of the camera sensor and the color of the used markers.

As it was first used in the design of classic projector, with the help of, which it is also possible to use a system. However, the problem is exacerbated by mobility, whereas the classic projector is big enough and it also needs a separate power supply from the mains. To improve the mobility of the whole system it was decided to use pico projector. With the small and lightweight pico projector together with a web camera, it was able to create a uniform structure (Fig. 6). This, the user can hang on his neck, connect to a laptop in his backpack and then work with the system anytime and anywhere.

Figure 6. VUIUG hardware solution

The camera is in this system one of the most important features, since without it the system would not be able to recognize and follow the defined markers. By testing camera location: The camera can be placed basically anywhere, but it is important for the background to be of a neutral color, ideally white. It is not appropriate to use a camera integrated in a laptop, which would also capture in addition to recording labels the user and the space around him. There is a strong possibility that a camera would recognize also other object with a similar color to defined marks and would work with them as well. In this case, it was created a structure consisting of a camera and mini projector. The camera is positioned above the projector, which contributes to a comfortable and substantially more natural application control. The entire structure is suspended by the neck, thereby allowing the image to be projected in front of the user. Since the camera is above the projector, it takes away the area of the projected image and allows the user to work without any restrictions, such as shielding the image. An important factor that needs to be considered when placing the camera is space that is being captured. It should not be too bright or too dark, because in this case the system only very badly recognizes the markers.

V. CONCLUSION

HCI technology development is currently very rapid. Just the virtual-reality technologies and similar technologies are probably the greatest progress in this area and in industrial use [5] or e.g. in maritime praxis [6]. Just deploying such technologies can be a significant change in the management of the production process. At the same time, these technologies allow the creation of previously impossible training procedures. These procedures especially their visual aspect and interactivity may change streamline and shorten the process of operator training/education.

Developed system is not yet fully accurate and reliable. For the future it would definitely be interesting to try to create a solution based on the comparison of images or maybe to use a higher quality device for the capturing process. One of the possible solutions could also be to use an infrared camera, since it is well known that the fingertips have normally higher temperature than the rest of the hand. This way the fingertips could be easily detected and there would not be need for any markers.

Figure 7. Example of VUIUG as wearable device on an user

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IMPROVED ALGORITHM FOR TAG-BASED COLLABORATIVE FILTERING

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Abstract - Critical aspect in the modern e-learning systems is selecting the most adequate learning materials based on learners' requirements, needs and knowledge goals. It is especially important because of information overload. In addition, e-learning systems should deliver learning materials to learners in the format adequate to their learning style. On the other hand, it is common practice to use tags in order to filter the most useful learning materials because they allow learners to mark or highlight some learning materials with their own tags. In that way learners contribute to organizing and retrieving useful learning materials. Our previous research was focused on tag-based collaborative filtering and learning style determination in order to suggest useful learning material in adequate format.

In this paper, we propose a new tag-based collaborative algorithm that takes in consideration the factors that affect the tag-based collaborative filtering in order to develop more efficient and accurate algorithm, and suggest the learning materials based on posted tags rating and students rating.

The developed system was implemented at the Faculty of Law – Bitola, and the evaluation results are shown in this paper.

I. INTRODUCTION

Recommending systems in e-learning environments utilize information about learners and learning activities and recommend items such as papers, web pages, courses, lessons and other learning objects that meet the pedagogical characteristics and interests of learners [1]. The effective recommending system in e-learning environments must take in consideration some learners' characteristics like learning goals, knowledge level, learning characteristics, strategies and etc. The main goal of the recommending systems is making predictions using as much as possible user ratings and tags available for a given item.

Collaborative filtering is a wildly used approach to recommend adequate items to users based on the assumption that similar minded people will have similar taste, requirements, needs or behaviors. It can help users organize, share and retrieve information in an easy and quick way [2].

With the increased use of the collaborative tagging systems, tags could be useful information to enhance algorithms for recommending systems. These systems can support learners by recommending learning resources and tags. Collaborative tagging is a mechanism for describing items in large on-line collections. In other words, collaborative filtering approaches predict the rating of items for a specific user based on the ratings and tags from other users, which have similar interests. The same is for tag suggestions. Tagging has recently become very popular and useful. At the same time, it is an effective way of classifying items and categorizes them in groups that contain items with similar characteristics. Tags are assigned by users to describe and find back items [3]. The use of tags, keywords freely chosen by users for annotating resources, offers a new way for organizing and retrieving web resources that closely reflects the users' mental model and allows the use of evolving vocabularies [4].

Because different learners may add different tags on the same learning material while the same tag may contain different items for different users, the user should be profiled not only by the tags and items, but also by the relationship between the tags and items of the user [5].

In our previous researches [6,7,8], we have implemented an intelligent e-learning system that was used in the educational process at the Faculty of Law in Bitola. It includes the use of an adaptation rules and ontology for knowledge representation and supports the learners by recommending learning materials, online learning activities based on their learning style, knowledge level and the browsing history of other students with similar characteristics, based on the tags entered by the students. In other words, the system uses collaborative filtering based on tags posted from the students. The students can add tags for the learning materials by using an interface and simply by entering one or more tags separated by commas in the free-text input text field. In our another research [9], we have identified the factors and parameters that influence a tag based collaborative filtering used for recommending the most adequate learning materials. In that content, we have identified the following factors: students rating, tags rating and learning materials rating.

In the scope of this paper, we review several tag-based collaborative filtering algorithms and propose a new tag-based collaborative algorithm that takes in consideration the factors that affect the tag-based collaborative filtering in order to develop more efficient and accurate algorithm. Our approach determinates the similar profile with logged student, selects the adequate learning materials and forces the more important learning materials – materials that have tags with high rating set by students with high rating.

II. RELATED WORKS

The authors in [2] proposed a tag-based collaborative filtering approach for recommending personalized items to the users. Based on the distinctive three-dimensional relationships among the users, tags and items, they proposed a new similarity measuring method, which generates the neighborhood of users with similar tagging behavior instead of similar implicit ratings. Based on experimental result, the authors show that by using the tagging information, the proposed approach outperforms the standard user and item based collaborative filtering approaches. In [10], the authors proposed a framework for improving recommending systems through exploiting the users tagging activity. They stress social annotation as a new and powerful kind of feedback and as a way to infer knowledge about users. In addition, they investigated the role of tags in the definition of the user model and the impact of the tags on the accuracy of the recommendations. The authors in [11] proposed a novel algorithm for tab-based collaborative filtering, which exploits user-contributed tags that are common to multiple domains in order to establish the cross-domain links necessary for successful cross-domain collaborative filtering. The authors introduced a constraint involving tag-based similarities between pairs of users and pairs of items across domains. By using two publicly available collaborative filtering data sets as different domains, the authors experimentally demonstrated that the new algorithm substantially outperforms other state-of-the-art single domain collaborative filtering and cross-domain collaborative filtering approaches. The authors in [12] proposed a collaborative approach for expanding tag neighbors and investigate the spectral clustering algorithm to filter out noisy tag neighbors in order to get appropriate recommendation for the users. Based on the preliminary experiments that have been conducted on MovieLens dataset to compare the proposed approach with the traditional collaborative filtering recommendation approach and native tag neighbors expansion approach in terms of precision, the result demonstrates that the proposed approach could considerably improve the performance of the recommendations. The authors in [3] focused on generating tab-based profiles for the users and then recommended new learning materials based on the generated profile. In addition, they introduced topic aware recommendation algorithm - first detect different interests in the user's profile and then generate recommendations for each of these interests. The authors in [13] present a tag recommending system, which extends the collaborative filtering with a content-based approach able to extract tags directly from the textual content of HTML pages. Results of their experiments carried out on a large dataset gathered from Bibsonomy, where's shown that the use of content-based techniques improves the predictive accuracy of the tag recommender.

III. PROPOSED APPROACH

All of the users can describe learning materials with a set of tags. In that manner, the system creates a complex network of users, learning materials and tags. In this paper, we use three-dimensional relation: learner – learning material – tag in order to determinate learners that set tags for specific learning material. In that manner, we can define the following sets:

$S = \{ S_1, S_2, ... S_n\}$: set of learners (in our case students)

$L = \{L_1, L_2, ... L_n\}$: set of learning materials (video or audio)

$T = \{T_1, T_2, ... T_n\}$: set of tags posted from students S for learning materials L

Additional, learners and tags have their own rating. The learning material becomes important if it is tagged with important tags by important learners. For instance, one learning material could be tagged with important tags by important learner. Then, the tagged learning material can be considered as an important learning material and suggest it to the logged learner. The same holds for the learners and tags.

The main idea of our paper is using tag-based collaborative filtering in order to suggest the most relevant learning materials to the learners, but also to take in consideration the learners' and learning materials' rating. With other words, the suggested algorithm will force the more important learning materials – materials that have tags with high rating set by learners with high rating.

To generate the suggested list of learning materials using collaborative filtering, the system needs to complete two steps.

The first one is finding the neighborhood of the logged learner - a set of the most similar profiles, order them by their rating and select the top N profiles.

Once the most similar profiles are identified, the second step is to select the learning materials that could be recommended. These materials will be taken from the set of materials which the selected similar top rating profile set tags, and which the logged learner has not posted yet. In this step, the system will force the learning materials with higher rating.

Within the first step, we use BM25, also known as Okapi BM25. It is a non-binary probabilistic model used in information retrieval [14]. It calculates the relevance that the learning materials of one group have given to a query. We take in consideration a set of tags of each learner and make two analogies, comparing the tags of the logged learner with a query, and the set of tags of each similar profile as a document. It means that we performed calculation of profile similarity based on the BM25 model and thus we generate a set with all the similar profiles to the logged learner. The BM25-based similarity model is taken from the calculation of the Retrieval Status Value of a document (RSV_d) of a collection of a given query [14]:

$RSV_d =$

$$\sum_{t \in q} IDF * \frac{(k_1+1)tf_{td}}{k_1\left((1-b)+b*\left(\frac{L_d}{L_{ave}}\right)\right)+tf_{td}} * \frac{(k_3+}{k_3}$$

In our model RSV_d represents the similarity score between the logged learner (the terms of the query q) and one neighbor (the terms of the document d). This similarity is calculated as a sum over every tag t posted by the logged student. The neighbor n is represented as her set of tags with their frequencies. L_d is the sum of the frequencies of each tag of the neighbor n. L_{ave} is the average of the L_d of every neighbor. The term tf_{tn} is the frequency of the tag t into the set of tags of the neighbor n, tf_{tq} represents the frequency of the tag t into the query - the set of tags of the logged user.

After calculating the similarity between the logged learner and each neighbor, we choose the top N similar neighbors (learner profiles) with the highest rating.

Within in the second step, the system uses Cosine-based Similarity to calculate the similarity between two learning materials – learning materials for which the logged learner has set tags and learning materials for which the similar learners has set tags. Then, the system will select top N materials with highest rating. To get the more reliable results for calculating the similarity between learning material *a* and learning material *b*, we need to isolate the students who have set tags to both of these items and then to apply a similarity computation technique to determine the similarity between learning material *a* and learning material *b*.

We use Cosine-based Similarity to calculate the similarity between two learning materials. In this case, the learning materials are thought of as two vectors in the m dimensional user space [15]. The similarity between the materials is measured by computing the cosine of the angle between these two vectors, based on following calculations:

$$Similarity\ (a,b) = \cos\ (\ ,\ ) =$$

Because the learners rating and the learnin materials rating have an impact on the process of determining the relevant learning materials, we need to calculate them.

A. Student rating

In order to calculate the learners rating, we are using two coefficients: knowledge level coefficient (C_{kl}) and student activity coefficient (C_{sa}).

Total student rating C_{kl} can be calculated as an average value of the two coefficients:

$$C_{kl} = \sum(\quad * K_{ln})$$

P_n is a score from the test of knowledge level K_{ln} and N_t is the maximum number of test points.

The student activity coefficient (C_{sa}) can be calculated as:

$$C_{sa} =$$

T_{su} is number of total tags posted from the student *S*, while T_t is total number of tags posted from the other learners for learning materials tagged by learner S.

Finally, learner rating S_{rat} can be calculating as:

S_{rat} =

B. *Learning material rating*

Average material rating *(LM_r)* can be calculated as an average value of two coefficients: average rating posted from the learners *(R_{av})* and learners' average rating that post rating to learning material (R_{sav}):

LM_r =

The Figure 1 shows the diagram of proposed approached.

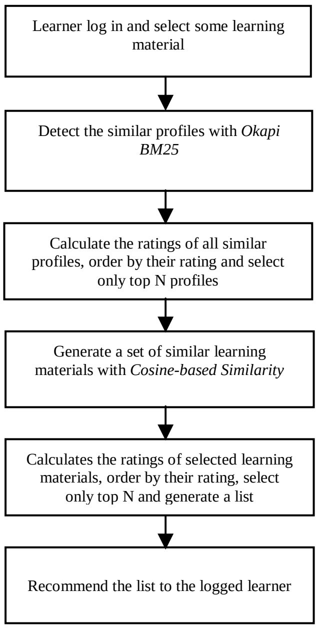

Figure 1. Proposed approach diagram

IV. RESULTS

The system was implemented at the Faculty of Law in Bitola. We compared the results from our preview research and the current research. In our preview research, we were using simple collaborative filtering for learning material recommendation, but we did not take in consideration any additional factors that affect the collaborative filtering process. In the current research, we use BM25 probabilistic model for determination of similar students with the logged student and Cosine-based Similarity for selecting the most adequate learning materials.

TABLE I. COMPARATION OF THE RESULTS

Activity	*The old research*	*The current research*
Number of learning units	91	148
Number of students	110	110
Number of tags	739	1345
Average students ratings (1-5)	/	3.89
Average learning materials ratings (1-5)	/	4.12
Used learning materials from the suggested list (%)	74.6	83.8

V. CONCLUSION

The system's ability to select the most adequate learning content and deliver it in the adequate format to the users. The main goal of our system is to recommend the most appropriate materials to the students based on the tags they set for the learning materials. Additional, we have taken in consideration students rating and learning material rating in the process of collaborative filtering.

In the scope of this paper, we proposed a tag-based collaborative filtering algorithm that takes in consideration the factors that affect the tag-based collaborative filtering in order to develop more efficient and accurate algorithm. Our approach determinates the similar profile with logged student, selects the adequate learning materials and forces the more important learning materials – materials that have tags with high rating set by students with high rating. The system calculates the rating of the learning materials and students first. Then, the system determinate the similar profiles to the logged learner based on the BM25 probabilistic model. Second, by using Cosine-based Similarity the system calculates the similarity between two learning materials – learning materials for which the logged learner has set tags and learning materials for which the similar learner has set tags. Then, the system will select top N materials with the highest rating.

After a period of using the system, we have compared the results obtained from the student's activities and we can conclude that the proposed algorithm for tag-based collaborative filtering that takes in consideration ratings of students and learning is more efficient that a standard collaborative filtering. It can be concludes based on the highest percentage of accepted items from the suggested list in the current research versus the percentage in the preview research.

The future researches could be focused on including lists with synonyms for the tags and cold star problem in tag-based collaborative filtering process in order to be recommend more adequate learning materials.

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SOFTWARE SYSTEM FOR AUTOMATED SUPPORT OF END-USERS

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Abstract - This paper presents a software module for automated support of University IT System end-users. It is developed as a part of the integrated University IT System. It aims at diminishing the administrative workload of students, teaching staff, admin assistants and student service officers as well as to enable more efficient working environment.

I. INTRODUCTION

The rapid development of the information technology worldwide contributes for a drastic change of the traditional procedures according to which the companies are functioning for completion of everyday activities. This change demands for establishing separate departments to support the end users. The same demands are valid not only for private companies but also for education institutions including universities.

The department for end users support at UGD Info Center, at Goce Delcev University – Stip, provides support to end users (students, teaching staff, assistants and student service officers) for problems that occur during their interaction with the developed information system. The communication between the end users and the Department of Customer Support currently is realized by e-mail, telephone and in person at the office of UGD Info Center. This approach, in problem resolving, causes huge burden on everyday activities of the operators at the Department of Customer Support, resulting in absence of systematic archiving of completed activities realized for the end users. Further, on, most of the time is spent on distribution of the current requests among department's operators, and inefficient synchronization of the service incidents and responsible operators. In a long term, considering that the number of users who require daily assistance will be increased, this strategy is unsustainable.

The aim of this paper is to research the possibility for implementing a web designed software system for automated software support, through usage of suitable technology and upgraded Case Management process, aiming to increase the quality level of services provided by the Department of Customer Support. A survey conducted among each involved party proved that there is a need for such system, which will contribute to increase significantly productivity, effectiveness and efficiency of the employees of the Support Department. Additionally, the end users would be able to follow the status of the resolution of their service incidents at all times.

Upon the analysis, the system was designed and developed. The implemented system was tested and evaluated by the potential end-users. The conducted evaluation study has shown that the proposed solution entirely fulfills the demands of end-users.

II. BACKGROUND OF END USERS SUPPORT SYSTEMS

Before the introduction of the concept of the IT department for end users support, the clients (users), in order to solve their technical problems, had to contact employees of the IT department, by phone or in person [1], [2]. However, this concept of problems solving have major drawbacks in terms of the structure of the IT department as well as in terms of users' satisfaction. The employees of the IT department are not always available for immediate assistance, because of their primary assignments within the department. The end users often require assistance from incompatible employee within the IT department, leading to users' frustration, because they have to make an extra call or waiting to be transferred to other expert responsible for solving their problem.

In order to overcome these problems, the idea of establishing the IT Department of Customer Support occurs. These department (also known as Computer Call Center, Contact Center or Support Center), is the central point of the IT department, that provides the end users with IT information about their needs in order to overcome some problems. The responsibilities of the Department includes first level of support in case of occurrence of incidents, daily communication between with the user support system and reports generation about the quality of provided service [3], [4]. In [5] Workman and Bommer also define the importance of IT Department of Customer Support in providing technical assistance to users in case of computer failures (software and hardware).

From the beginning of the establishment of the IT Department of Customer Support within the companies, several different models evolved.

The decentralized model was one of the most popular in the 80s of the 20th century. According to this model, companies have more than one IT department to support end users, separated by areas and IT groups. Decentralized model allows different problems' categories to be resolved within the respective IT group, that lead to timely resolution of problems and users satisfaction. This model initially gave the expected results, because ICT was very simple and the problems were well known. Over time, IT infrastructure becomes increasingly complex and the problems were often transferred from one IT group to another in order to obtain the correct solution.

In order to overcome the problems faced by the decentralized model, companies started to use the centralized model within the IT department to support end users. This model enables merging most of the groups in a single (central) point for communication, which allows better allocation of resources, improved internal communication and incidents resolving [6].

Today, big corporations that have offices around the world, implement a virtual model of department to support end users. This model allows end users support within the departments located in different physical locations. The end users are able to contact the department for support through one contact phone, enabled by modern telephone routing technologies [7]. This method enables available of 24/7/365 days a year, regardless of department physical location.

Another approach, which is very popular nowadays, is e- support. This model is very widespread, because it allows better, faster and cheaper service. This model uses Internet and web as the primary communication channel [8]. End users use e- mail or website to contact the Department for support, or can access online resources such as knowledge base.

Which model the company will choose, depends on the needs and the technology that the company possessed. However, it is clear that a good customer support is essential for keeping the customers happy and most importantly, retaining them.

III. DEFINING THE REQUIREMENTS

In order to tailor a system that will satisfy the needs of its main stakeholders (students, teaching staff, administration, student service offices, employees at the UGD Info Center) and to make their work more efficient and more productive, structured survey technique was used for their requirements elicitation. Considering the current situation, where all the incidents are reported or forwarded to the UGD Info Center and there they are processed in a causal way, without any tracking and feedback, the results on the survey questions, reveled the necessity of an automated help desk system.

The survey was conducted among 85 participants, gender and percentage balanced from all stakeholder groups. Majority of survey questions were offered with multiple-choice answers. The results from the survey are presented in the following.

TABLE I. YOUR OPINION ABOUT THE CURRENT QUALITY OF SERVICES OFFERED BY UGD INFO CENTER[A]

Answer	*Number of Responses*
Terrible	40
Bad	15
Neutral	20
Good	10
Very good	0

Single answer allowed

TABLE II. WHAT WILL BE THE BENEFIT OF IMPLEMENTING AN ELECTRONIC AUTOMIZED HELP-DESK SYSTEM [B]

Answer	*Number of Responses*
Saving time	67
Better coordination and visibility	70
Increasing the effectiveness and efficiency	65
Better productivity and flexibility	80
No advantages	4

Multiple answers allowed

TABLE III. WHAT FUNCTIONS THE HELP-DESK SYSTEM SHOULD PROVIDE[C]

Answer	*Number of Responses*
e-Creation of service incident	75
View of crated service incidents	72
Update an existing service incident	45
Attaching files to service incident	64
Creating notes to service incident	59

Multiple answers allowed

TABLE IV. WHICH CATEGORIES OF SERVICE INCIDENCE SHOULD BE PROVIDED[D]

Answer	*Number of Responses*
Question	79
Request	82
Problem	85

Multiple answers allowed

TABLE V. WHICH MODALITIES FOR CERVICE INCIDENCE CREATION SHOULD BE PROVIDED [E]

Answer	*Number of Responses*
Task	62
Fax	0
Phone call	79
Email	68
Letter	0
Meeting	9

Multiple answers allowed

TABLE VI. WHICH TEMPLATES SHOULD BE PROVIDED BY THE SYSTEM[F]

Answer	*Number of Responses*
Procedure for solving a specific problem	60
Question/answer for a given problem or situation	79
Solution to a given problem	69
General template	40

Multiple answers allowed

Considering the results of the survey the HelpDesk system was designed and integrated within the already developed information system.

IV. DEVELOPMENT OF SOFTWARE

Taking advantage of the existing Case Management process within MS Dynamics CRM platform (which is built within the overall student information system at the University), we developed automatic help-desk system which enables efficient and effective handling incoming service incidents by the end users through the automatic allocation of the responsible operator, escalation and resolving of these service incidents through implementation of uniform business rules using the plugin and workflow technology. The main advantage of the MS Dynamics CRM platform is the use of Internet as a tool for communication or more specifically web services. Web services enable simple integration and configuration of the applications, in order to meet business needs. Using a properly implemented web services, the interaction between the end user and the system is realized, through a dedicated web portal created for students, and a special web portal for teaching staff.

A service incident is simply an entry on the interaction between the client and the Department of Customer Support. When a customer is facing some problem, he contacts the Department of Customer Support by phone, e-mail, or through a web form. This activity needs to be tracked, so the service incident is created. All involved parties, regardless of their geographic location, can create it. When a new incident is created, a workflow is triggered which determines if the client, reporting the problem, currently exists as a contact in CRM or not. If not the new record in the database is created. Using the contact information, an e-mail is send to the client, containing information about the reported service incident as a proof of successfully created incident. Activity records are added to the contact and service incident.

When a service incident is created, it triggers the procedure for granting a responsible operator (IT technician from the Department of Customer Support), that search which operator from the appropriate level is least loaded in terms of the number of open (unresolved) service incidents and assigns the service incident. In case there is more than one operator, which is suitable to be assigned as responsible operator, the service incident is assigned by random. Then it is up to the operator to work on these new incidents and mark accordingly when completed. The mechanism for automatic assignment of responsible operator is realized by implementing the appropriate plugin trigger that triggers when a new service incident is created (Fig. 1).

For resolving the service incident, operator first searches the database of knowledge, which includes all previously received incidents, in order to find the similar resolved service incident. Using the keywords, it is possible to search through the database of knowledge, on different category levels. In the case of absence of previous solution of some similar service incident, the responsible operator needs to resolve it. If he is not capable to do that, then he should assign the service incident to another operator from the superior level. Different workflows are triggered when a service incident is closed (resolved), or reopened.

The system is designed so, it has built-in security, and only authorized users have access to appropriate parts of it. To enable data integrity and to support system reliability three new security roles for operators, regarding the levels of support, are defined.

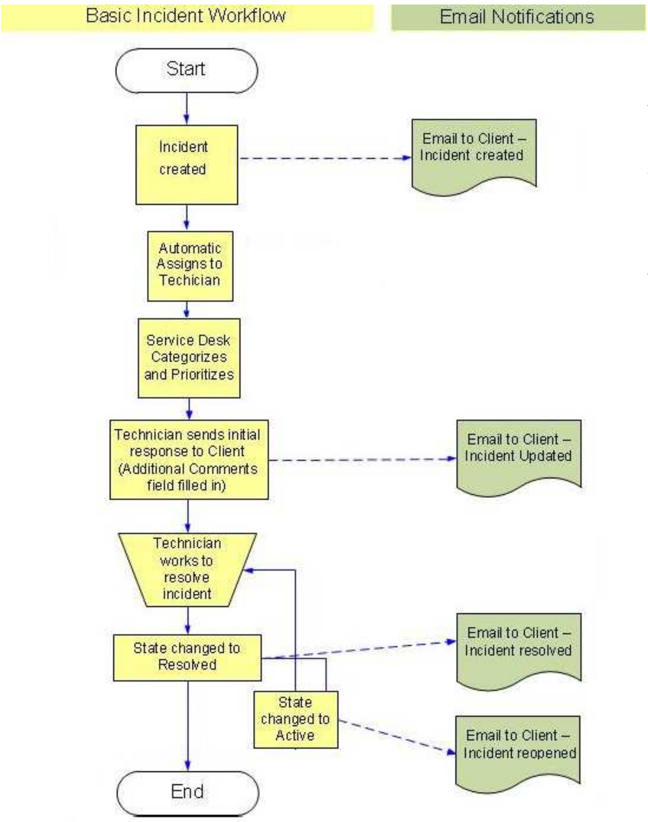

Figure 1. Activity diagram for sevice incident creation and solving

V. SYSTEM EVALUATION AND DISCUSSION

After system implementation and in order to get a clear picture of the level of usability and satisfaction of the end users, the benefits of its use, a series of interviews with end users of all target groups were conducted.

Through interviews conducted between students, teaching staff and associates and officers of student services, 95% of interviewees were very satisfied with the implemented functionalities, great flexibility and simplicity in the process of interaction with the customer support department quickly and efficiently, filing service incidents, tracking their status, implemented automated way of informing and web reporting, as well as centralized and unified approach of incidence management. 85% of interviewees were satisfied with the way of implementing the functionality to search through the knowledge base and the ability to forward a specific item from the base of knowledge via email. Some of the interviewees (10%) gave suggestions for upgrading the system with the implementation of live chat operators.

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ON A MIXED-UP SCHEDULE FOR TEACHING SOFTWARE QUALITY AND PROJECT MANAGEMENT – AN EXPERIENCE REPORT

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Abstract - How does a teaching block impact on students, who are used to 13-week semester subjects? We now had the chance to try out such a change in the setting within the Software Quality and Management course at the Technical University of Kosice. This course is located in the last year of our Informatics and Applied Informatics Masters' degree study programs. This paper presents our teaching experiment, together with its results. First, we present details of the mixed-up semester and block schedules. Then, we analyze time constraints, relations to other subjects, various students' problems, workload on students and teachers, and grading issues. We also evaluate the collected data and opinions, and discuss student feedback related to this specific course organization. The presented conclusion focuses on the future application of the teaching schedules used as well as on improvements of these schedules.

I. INTRODUCTION

Teaching at universities is always a big challenge. The bigger the challenge is the faster the development and innovation is in the given field. Software engineering is a characteristic example of such a field [1], [2]. In our setting, software quality assurance and software project management represent our teaching challenge.

Modern trends in teaching include the usage of examples [3], case studies [4] and simulations [5-8]:

1. Examples are the source of basic knowledge.
2. Case studies require more concentration than examples from the students to understand a process.
3. Simulations allow for the most complex type of knowledge transfer and interaction.

Instead being deductive as in the cases 1 and 2 above, simulations require predictive thinking. There is a significant positive property of teaching by using simulations: the knowledge stems from the students' own experiences. Additionally, the language used within simulation environments is less a problem, especially when compared to using foreign language teaching material. Mária Šimková et al. argues that such materials have unwanted bad impact on native language skills of students [9]. Often, parts of these teaching materials come from industry or an inter-university cooperation, which implies also a jargon to be used – yielding another language problem and introducing inconsistencies in the used terms. Finally, our experience also shows that some students still prefer cheating [10], and thrilling simulations can be seen as a chance to increase the interest in learning again.

Besides the teaching environment, the most important issue is the student himself/herself. In our research, we aim to measure their results [12] and adopt teaching material to consider student knowledge but also to provide required level of new knowledge to them as authors of [11-15] do.

Further characteristics of a teaching environment include social and technical backgrounds and habits. Here, we consider e.g. lengths of teaching and examination periods, grading and evaluation requirements, learning material styles etc.

We dedicate this paper to the memory of Ladislav Samuelis (1951-2013), the promoter of teaching software quality in Slovakia.

Many thanks go to Elke Hochmüller from the Carinthia University of Applied Sciences in Klagenfurt for helping and supporting course implementation.

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In this paper, we present the results of an experiment where we tried out a radical change in the setup of our teaching environment at the Technical University of Kosice (TUKE). The main question was the effect of the introduction of a tight teaching block instead of traditional courses on a weekly basis. For this, we examined changes in the students' behavior and workload as well as in the teachers' workload. The details on the environment changes will be presented in Section II of the paper. In Sec. III, we present and discuss selected problems with its implementation, while our student-behavior related experience is discussed in Sec. IV.

II. LECTURES & LABS IN OUR EXPERIMENT

For our experiment, a course called Software Quality and Management was selected. This course takes place in the last year of our Informatics and Applied Informatics Masters' degree study programs. During our experiment, 148 students of the said specializations attended the course. In the year before our experiment, there have been 140 students attending the class. In the traditional 13-week semester setup, one teacher taught lectures and labs.

The theory required for the course is presented at lectures, while labs use a simulation tool for practicing software project management. The theory is also accessible in a printed form as a textbook [16]. For the simulations, an environment called AMEISE (A Media Education Initiative for Software Engineering) [6-8] was used.

The basis for an AMEISE simulation run is a so-called simulation model. It contains the different simulation settings. In our course we made use of a quality assurance model which focuses on quality aspects, requiring the trainee to manage a 200 AFP (Adjusted Function Point) project within 9 simulation months, a budget of 225.000 €, and strict requirements concerning the quality of the final product (in terms of a maximal number of errors allowed per 1000 lines of code and a minimal percentage of AFPs required to be implemented).

A. Structure of the 13-week semester subject

The “classical” semester TUKE students are familiar with lasts 13 weeks, followed by a 6 weeks examination period. The organization of a typical semester is as follows:

- Every week a lecture. There are 11 or 12 lectures depending on the actual year (as there could be a lecture cancelled due to a national holiday or a conference). This also means that the lecture content is adapted to the situation – in some cases; the lecture is more condensed with a shorter time reserved for discussion. The length of a lecture is 90 minutes, i.e. two lecture hours.
- Every week a lab. There is the same number of labs and lectures that take place. Lab classes are only partially related to the actual week's lecture. The main focus of the labs is on practicing software project management skills. Basically, two simulations in the AMEISE environment have to be done by each student team. Teams usually consist of two members; in the case of an uneven number of students, one team consists of three students. The duration of the labs is 90 minutes, i.e. two lecture hours. As the duration of one AMEISE simulation run is more than a usual lab in the schedule, some parts of the simulations are to be completed at home, summing up to about 3 extra hours.

To conclude, the average workload of a student is 4 lecture hours per week, summing up to 48+3 (which is 51) lecture hours per semester.

The lecturer has to work more, not only because of material preparation, but also because the students are from two fields of study. On average, it needs about 48 hours for preparation, giving the lecture and after-lecture work. Due to the high number of students, 6 groups had to be formed in the lab classes. The lab workload for the teacher to be taken into account is thus 6 times 24 hours. It results in 12 hours per week or 144 teaching hours per semester of workload for the teacher.

Grading is done at two stages: the AMEISE simulation success grants the 6 ECTS credits and the exam result determines the final value of the grade at our local A-FX scale. The weight distribution is 40% and 60%; obviously, 21% of 40% for the credits respectively 31% of 60% are needed to pass the exam and are the minimal requirements in the ECTS system of the subject.

Examination results for the 13-week semester subject are displayed in Fig. 1. It presents the results from the academic year 2012/2013 in the mentioned subject.

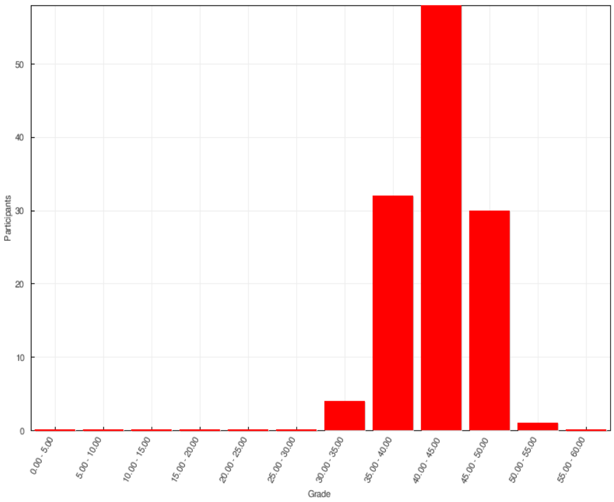

Figure 1. Course exam results from the 13-weeks variant

B. *Structure of the mixed-up schedule*

The mixed-up schedule combines the “classical” 13-week semester with a teaching block. This combination had to be implemented due to the limitations in the organization of teaching subjects at our department – further details on problems and specific solutions will be presented in Sec. III.

The key point of the schedule is that labs are organized in a completely different way – into blocks; lectures are mixed-up – some are presented regularly during the semester, others during the block of labs. The layout of the lectures is as follows:

1. The first four lectures are moderated guest lectures from the Testing headquarter at a big Company. Topics of these lectures include software and test-aware project management and software testing.
2. Next, three lectures on software metrics follow.
3. The remaining lectures focus on software quality management, on actual research results and challenges in all discussed fields of software engineering.

The above lecture organization is almost identical to the 13-week schedule. Therefore, we can provide nearly the same amount of effort:

- 24 hours per semester for students, and
- 48 hours per semester for a single teacher. However, the moderation of guest lectures is a lower workload than preparing for own presentations.

The introduction of a teaching block is something new at our organization. The aim is to deepen student knowledge intensively using simulations immediately after lectures introducing the simulation topics. How does it work? We created the following schedule:

1. Intensive introductory lectures on software quality metrics and software project management,
2. Even more intensive lecture introducing the AMEISE simulation environment,
3. First simulation runs,
4. Feedback session on first simulations,
5. Second simulation runs,
6. Feedback session on second simulations.

To increase the students’ motivation, a best simulation award was defined for the first simulation runs.

The workload measurement results for students can be summed up to 23 hours per block. The teachers’ workload considering 6 groups (as above) sums up to 83 teaching hours. This is a problem, because this would not fit into a normal one-week block. In addition, for that reason, we decided to involve 3 teachers (details follow in Section III.C) in the lecture.

III. PROBLEMS & SOLUTIONS

Our final schedules looked like as presented in Fig. 2. However, it was a long way to create them. Our way was strewn with obstacles – which ones, we now present in the next sub-sections.

A. *In which week should the block be?*

This was a very important question, also related to the workload of students and teachers.

The usual semester organization at our university prescribes that every student must have a lesson every week in every of his teaching subjects. This implies a huge complication when organizing a one-week teaching block. Students cannot be taken off from their usual schedule.

As a solution, we used the second week of the examination period for our block. However, with that, another problem appeared – there were possible collisions with exams in other subjects this time.

We solved the second problem by reorganizing students into larger groups: green, yellow and orange. This affected the schedule as well, but could decrease the number of teachers' hours due to a smaller number of groups.

B. How to grade the students?

Grading should be a transparent process in teaching. Fortunately, there are several attributes reported back as the result of a simulation run. In the simulated project, a software system had to be "produced", and the following attributes (simulation goals) were used as a basis for the grading:

1. Duration of the project (in simulation time),
2. Costs (needed for delivering a product),
3. Number of Adjusted Function Point covered by the code,
4. Number of errors per 1000 lines of code,
5. Adjusted Function Point % covered by the manuals,
6. Number of errors per page in the manuals.

We also defined lower limits of success, but as there have been two simulation runs, the most important factor was *how* the teams *improved* their simulation results. In order to pass this part of the lecture, we defined that at least in one of the above factors an improvement was required.

We used the reporting interface of the AMEISE server to retrieve all the relevant data. Then, we put these data into an Excel file, applied our limits, and summed up the results for each team separately.

Green Group (TG2) – Schedule

Date	Time	Room	Course Unit / Homework	Comment/Deadline
13.1.	12:30-15:00	BN5-ZP1	AMEISE Introduction	
13.1.	16:00-18:00	L9-A_537	Project Planning 1	Moodle DL: 13.1., 20:00
14.1.	09:00-13:30	L9-A_537	Simulation Run 1	AMEISE DL: 14.1., 13:30
14.1.	16:00-18:00	L9-A_537	Self Evaluation 1	Moodle DL: 14.1., 20:00
15.1.	09:00-11:00	BN5-ZP4	Feedback Session 1	
			HW: Project Planning 2	Moodle DL: 15.1., 15:30
15.1.	15:00-19:00 15:30-19:30	L9-A_537 L9-B_515	HW: Simulation Run 2	rooms optional, AMEISE DL: 15.1., 24:00
16.1.	12:00			Assessment Reports 2 available in Moodle
			HW: Self Evaluation 2	Moodle DL: 16.1., 15:30
16.1.	16:00-18:00	BN5-ZP4	Feedback Session 2	

(a)

Yellow Group (TG1) – Schedule

Date	Time	Room	Course Unit / Homework	Comment/Deadline
13.1.	10:00-12:30	BN5-ZP1	AMEISE Introduction	
			HW: Project Planning 1	Moodle DL: 14.1., 08:00
14.1.	08:30-12:30	L9-B_515	Simulation Run 1	AMEISE DL: 14.1., 13:30
			HW: Self Evaluation 1	Moodle DL: 14.1., 20:00
15.1.	09:00-11:00	BN5-ZP4	Feedback Session 1	
			HW: Project Planning 2	Moodle DL: 15.1., 15:30
15.1.	15:00-19:00 15:30-19:30	L9-A_537 L9-B_515	HW: Simulation Run 2	rooms optional, AMEISE DL: 15.1., 24:00
16.1.	12:00			Assessment Reports 2 available in Moodle
			HW: Self Evaluation 2	Moodle DL: 16.1., 15:30
16.1.	16:00-18:00	BN5-ZP4	Feedback Session 2	

(b)

Orange Group (CG) – Schedule

Date	Time	Room	Course Unit / Homework	Comment/Deadline
13.1.	10:00-12:30	BN5-ZP1	AMEISE Introduction	
			HW: Project Planning 1	Moodle DL: 15.1., 20:00
16.1.	08:30-13:30	L9-A_537 L9-A_509	Simulation Run 1	AMEISE DL: 16.1., 13:30
17.1.	14:00-16:00	L9-A_509	Feedback Session 1	
			HW: Project Planning 2	Moodle DL: 17.1, 24:00
			Simulation Run 2	AMEISE DL: 19.1., 24:00
?	?		Feedback Session 2	by Csaba Szabó

(c)

Figure 2. Final green (a), yellow (b) and orange (c) group schedules for the week with AMEISE

To make it easier for the teams to improve, the first feedback session included suggestions on it.

C. How to decrease workload?

Our strategy in decreasing the workload was to reorganize groups and their schedule. From the first guessed value of 24 hours' workload on students, the final organization using only three groups instead of six served with 23 hours' workload. In the case of teachers, involving three teachers, namely Andreas Bollin, Elke Hochmüller and Csaba Szabó, decreased the value from 83 to 40 hours.

D. Which week should be the exam?

According to the intensive block teaching, the question of examination dates was also important. Long-time memory and short-time memory effects play a major role in this case. In addition, the different learning styles of students also have to be considered. Results from brain-friendly teaching [17] indicate that using simulations (and activities) in teaching yields an optimal combination. This means that the exams can be at the end of the block.

Practically, the mixed-up schedule already checks for short and long-term memory support.

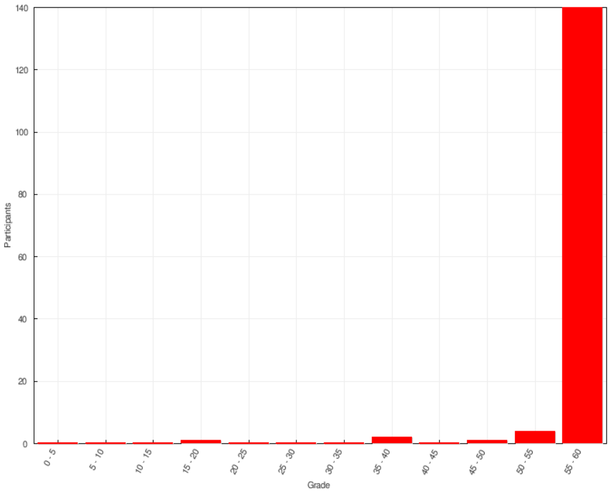

Figure 3. Course exam results from the intensive examination week after the mixed-up schedule

The simulation block can be implemented one week before the exams, as almost every theoretical lecture took place one month (or longer) before.

We defined three examination days with 9 exams in the week immediately after the week with AMEISE. Another three exams were defined for the next three weeks of the examination period. Except one student, all students passed the exams during the intensive week. The examination results for the intensive examination week are shown in Fig. 3.

E. Technical problems & solutions

As usual, technical problems also appeared. The most significant issue was the AMEISE server, which was located at the Alpen-Adria University in Klagenfurt, Austria. The clients connected to the server via the wireless computer network at TUKE and produced too much traffic. The bottleneck caused response time problems in all the clients. In addition, this unstable connectivity as a consequence slowed down the AMEISE server and led to inconsistencies between the clients and the server. As a solution, we will use a local server in the future and improve/update the client software setting to limit unnecessary network traffic.

Another technical problem was the capacity of rooms available for the labs. Distributing the groups over several labs solved this problem, but also complicated the schedule in several points.

IV. Student Feedback

We collected qualitative feedback from the students during the execution of the mixed-up schedule systematically using questionnaires. Follow-up feedbacks were gathered, but in a less systematic way: students were allowed to report on their feelings about the schedule after the exams verbally, and, last but not least, indirect feedback was collected by reading student forums and by asking students (selected randomly) who were not enrolled to the subject.

A. Immediate feedback

As immediate feedback, we consider feedback gained during the simulation sessions, i.e. before the end of the teaching block. This feedback was manifold; negative feedback is that several students had language or technical problem.

However, what can be seen as a great success: the vast majority of the students welcomed the new kind of organization and gave all positive feedback on the system, guiding activities and amount of new knowledge gained during the simulations.

B. Delayed feedback

Delayed feedback is given not later than two weeks after the teaching block finished. This includes feedback presented at the exams or informal feedback from several students.

The results of the evaluation show that there is mostly positive feedback again. The possible reason of missing negative feedbacks was aimed to be eliminated by asking only students who already passed the exam. We know that these results are not objective, but the willingness of students to give a feedback is already an achievement, and to some extent a success of the teachers.

C. Late feedback

Late feedback is the feedback achieved later than two weeks after finishing the teaching subject. Here, no students were directly asked. Via student forums, indirect information was collected regarding to students' recommendations on the Software Quality and Management course to other students.

These types of recommendations are statistically incomplete, but as human factor evaluations, they reflect student satisfaction. We hope, this satisfaction remains and will not be teacher-related. The name AMEISE gained a positive meaning between our students – but we also know about 3 students who expressed a strong negative feeling about it. Other less negative feedback came from a very small group of students – about a size of 10 students.

V. Conclusion

The most significant lesson is that a mixed-up schedule implies a huge hidden workload on the organization, as it is un-natural to most of our teaching environments. On the other hand, it represents a new and fresh point in students' life – a change that electrifies them. This new power is really needed in all-day life.

Another lesson learned is that language does really matter even in software engineering education – there are students who claim problems with English, especially in the feedback concerning lecturers (e.g. one issue is that a lecturer was speaking too fast). Probably, we will never have students with equal and very good English language skills at our University because the common teaching language is Slovak.

Finally, based on our personal experience, the extension of the three-teacher team by one additional member seems to achieve the optimal solution when we cannot solve the room capacity problem in a different way in the future. A fourth teacher is needed to keep the number of two guiding teachers per lab.

The AMEISE client and server are stable enough to use them with our future larger and smaller groups as well. The local server will help to speed up the response times. Remote administration will keep the possibility of fast help from our University's cooperation. Little improvements of the client software are already subject of cooperative work; recently found issues will be processed, too.

The schedule is hard to improve, because of the facts already presented in Section II.B. The problems of organization with finding a proper date during the semester cannot be solved without changing local policies in teaching. A possibility shows the organization of winter or summer schools for extra credits.

Feedback sessions were obviously the most powerful sources of knowledge. Students could learn from their own mistakes as well as from the mistakes of the others. We can claim that these sessions caused the most positive feedback on the course organization at all.

The mixed-up schedule showed up as a very good solution regarding to the short time and long-time memory of students. Our students had to use both types of their knowledge at the exam. The results suggest that it also increased their effectiveness in comparison to the previous year's results on the same question bank. Looking at Fig. 1 and Fig. 3, cheating might still be an issue, and an improvement of our question database might be needed.

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DATA PROCESSING OF RECORDED MOTION AT SEVEN-STORY HOTEL IN VAN NUYS, CALIFORNIA DURING NORTHRIDGE EARTHQUAKE 1994

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Abstract - In this paper, we present digital signal processing of recorded earthquake motions. The paper describes all the techniques used for the whole process of signal processing. From the measured displacements at the ground (first) floor and at the roof of typical seven-story building and their processing, we can get valuable information about the strong ground shaking and the structural response. In many cases, Fourier transform from time to frequency domain provides more information about the signal.

First, using FFT, we transform the measured displacements at basement and at the roof from time to frequency domain. The transformation at basement level, Fb(f), gives us valuable information about the frequency content of the strong ground motion. On the other side, the ratio of the Fourier transform at the roof and at the basement gives us so called transfer function, $H\square Fr\square f\square\square Fr\square f\square$, which reveals the natural frequencies of the building.

To accomplish the above tasks, we use the software Labview. Labview enables constructing graphical environment that represents design and analysis of a DSP system in a very minor compared to text – based programming environments. The graphical environment in Labview consists of VI (virtual instrument) which is represented by a Front Panel (FP) and Block Diagram (BD). The BD incorporates the graphical code and the FP provides the user – interface of the program. The Vis is modular and independent, which means they can be run by itself.

I. INTRODUCTION

A. The Building

This seven – story hotel in Van Nuys (VN7SH), California is one of the most studied buildings is southern California [2]. It has been designed in 1965 and constructed in 1966. VN7SH is located in central San Fernando Valley of the Los Angeles metropolitan area.

The building is 18.9 × 45.7 m in plan. The typical framing consists of columns spaced on 6.1 m centers in the transverse direction and 5.8 m centers in the longitudinal direction. Spandrel beams surround the perimeter of the structure (Figure 1). Lateral forces in the longitudinal (EW) direction are resisted by interior column-slab frames and exterior column spandrel beam frames [4]. The added stiffness in the exterior frames associated with the spandrel beams creates exterior frames that are roughly twice as stiff as interior frames. The floor system is reinforced concrete flat slab, 25.4 cm thick at the second floor, 21.6 cm thick at the third to seventh floors, and 20.3 cm thick at the roof.

The building is situated on undifferentiated Holocene alluvium, uncemented and unconsolidated, with a thickness of < 30 m, and an age of < 10,000 years [4]. The average shear-wave velocity in the top 30 m of soil is 300 m/s, and the soil-boring log shows that the underlying soil consists primarily of fine sandy silts and silty fine sands.

The foundation system consists of 96.5-cm deep pile caps, supported by groups of two to four poured-in-place 61-cm-diameter reinforced concrete friction piles. These are centered under the main building columns. A grid of beams connects all of the pile caps. Each pile is roughly 12.2 m long and has a design capacity of over 444.82 × 103 N vertical load and up to 88.96 × 103 N lateral load.

TABLE 1. PROPERTIES OF THE CONSTRUCTION MATERIALS OF THE VN7SH BUILDING;
(1) POUNDS PER CUBIC FOOT
(2) POUNDS PER SQUARE INCH
(3) KIPS PERS QUARE INCH

Concrete (regular weight, 150 pcf (1))		
Location in the structure	Minimum specified compressive strength $f_c' -$ psi (2)	Modulus of elasticity E – psi (2)
Columns, 1st to 2nd floors	5,000	4.2×10^6
Columns, 2nd to 3rd floors	4,000	3.7×10^6
Beams and slabs, 2nd floor	4,000	3.7×10^6
All other concrete, 3rd floor to roof	3,000	3.3×10^6

Reinforcing steel			
Location in the structure	Grade	Minimum specified yield strength $f_y -$ ksi (3)	Modulus of elasticity E – psi (2)
Beams and slabs	Intermediate grade deformed billet bars (ASTM A-15 and A-305)	40	29×10^6
Column bars	Deformed billet bars (ASTM A-432)	60	29×10^6

B. *The Earthquake Damage*

The *M*L = 6.4 Northridge earthquake of January 17, 1994 severely damaged the building. The structural damage was extensive in the exterior north (D) and south (A) frames (figure 1) that were designed to take most of the lateral load in the longitudinal (EW) direction.

Severe shear cracks occurred at the middle columns of frame A, near the contact with the spandrel beam of the 5th floor (Figs. 1 and 2). Those cracks significantly decreased the axial, moment, and shear capacity of the columns. The shear cracks that appeared in the north (D) frame on the 3rd and 4th floors and the damage to columns D2, D3, and D4 on the 1st floor caused minor to moderate changes in the capacities of these structural elements. No major damage to the interior longitudinal (B and C) frames were observed, and there was no visible damage to the slabs or around the foundation. The nonstructural damage was also significant. The recorded peak accelerations in the building were 0.46g (L), 0.40g (T), and 0.28g (V) at the base, and 0.59g (L) and 0.58g (T) at the roof, along the longitudinal (L), transverse (T), and vertical (V) axes of symmetry (there were no sensors installed on the roof to measure vertical motions) [5].

During Northridge, earthquake five transducers have measured the longitudinal displacements over the seven floors.

The response of VN7SH was recorded by a 13-channel CR-1 central recording system and by one tri-component SMA-1 accelerograph, with an independent recording system but with common trigger time with the CR-1 recorder.

The simplicity, uniformity, and symmetry of the building geometry make this building ideal for testing and for calibration of different analysis methods. Instead of the common earthquake several damages, the Van Nuys damage is concentrated at the fourth floor, which makes VN7SH very important for any kind of numerical analyses.

We use digital signal processing via Labview to be known with the crucial characteristics of a seismic excitation like one in California 1994. In a study of the propagation of non-linear waves in a simple, uniform shear beam, caused by incident strong motion pulses, Gicev and Trifunac [2] found that for large ground displacement pulses the maximum permanent strains in the beam occur mainly at the interface of the beam with the soil, while for smaller amplitudes of pulses permanent trains occur closer to the top of the beam. They identified three zones of the permanently deformed beam: (1) a permanently deformed zone at the bottom; (2) an intermediate zone, which is not deformed at its bottom part and is deformed in the top part; and (3) a non-deformed zone at the top of the beam. They found that the occurrence and the development of these zones depend upon the dimensionless excitation amplitudes and the dimensionless frequency of the incident strong motion pulses, and in particular on the conditions that lead to the occurrence of the first permanent strain.

Gicev and Trifunac [2] have also showed that for excitation by near-field displacement pulses, failure can occur anywhere in the building, before the incident wave has completed its first travel from the foundation to the top of the building and back to the foundation.

For large and long strong-motion pulses, only zones 1 and 3 are present in the beam. For large amplitudes and short strong-motion pulses, all three zones can develop and are present. For smaller excitation amplitudes, only zones 2 and 3 exist in the beam.

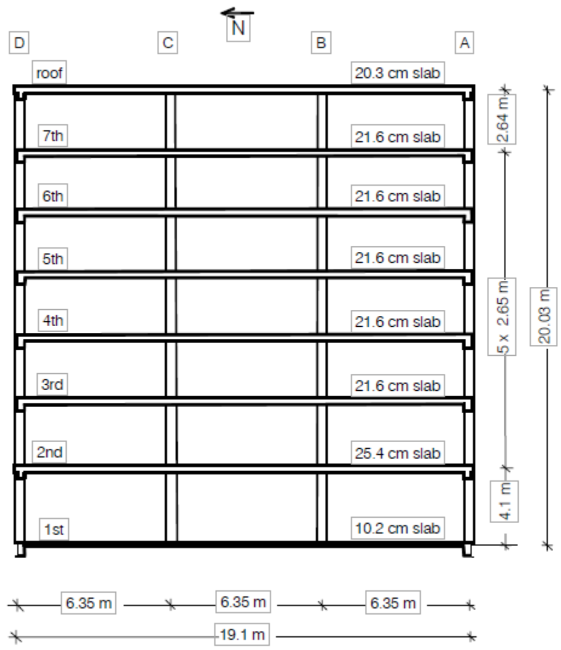

Figure 1. North – South section of the building.

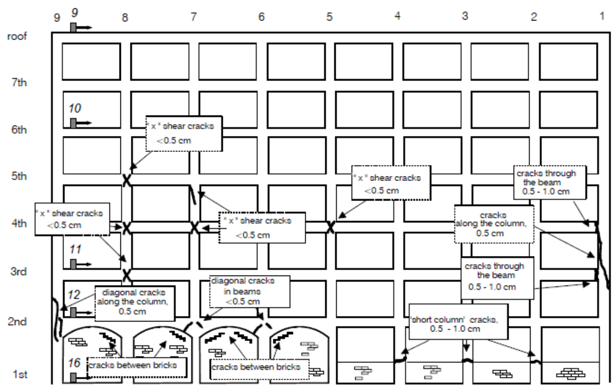

Figure 2. Observed damage at the north view of the building.

II. The Physics

A. *Power Spectrum and Fourier Transform*

Spectrum represents a relationship represented by a plot of the magnitude or relative value of some parameter against frequency. Any one of the physicals phenomenon has its own spectrum associated with it, the phenomenon is thermal, hydraulic, electromagnetic, seismic or other.

The Fast Fourier Transforms (FFT) is an algorithm for calculation of Discrete Fourier Transform (DFT) of an input data vector [6]. In fact, FFT is DFT algorithm wich reduces the number of computations needed for N points from $O(N^2)$ to $O(N\log N)$ where log is the base-2 logarithm using periodicity and property. There are several algorithms that can calculate FFT efficiently.

Every phenomenon also has his own quantities and in our case that is time and displacement from longitudinal wave caused by seismic excitation. The quantities are described in time domain, and for every function of time $f(t)$, an equivalent frequency domain function $f(\omega)$ can be found that specifically describes the frequency – component content (frequency spectrum) required to generate $f(t)$. With other words, the power spectrum answers the question "How much of a signal is at a frequency?" The periodic signal gives peaks at a fundamental and its harmonics. Another way to look at a signal is in discrete time domain, which puts series of values consecutively in time. One can tell something about the behavior of the signal at every moment of time, and make statements for its long – term behavior. However, it is difficult to say anything about how the long – term behavior is related to the short – term development of the signal. The Fourier transform views the signal as a whole. It swamps the dimension of time with the dimension of frequency. It can be thought as a combination of slow and fast oscillations with different amplitude. A very strong and slow component in the frequency domain implies that there is a high correlation between the large – scale pieces of the signal in time (macro – structures), while a very strong and fast, oscillation implies correlation in the micro-structures. Therefore, if we consider that our signal $f(t)$ represents values in every single moment of time, its Fourier transfer $f(\omega)$ represents the strength of every oscillation in a holistic way in that chunk of time. Each of the two signals is related to one another with the formula:

$$F(\omega) = \int_{-\infty}^{\infty} f(t)e^{-j\omega t}\,dt \qquad (1)$$

In our case Labview functions for FFT – based signals are the FFT, the Power Spectrum, and the Cross Power Spectrum. With these functions also can be created additional measurement functions such as frequency response, impulse response, coherence, amplitude spectrum, and phase spectrum. The Fourier transform analysis assumes the life of a signal from $-\infty$ to ∞. Because of that, when an analysis is carried out for a finite amount of time, it is either assumed that the signal is periodic or that it has a finite amount of energy. The true power spectrum of a signal has to consider the signal from $-\infty$ to ∞. However, we must consider that we are not always able to observe a signal that way or derive precise functions for it. Virtual instrumentation software is focused on the needs of the application and user defined. Applied mathematics is combined with real – time measurements, which reduce the time for innovation and importantly the time to market and/or time to commercialization of the final products and services that result from research and development using virtual instrumentation approach.

III. LABVIEW RESULTS

The measured displacements from the seismic excitations are longitudinal displacements in matter of time. We collect data from five instruments (channels) shown on Figure 2 (09, 10, 11, 12, 16). Channel 16 is at the basement of the building and channel 09 is at the roof of the building. Analog to this, the displacement is most significant at channel 09. We construct program in Labview to see graphically these displacements. The program has reader of the data files shown in figure 3.

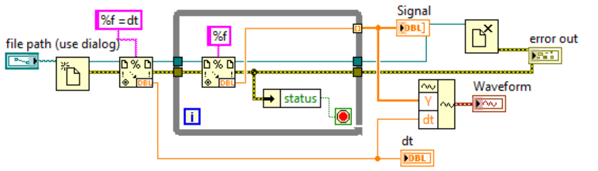

Figure 3. Block Diagram for data reader for each of the channel measurements

Important to mention is that the measurement is with time of 60 seconds and time step $dt = 0.02$. That mathematically gives 3000nd steps. The time step is defined at the start of each of the measurement files, so, we make a scan function to collect dt and through while-loop build a waveform.

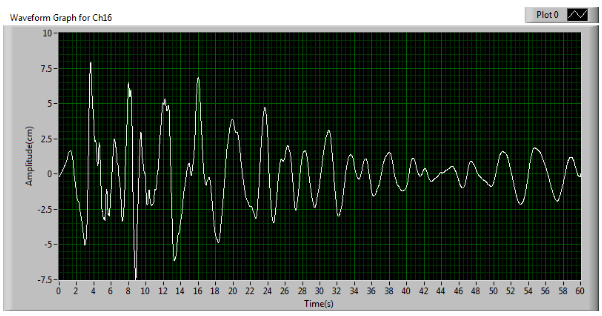

Figure 4. Displacement in matter of time for channel 16 (x-scale represent the time(s), y-scale represent the displacement (cm)).

If we analyze the waveform graph, we can see that in first 24 seconds the amplitudes are high and are going from 5 to 7.5 centimeters.

From the channel 16 to channel 09, the amplitudes are continuously growing and at channel 09, they are highest. So because we are interested mostly of that what is the difference between the basement channel and the roof channel, on figure 5 is represented the displacement at channel 09.

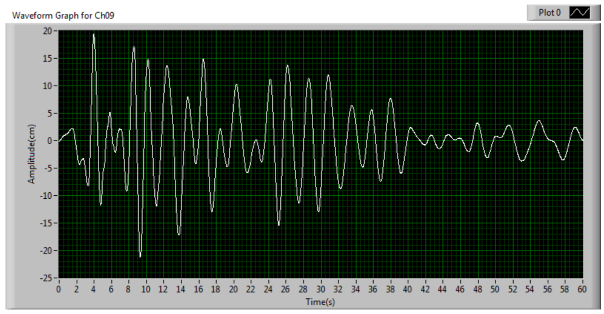

Figure 5. Displacement in matter of time for channel 09 (x-scale represent the time(s), y-scale represent the displacement (cm)).

From figure, 5 can be seen that the displacement is significantly bigger and from 0 to 38 second is between nearly 8 to 20 centimeters that gives us a clue that, metaphorically said, the roof of the building is shaking for 20 centimeters. Important to mention is that these displacements looked from seismic angle are far more complex, and are illustrated in [2].

Next processing that interests us in this paper is the FFT of these signals.

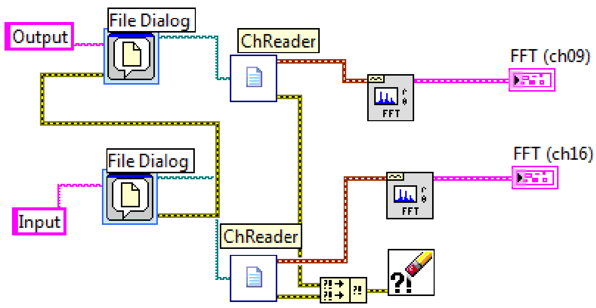

Figure 6. Blog diagram for simultaneously reading the two channels with FFT signal processing

On figure 6, one can see that there are two channel readers connected with FFT spectrum for magnitudes of the signals. There are also two file-dialog boxes connected on the channels, and two waveform graphs denoted as FFT(ch09) and FFT(ch16).

The figure 7 and figure 8 represent the FFT of the channel 09 and channel 16 consequently. Now if we take a close look at waveform graph of channel 09 (roof) we will see that for higher displacement we get higher magnitude. The highest peak is at nearly 0.43Hz at magnitude of 3.5.

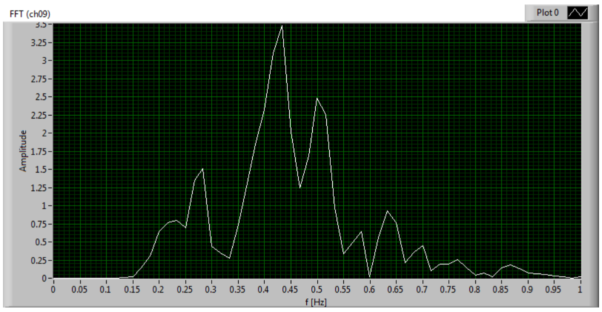

Figure 7. Waveform graph for FFT of channel 09 with x-scale frequency and y-scale magnitude.

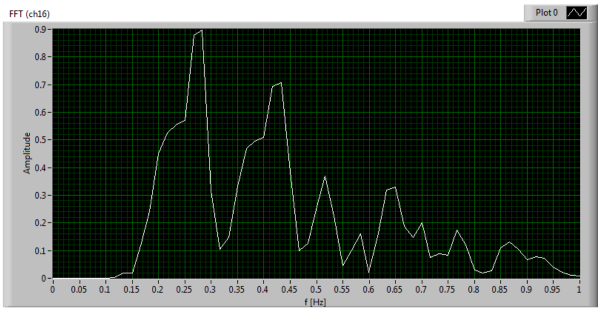

Figure 8. Waveform graph for FFT of channel 16 with x-scale frequency and y-scale magnitude.

The figure 8, waveform graph for channel 16 represent also FFT at displacements in the basement and proves that with smaller displacements there are smaller magnitudes, or, in case of ch16 we have 0.9 magnitude at frequency of 0.28Hz.

The transfer function represents the ratio of the output of a system to the input to the system, in the Laplase domain considering its initial conditions and equilibrium point to be zero. If we have an input function of $X(t)$, and an output function $Y(t)$, we define the transfer function $H(s)$ to be:

$$H(t) = \frac{Y(t)}{X(t)} \quad (2)$$

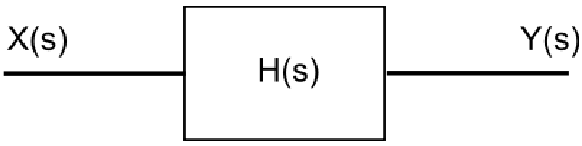

Figure 9. Input X(s) and output Y(s) of a transfer function H(s).

The transfer function of a system is the relationship of the system's output to its input, represented in the complex Laplace domain.

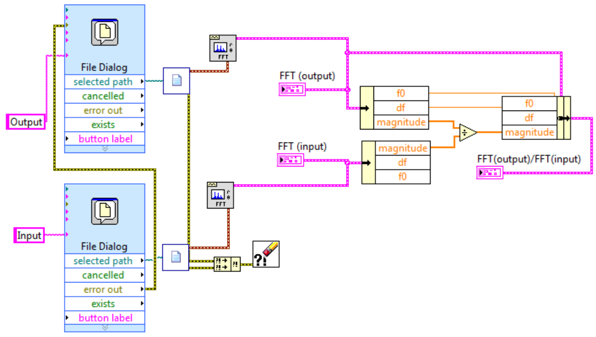

Figure 10. Blog diagram of H(t) transfer function via Labview

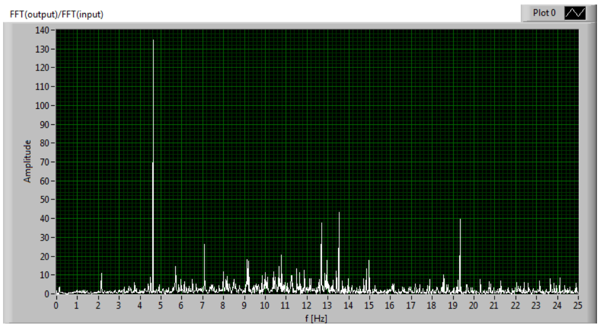

Figure 11. Waveform graph for H(t) transfer function

Figure 10 represent the block diagram for H(t) transfer function, the two channel readers gives the signals to FFT(magnitude) and we divide the output from the input in a waveform graph, figure 11. From the waveform graph, we can see what is like the impulse response of this particular building or the natural frequency of the building. The highest amplitude peak is at nearly 4.5Hz with is crucial in case of a seismic excitation with that proportions.

IV. CONCLUSION

For past three of four decades, scientists are giving efforts on predicting some natural disasters. The fact is that, we still do not know all of the characteristics of these natural excitations, but we can prepare better for them, if we know closely the effects of these disasters in matter of their power. In our case, we speak about seismic excitation that has result with damage to the VN7SH.

With power of numerical methods, mathematical transformations and software digital processing, we can be a little more aware of what kind of damage would be, in scenario like in California 1994. Every building has its own natural frequency. Sometimes it is very important to know this frequency because some buildings are used as fabriques that have some oscillating machines and it can be of crucial importance where in the building will these machines will be located.

Our purpose is to take measurements of the buildings and tell to their builders little more informations of that how will that building act in worst-case scenario.

Normally this field of investigation is improving more and more, with powerful tools like Labview which is used for these signal processing.

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APPLYING THE FUNDAMENTAL LEMMA OF VARIATIONAL CALCULUS TO THE PROBLEM OF THE SMALLEST SURFACES IN ROTATION

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Abstract - Variational calculus studies methods for finding maximum and minimum values of functional. It has its inception in 1696 by work of Johan Bernoulli with its glorious problem for the brachistochrone: to find a curve, connecting two points A and B , which does not lie in a vertical, so that heavy point descending on this curve from position A to reach position in B for the least time. In functional analysis variational calculus takes the same space, as well as theory of maximum and minimum intensity in the classic analysis. We use and prove the theoremfor functional where we prove that necessary condition for extreme of functional is the variation of functional to be equal to zero.We have simplified the received necessary condition for extreme and prove so-called, the main lemma of variational calculus. At least we describe private case in the solution of the equation of Euler and give an example of application, such asthe problem of the smallest surfaces in rotation.

I. THEORETICAL ISSUES

We are searching for extreme of the functional

$$v[y(x)] = \int_{x_0}^{x_1} F(x, y(x), y'(x))\, dx, \qquad (0.1)$$

with the limit points of the allowable set of curves: $y(x_0) = y_0$ and $y(x_1) = y_1$. We will consider that the function $F(x, y, y')$ isthree times differentiable.It is known that necessary condition for extreme of the functional (0.1) is that its variation is equal to zero.We will now show how the main theorem is applied to the given functional (0.1). We are taking some limit curves $y = \bar{y}(x)$ close to $y = y(x)$ and include curves $y = y(x)$ and $y = \bar{y}(x)$ to the family curves with one parameter

$$y(x, \alpha) = y(x) + \alpha(\bar{y}(x) - y(x)).$$

When $\alpha = 0$ we receive the curve $y = y(x)$, when $\alpha = 1$ we receive $y = \bar{y}(x)$. As we already know, the difference $\bar{y}(x) - y(x)$ is called variation of the function $y(x)$ and is denoted by δy. The variation δy in variational problems play a role analogous to the role of the increment Δx of an independent variable x in problems for study of extreme of function $f(x)$. The variation of function $\delta y = \bar{y}(x) - y(x)$ is a function of the x. This function can be differentiated one or several times, e.g. $(\delta y)' = \bar{y}'(x) - y'(x) = \delta y'$ i.e. it is generated of the variance and it is equal to the variance of the generated, e.g.

$$(\delta y)'' = \bar{y}''(x) - y''(x) = \delta y'',$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

$$(\delta y)^{(k)} = \bar{y}^{(k)}(x) - y^{(k)}(x) = \delta y^{(k)}.$$

If we look at the values of functional (0.1) only of the family of curves $y = y(x, \alpha)$, the functional turns into function of α, $v[y(x, \alpha)] = \varphi(\alpha)$, as in the case that we consider $v[y(x, \alpha)]$ as functional depending on parameter, the value of the parameter α determines the curve of the family $y = y(x, \alpha)$ which on other hand determinesthe value of functional $v[y(x, \alpha)]$.

Theorem 1.

If functional $v(y) = \int_{x_0}^{x_1} F(x, y, y')dx$ has a local extreme in y, the necessary condition for extreme of functional is

$$\int_{x_0}^{x_1} [F_y - \frac{d}{dx} F_{y'}]\, \delta y\, dx = 0, \qquad (0.2)$$

Proof of theorem 1 .

We analyze the function $\varphi(\alpha)$. It reaches its extreme at $\alpha = 0$, and when $\alpha = 0$ we obtain $y = y(x)$. By assumption the functional reaches its extreme compared with any permissible curve, and in particular, in terms of the nearly families curves $y = y(x,\alpha)$. Necessary condition for extreme of the function $\varphi(\alpha)$ at $\alpha = 0$, as is known, is its a derivative is equal to zero at $\alpha = 0$, i.e. $\varphi'(0) = 0$. Since

$$\varphi(\alpha) = \int_{x_0}^{x_1} F(x, y(x,\alpha), y_x'(x,\alpha))\, dx,$$

$$\varphi'(\alpha) = \int_{x_0}^{x_1} \left[F_y' \frac{\partial}{\partial \alpha} y(x,\alpha) + F'_{y'} \frac{\partial}{\partial \alpha} y'(x,\alpha)) \right] dx,$$

where

$$F_y' = \frac{\partial}{\partial y} F(x, y(x,\alpha), y'(x,\alpha)),$$

$$F'_{y'} = \frac{\partial}{\partial y'} F(x, y(x,\alpha), y'(x,\alpha)),$$

$$\frac{\partial}{\partial \alpha} y(x,\alpha) = \frac{\partial}{\partial \alpha}[y(x) + \alpha \delta y] = \delta y$$

$$\frac{\partial}{\partial \alpha} y'(x,\alpha) = \frac{\partial}{\partial \alpha}[y'(x) + \alpha \delta y'] = \delta y',$$

and we get

$$\varphi'(\alpha) = \int_{x_0}^{x_1} \Big[F_y(x, y(x,\alpha), y'(x,\alpha))\delta y +$$

$$F_{y'}(x, y(x,\alpha), y'(x,\alpha))\delta y' \Big] dx,$$

$$\varphi'(0) = \int_{x_0}^{x_1} \Big[F_y(x, y(x), y'(x))\delta y +$$

$$F_{y'}(x, y(x), y'(x))\delta y' \Big] dx \quad (npu\ \alpha = 0).$$

As we know, $\varphi'(0)$ is called variation of functional and means δv. Necessary condition for extreme of functionalis its variation to be equal to zero $\delta v = 0$. For the functional (0.1) this condition has a type of

$$\int_{x_0}^{x_1} [F_y' \delta y + F'_{y'} \delta y']\, dx = 0 \qquad (0.3)$$

Integrating the equation (0.3) by parts, where $\delta y' = (\delta y)'$, we get

$$\delta v = [F'_{y'} \delta y']\Big|_{x_0}^{x_1} + \int_{x_0}^{x_1} [F_y' - \frac{d}{dx} F'_{y'}] \delta y\, dx =$$

$$= \int_{x_0}^{x_1} F'_y \delta y\, dx + F'_{y'}(x_1, y(x_1,\alpha), y'(x_1,\alpha))\delta y(x_1) -$$

$$- F'_{y'}(x_0, y(x_0,\alpha), y'(x_0,\alpha))\delta y(x_0) =$$

$$= \int_{x_0}^{x_1} F'_y \delta y\, dx + F'_{y'}(x_1, y(x_1,\alpha), y'(x_1,\alpha))(\bar{y}(x_1) - y(x_1))$$

$$- F'_{y'}(x_0, y(x_0,\alpha), y'(x_0,\alpha))(\bar{y}(x_0) - y(x_0)) - \int_{x_0}^{x_1} (\delta y) dF'_{y'} =$$

$$= \int_{x_0}^{x_1} F'_y \delta y\, dx + F'_{y'}(x_1, y(x_1,\alpha), y'(x_1,\alpha))(0)$$

$$- F'_{y'}(x_0, y(x_0,\alpha), y'(x_0,\alpha))(0) - \int_{x_0}^{x_1} (\delta y) \frac{d}{dx} F'_{y'}$$

Since, all of the possible (permissible) curves in the given problem pass through fixed limit points, we get

$$\delta v = \int_{x_0}^{x_1} [F_y' - \frac{d}{dx} F'_{y'}] \delta y\, dx.$$

To simplified the obtained necessary condition (0.2), we will use the following lemma:

<u>Fundamental lemma of the variational calculus</u>

If for any continuous function $\eta(x)$ it is true that

$$\int_{x_0}^{x_1} \Phi(x) \eta(x)\, dx = 0,$$

where the function $\Phi(x)$ is continuous in the interval $[x_0, x_1]$, then

$$\Phi(x) \equiv 0$$

in this interval.

Proof of the fundamental lemma of variational calculus

We accept that, in the point $x=\bar{x}$, resting in the interval (x_0, x_1) , $\Phi(x)\neq 0$,is a contradiction. Indeed, the continuity of the function $\Phi(x)$, it follows that if $\Phi(\bar{x})\neq 0$ it $\Phi(x)$ keeps characters in vicinity of $\bar{x}$ ($x_0 \le x \le x_1$). We choose function $\eta(x)$ which also retains the mark in that vicinity and is equal to zero outside of this vicinity. We receive

$$\int_{x_0}^{x_1} \Phi(x)\eta(x)\,dx = \int_{\bar{x}_0}^{\bar{x}_1} \Phi(x)\eta(x)\,dx \neq 0,$$

Since product $\Phi(x)\eta(x)$ retains its mark in the interval $x_0 \le x \le x_1$ and is equal to zero in the same interval. And so, we come to a contradiction, therefore $\Phi(x)\equiv 0$.

Note. Adoption of lemma and its proof remain unchanged if the function $\eta(x)$ requires the following restrictions:

$\eta(x_0)=\eta(x_1)=0,$

$\eta(x)$ There is a continuous derived to line n ,

$\left|\eta^{(s)}(x)\right| < \varepsilon, \quad (s=0,1,\ldots,q; q\le n)$.

The function $\eta(x)$ can be selected, e.g. :

$$\eta(x)=\begin{cases} k(x-\bar{x}_0)^{2n}(x-\bar{x}_1)^{2n}, & x\in[\bar{x}_0,\bar{x}_1] \\ 0 & x\in[x_0,x_1]\setminus[\bar{x}_0,\bar{x}_1] \end{cases},$$

where n is a positive number, k is a constant.

Apparently, that the function $\eta(x)$ satisfies the above conditions: it is a continuous, there is a continuous derived to line $2n-1$, in the points x_0 and x_1 is equal to zero and by reducing the factor by k we can do $\left|\eta^{(s)}(x)\right|<\varepsilon$ for the $\forall x\in[x_0,x_1]$. Now we will apply the fundamental lemma of variational calculus to simplify the above necessary condition for extreme (0.2) of functional (0.1).

Consequence1.1.

If the functional $v(y)=\int_{x_0}^{x_1} F(x,y,y')dx$ reaches extreme of the curve $y=y(x)$, and $F_y^{'}$ and are $\frac{d}{dx}F_{y'}^{'}$ continuous, then it $y=y(x)$ is a solution to the differential equation (equation of Euler)

$$F_y-\frac{d}{dx}F_{y'}=0,$$

Or in an expanded form

$$F_y-F_{xy'}-F_{yy'}y'-F_{y'y'}y''=0\,.$$

This equation is called equation of Euler (1744 year). Integral curve $y=y(x,C_1,C_2)$ equation of Euler is called extreme. To find a curve, which is reached extreme of functional(0.1) we integrate the equation of Euler and spell out random constants, satisfying the general solution of this equation, of the conditions of borders $y(x_0)=y_0, y(x_1)=y_1$. Only if they are satisfied with these conditions, the extreme of the functionalcan be reached. However, in order to determine whether they are really extreme (maximum or minimum), we must investigate the sufficient conditions for extreme as well. To recall, that boundary problem

$$F_y{}'-\frac{d}{dx}F_{y'}^{'}=0, \quad y(x_0)=y_0, \quad y(x_1)=y_1,$$

not always has a solution, and if there is a solution, then this may not be unique. It should be taken into account that in many variational problems the existence of solutions is evident, from physical or geometrical sense of the problem, and in the solution of the equations of Euler satisfying the border conditions, only a single extreme may be the solution of the given problem.

Case study

Problem of the smallest surfaces in rotation

We want to determine curve at a given boundary points, by rotation around an axis which on the x-axis forms the smallest area.

It is known that the surface area of rotational body is

$$S[y(x)] = 2\pi \int_{x_0}^{x_1} y\sqrt{1+y'^2}\,dx \cdot$$

The integrand function depends only on y and y', therefore, the integral of the equation of Euler will have a type

$$F - y'F'_{y'} = C_1,$$

Or in this case $y\sqrt{1+y'^2} - \dfrac{yy'^2}{\sqrt{1+y'^2}} = C_1 \cdot$

After a simplification,

$$\frac{y(1+y'^2) - yy'^2}{\sqrt{1+y'^2}} = C_1$$

$$\Leftrightarrow \frac{y + yy'^2 - yy'^2}{\sqrt{1+y'^2}} = C_1$$

We receive $\dfrac{y}{\sqrt{1+y'^2}} = C_1 \cdot$

The easiest way to integrate this equation is by the application $y' = sht$, where $y = C_1 cht$, and

$$dx = \frac{dy}{y'} = \frac{C_1 sht\, dt}{sht} = C_1\, dt$$

$$\Rightarrow x = C_1 t + C_2$$

And so, the demandsurface forms a curve of rotation, the equation in parametric form has the type

$$x = C_1 t + C_2$$
$$y = C_1 cht$$

Excluding the parameter t, we have $y = C_1 ch\left(\dfrac{x - C_2}{C_1}\right)$- family curves, from whose rotation is forms a surface, which is called Catenoid (picture 1). Constants C_1 and C_2 are determined by the conditions atthe passing of the curve in the given boundary points (depending on the position of the points, there may be one, two, or neither one decision).

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MOOCS IN HIGHER EDUCATION – STATE OF THE ART REVIEW

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Abstract - This paper discusses a new trend in education, so -called Massive Open Online Courses - MOOCs and their implementation in higher education. MOOC courses are designed for an unlimited number of users, they are usually free and they are available exclusively online. MOOCs arise from so-called OER movement, i.e. the movement of open educational resources promoted on the UNESCO Forum in 2002. The application of these courses is differentiated in two types: cMOOCs and xMOOCs. MOOCs have been developed to support multiple platforms and with that, their massive use began. Students and professors very well accept the use of MOOCs in higher education. Professors agree about MOOCs usefulness and successful, but disagree about their formal acceptation on Universities.

I. Introduction

With the continuous development of technology, new challenges for the higher education emerge. The Internet and its wide and unlimited use has brought new trends, most of all in the way people communicate and share information. The e-mail, the social networks, the blogs, the discussion forums and similar platforms are now part of the everyday lives of ordinary people and have significantly improved the availability of data from all fields.

These trends have had their impact in the development of higher education. One of the newest and most interesting outbreaks is the appearance of massive open online courses (MOOCs). Our research has the goal of introduction with the meaning of these courses and the implications they have for higher education.

In the paper, we first give the definition and short history of MOOCs. Then we make a difference between different types of MOOCs and give overview of the most successful platforms for these courses. At the end, we present the advantages and disadvantages of MOOCs and the motivation for their use from individuals and Universities.

The paper is based on multiple researches and publications from electronic sources, most of which are from reputable researchers whose specific field of interest are the MOOCs.

II. Massive open online courses and their implications in higher education

A. What are Massive Open Online Courses?

According to Wikipedia [1], Massive open online courses (MOOCs) are courses aimed at unlimited participation and open access via the web. Simpler is the Oxford Dictionary definition [2], which says MOOC is a course of study made available over the Internet without charge to a very large number of people. The main goal of MOOCs comes from their definition. For the needs of this paper, we give our definition: MOOCs are courses, which are designed for unlimited number of users; they are usually free and available exclusively over the Internet.

B. Short History

The beginnings of MOOCs are not so far in the past. It is considered that they have emerged from the Open Education Resources (OER) movement. Open Education Resources are freely accessible, openly licensed documents and media that are useful for teaching, learning, educational, assessment and research purposes. The term has been coined on the UNESCO forum in 2002, which had explored the implications of the initiative for developing countries at MIT University. Ten years later at the World Congress for OER of UNESCO, the Paris Declaration was signed. The Declaration among other things recommends fostering awareness and using of OER and encouraging the open licensing of educational materials produced with public funds [3].

The first official MOOC is the course of George Siemens (Alabaska University) and Stephen Downes (National Research Council), called “Connectivism and connective knowledge”, which was created at Manitoba University in Canada. Besides the 25 students of this University, the course was followed via the web from additional 2300 students from the general public. All content of the course was available through RSS feeds and online students could participate via collaboration tools, including blog posts, threaded discussions in e-learning system Moodle [4] and through meetings via social platform Second Life [5]. Because of this course Dave Cormier from Prince Edward Island University and Bryan Alexander from National Institute coined the term MOOC for technology in liberal education [1].

C. Types of MOOCs

In the short development cycle of MOOCs, two types are differentiated until today: cMOOCs and xMOOCs. One type is not better than the other is, they are simply different.

In the cMOOC term, “c” means conectivism and the first MOOC created is part of this group. The theory of the creator of the course is based on the idea that the learning happens in a network, where students use digital platforms like blogs and social networks to connect with the content of the course, other learning communities and other learners with the goal of creating knowledge [6]. In cMOOCs, students are encouraged to contribute actively to learning by using digital platforms. The course organizers, who later share them through e-mail or newsletters, are summarizing the students’ contributions daily. cMOOCs are usually not sponsored by higher education institutions, but are organized by individuals with passion for a specific subject. The organizers devote time for creating a framework for learning, where students from all around the world can connect and share, contribute and collaborate, while simultaneously learn about specific subject and expand their network of professional and personal contacts. Despite being open, cMOOCs are also flexible, which means they fully match the needs of their participants and provide learning customized for these needs [7]. Its visionaries George Siemens and Stephen Downes are explaining this type of learning the best, who in his new book explains the learning, as “Learning is the creation and removal of connections between the entities, or the adjustment of the strengths of those connections. A learning theory is, literally, a theory describing how these connections are created or adjusted”[6].

Even though the first MOOC is a cMOOC, the massive open online courses truly gained their popularity with the appearance of the first xMOOC course in 2011. Creators of this course on the topic “Artificial intelligence” were Sebastian Thrun and Peter Norvig from Stanford University [8]. They expected a few thousand students, but the course was enrolled by 160.000 students from 190 countries around the world, which made it massive in the true meaning of the word. After finishing this course, Thrun founded Udacity.com, a platform that offers mainly science and technology courses. Soon after that Coursera.com and edx.com, which is a platform for free online courses of the Harvard and MIT Universities, were also opened [7]. Since then the number of similar platforms, sponsored by higher education institutions, but also from different profit and non-profit organizations, has been constantly growing. These types of MOOCs, which are offered on University platforms, are based on traditional studying materials and higher education methods of learning. They frequently involve video lectures and quiz-tests as a method of evaluation. Usually they include content available on the Internet, outside the learning platform.

All this being said, the basic difference between cMOOK and xMOOC is that in cMOOCs learners are in the center of attention and they are the main contributors to the learning, while in xMOOCs in the center of attention is the professor who leads the course and gives directions to learners. Although the digital platforms for communication are of crucial meaning for cMOOCs, their use is also encouraged in xMOOCs. For higher education, xMOOCs are more significant, because they are closer to the traditional education.

D. The most popular platforms

In their paper “MOOCs and open education: Implications for higher education” [9], Li Yuan and Stephen Powell from the Centre for Educational Technology and Interoperability Standards, analyze the most popular MOOC platforms, their functions and their interests. One of the best known is edx.com, which has already mentioned is a joint non-profit platform of MIT and Harvard Universities. These Universities use MOOCs to understand how students learn, with the goal of improving learning and teaching on the traditional campus. Coursera.com, Udacity.com and Udemy.com are for-profit platforms, which usually make money from course certificates, but they also work on development of other business models like selling information to students, advertising of sponsored courses, charging fees for credited courses etc. P2pu.org and khanacademy.org are platforms sponsored by foundations and their goal is to provide opportunities for everyone who wants to learn online, allowing them free access.

According to the research of the site openeducationeuropa.eu, made in December 2013, Europe is also following the trend with MOOCs, the leader being Spain with the greatest number of courses, and UK, Germany and France are following on the list. Until now, approximately 400 courses have been created, the most common topics being science and technology, social sciences, applied sciences and business. The best-known European providers of MOOCs are the European higher education institutions and the platforms UnX, Miriada X, OpenupEd, OpenCourseWorld, Iversity, FutureLearn etc. [10].

E. Advantages and disadvantages

According to Dr. Shelley Kinash from Bond University, Australia [11], there are many characteristics of MOOCs, which differentiate them from traditional education, some of them being considered as advantages. MOOCs are usually independent subjects, and students around the world can enroll from anywhere in anytime. They balance between synchronous and asynchronous way of learning, which means that sometimes both the teachers and students are online, but most activities are designed so students can pay attention to them in the time that suits them the most. The time for enrolling and finishing the course is usually not limited. MOOCs use the concept of customized learning which means that the weight and the challenge of the content and exercises are adjusted to the level of knowledge of the learners. Most of the MOOCs take advantage of newest technologies to provide and enhance learning. Lots of them have multimedia content, use video lectures, games, quizzes etc., which represents more entertaining way of learning. The first advantage Universities consider when offering MOOCs is marketing. MOOCs are in a way an ad for the University that offers them, and a free opportunity for potential students to try the course, without being officially enrolled at the institution. Besides that, MOOCs are used for research of the new pedagogical platforms, to experiment with new approaches to learning and new technologies. According to many professors, MOOCs and the open approach to education are an important modern day value.

Despite the many advantages, there are also problems that emerge about MOOCs, the first being the dropout rate. According to the most relevant research so far, conducted by Katie Jordan, as a part of her doctoral thesis, MOOCs usually end up finished by less than 13% of the enrolled students, which means that the failure rate reaches over 90% [12]. In addition, many employers consider that MOOCs produce sub-standard students with lower level of knowledge as opposed to traditional education. Another important disadvantage is the problem with accreditation. The most of the MOOCs are not accredited at all, and the ones, which are, usually charge fees for the credits. At the same time, these fees are not standardized. Many professors believe that the accreditation of MOOCs should not be rushed, because of the difficulty of evaluation of students and the increased opportunity of cheating while taking exams online. The platform Udacity.com has offered one way for solving this problem, by offering students to pay $80 so they can take the exam in test-centers of the global education company Pearson [13]. There is also the concern that with accrediting MOOCs, the big, well-funded Universities will align or lead to extinction the smaller Universities, with the introduction of so-called global education. Quality MOOCs also require significant resources, primarily in the design, administration and staff, who should have experience in adaptive learning. Considering that these courses are still young in their development, significant investment of time and finances is required to be up-to-date with modern technology and new content. Last, but not least important problem with MOOCs is the intellectual property, which is not exactly defined with online materials.

Given the above advantages and disadvantages of MOOCs, the thoughts for their future differ. While some professors think that MOOCs will slowly replace Universities, as we know it, others believe they will extinct and remain to be an interesting page in the history of higher education [11].

F. Motivation for MOOCs

When it comes to MOOCs there are multiple stakeholders, each with their own motivation. There are tutors whose task is to facilitate MOOCs, institutional managers who help in determining the place of MOOCs alongside the traditional education, the policymakers who consider the long-term implications for education and the capital investors who are interested in the return-on-investment rate [14]. However, the most important stakeholders remain to be the students who enroll in these courses and the professors who design and tech them.

There are multiple factors that motivate students to enroll in MOOCs. They include economic benefits, development of personal and professional identity, challenge and achievement, as well as fun and enjoyment. Polls conducted by researchers at Duke University, in relation to their first MOOC, showed that there are four main student motivations for enrolling in online courses [15]:

- To gain understanding about the subject without specific expectations for completion or achievement;
- For fun, pleasure, social interaction and intellectual stimulation;
- Convenience, often in combination with barriers to traditional education and
- To experience and explore online education.

Although polls conducted before the start of the course showed fun and pleasure to be quite important, in the polls conducted after the end of the course most students said they had a general interest in the topic. They reported that they used the online course to help them decide if they want to enroll at University, while a significant minority said they could not afford formal education. This is only one research about the motivation of students enrolling MOOCs, but this subject is very wide and should be thoroughly researched in the future.

As for teachers, the largest survey of MOOCs teaching experience and the professors' motivation was conducted in early 2013 by the Chronicle of Higher Education and includes 103 professors as respondents [16]. The results generally showed that although the process of creating MOOCs is extremely time-consuming (average 100 hours per course); professors believe that these courses are successful. The maintenance of the course and the answering of students questions took extra time. For the evaluation 74% of the respondents said, they used automatic technology system, which they consider reliable. The most used materials for the courses were their own video lectures and open educational resources. Although teachers invest a lot of time in preparing the course, 72% believe that formal accreditation should not be allowed. As motivation for creating and maintaining MOOCs, they cite several reasons, the most common being:

- To assist in the availability of higher education (71.8%);
- To increase their impact as an instructor (40.8%);
- To increase their reputation in their own discipline (37.9%);
- To collect tips for enhancing the traditional lectures (36.9%);
- To increase their visibility in the media and the general public (33%).

When it comes to enthusiasm over MOOCs, the professors change their opinion from being skeptical (before the MOOC experience), to being more enthusiastic (after the MOOC experience).

G. MOOCs in practice

Although MOOCs seem to be revolutionary, they are just the next logical step in higher education, following the appearance of online education and including open education resources.

When it comes to MOOCs in practice, almost all platforms follow similar path of organization. The courses are usually prepared from University professors, who engage in recording video materials and preparing reading materials for the students. Once the course begins students are offered weekly plan of videos, readings and assignments they are supposed to finish until the beginning of the next week. Most of the assignments have immediate feedback, but there are also some, which are evaluated by peers, and results are given in few days. Professors send weekly newsletters to students introducing to them the topic of the week and encouraging them to take part in the discussion forums. Forming study groups (whether face-to-face or online) is also encouraged. Courses are usually 6 to 8 weeks long, and at the end of each there might be an exam or just summary of the weekly assignments score. To pass the course 70% score is the minimum required.

As an example, we did a research on how coursera.org works [17]. They motivate students to enroll into their courses by offering them learning at their own pace with the end result of achieving their goals. The four ideas that were crucial in shaping the platforms' idea are effectiveness of online learning, mastery learning, peer assessments and blended learning. Professor Maha Bali from the American University in Cairo after taking few courses offered from coursera.org concludes that the designers of these courses should focus more on promoting deeper learning, than on designing easy assessments that encourage course completion, because even if completion rates can be improved in the short term, this trend can harm the reputation and future development of MOOCs in the long term [18].

To write about MOOCs in practice and stay up-to-date is a difficult task, because as it is the case with all of the new trends, new researches emerge every day. Even at the time, we are writing this paper and until it is published, there will certainly be some revolutionary things happening in the MOOCs world.

III. CONCLUSION

The purpose of this paper was introduction to MOOCs and elaboration of the implications they have. From what has been stated in the paper it can be concluded that with the increasing availability of technology, these courses will expand and the interest for them tends to rise. In order to follow the trends, relevant institutions in the Balkan countries should take seriously the MOOCs, fit them in their plans and create conditions for their introduction as part of formal and non-formal education. With this, in addition to inclusion of more students, employees in higher education will gain significant experience in the use of new technologies and obtain ideas for enhancing the traditional ways of teaching.

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COMPUTER GAMES' STUDIES IN RUSSIA

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Abstract - Russian researchers of the XXIst century have addressed repeatedly the topic of computer games. These studies have proved that some computer games have aroused people's aggression, anger, addiction to the scenes of virtual violence, emotional alienation, and addiction.

Comparing the responses of children from different years is the increase of interest in the virtual world is not only an adult audience, students and pupils, but also pre-school children.

Sociological studies show that the typical gamer domestic employment type - the student of school or university (66.6% of them play computer games), an employee with higher education (33.1%), unemployed (31.5%), time spent Russian gamer at a time on a computer game, on average - 126 minutes.

The most numerous sub-group - 34.2% of the total number of Russian players in the computer games - make up the so-called "conservatives." The average age of its members - 34.6 years, and is the only subgroup in which the majority (56.2%) was women. Only 14.5% of "conservatives" play computer games daily, while it is a proven, favorite game with a limited range of genres. For the "conservatives" computer games - an insignificant part of their lives.

Today, computer games are not only used for entertainment; they are used extensively in teaching languages, history, geography, art, and science. However, they still attract a broad audience, especially games that are fun and entertaining, with a fascinating story. In the spirit of postmodern trends, modern computer games have absorbed almost the entire arsenal of entertaining tales and myths, comic books (with their brutal one-dimensional characters), genres of cinema (action, science fiction, thriller, detective, comedy, romance, erotica, etc.). According to Savitskaja, for players, the "official role" of mythology in modern computer games is "as a hidden language of the unconscious in common with the style of their dreams, hence the increasing popularity of psychoanalytic interpretations of games based on the identification of natural, virtual dreams with mass-market versions of virtualization awareness, one of the most popular formats of high-tech global mass culture (special effects in blockbuster movies, computer games, amusement parks, computerized laser shows, etc.)" (Savitskaja, 2012).

Social communication skills are an important aspect related to computer games, which include the ability to play in a band, the sharing of information about computer games in networks, forums, chat rooms, and the use of mobile communications. For the computer game players, communication is characterized by the diversity of the virtual world (which is patterned after the real world or immerses players in a world of fantasy that encourages the development of creative thinking activities); the reversibility of acts done in the virtual environment (except, perhaps, in MMORPGs); and the anonymity of people entering into voluntary gamer communication in social networks, which is observed as far as it is acceptable for them (Yugay, 2008, p. 22).The main properties of the virtual culture of computer games (as a product of globalization) include bringing people together in new subcultures form of communication, the formation of new types of relationships that characterize geographic, democratic, and broad social and cultural differentiation; psychological manifestations of human creative freedom in virtual environments, and active use of the opportunities which are not available to a person in real life (Yugay, 2008, pp.).

Computer games can develop certain abilities, including skills involving working with three-dimensional and two-dimensional spaces attention (selectivity and distribution), working memory, logical and strategic thinking (in certain games genres), and spatial reasoning. Typically, gamers make informed, deliberate decisions, but are also willing to take risks. According to some authors, a gamer's willingness to take risks can be useful in business (Voiskunsky, Bogacheva, 2013, p. 4-5, 12-13). Negative effects are also possible, such as emotional enthusiasm that develops into addiction or causes a full withdrawal into the virtual world, resulting in irreparable damage to the health of the gamer. In addition, many computer games that involve the user interactively in acts of bloody violence can negatively affect the psychological state of players, especially underage ones. I conducted research regarding the gaming audience in Taganrog, which showed that Russian students tend to choose exactly this type of game, with virtual worlds that allow one to kill with impunity, and beat or fight opponents (Fedorov, 2005, p. 88-96).

Boys are especially emotionally reactive and aggressive while playing computer games, enthusiastically recounting the bloody scenes and weapons list. “My favorite game is about worms,” says Peter W. (seven years old), “they have ‘wet’ worms, so that the blood is sprinkled on all sides, for it gives life!” Of course, computer games clearly meet the need to discharge and release aggression in a safe direction for society, but the child “still very often confuses fiction with reality, especially since the game involves everyday activities” (Brevnova, 2012, p. 22).

A sociological study in Russia (the survey was conducted in December 2012 in cities with populations of more than 100,000 people; and 2033 people over the age of 13 years were surveyed) showed that motivation and behavior in computer games is expressed as follows: achievement of goals in a game (76 %), the training of intelligence and skills development (73%), immersion in a story and its atmosphere (64%), rest from everyday life (62%), entertainment (45%), obtaining an aesthetic pleasure from the game’s story/characters, etc. (33%), and playing with friends (19%) (“Game market in Russia”, 2012, p. 22).At first glance, it seems paradoxical that the motive of entertainment gained only 45% of the votes of gamers. However, it should be noted that achieving the game’s objective (76%), immersion in the story and its atmosphere (64%) and rest from one’s daily routine (62%) in computer games are also related to their main function, which is entertainment.

The average age of computer game players among the urban population of Russia is 33 years (54% of them women, and 46% men), 45% of them are married, and 58% have children (“Game Market in Russia”, 2012, p. 13, 29), which proves that games are interesting to not only teenagers, but also to adults. Furthermore, 87% of the Russian Internet audience play computer games more often than once a month, and 50% of them play every day. Due to the intense proliferation of tablet computers and smart phones, the number of Russian gamers who play computer games on these devices has increased, to about 40% to 50% of the surveyed Internet users. In addition, about 60% of Russian Internet users play computer games on-line in cities with populations of more than 100,000 people. Most Russian players spend about 30% of their leisure time playing computer games, both on weekdays and weekends. As much as 75% of Russian gamers are paying for the use of computer games, and their spending on this hobby is approximately 19% of their total spending on leisure. Comparatively, the other major expenses of Russian gamers are restaurants and cafes (24% of total spending), sports (20%), and cinema (16%) (“Game Market in Russia”, 2012, p. 24).

Thus, Russian computer game players are said to form a subcultural association; “gamers share a certain view of the world, members of the gaming community have a similar status in the real world (a single age group, income level, and education). This community is characterized by its own symbolic level (attributes, symbols, jargon, and subcultural folklore). Gamers are aware of themselves as the elite community *homo ludens*, and are a significant part of the network society, which has already become an integral part of many cultures of everyday life” (Vassilieva, Efimov, and Zolotov, 2009, p. 208).

In recent years, Russia has increasingly created special training courses on computer games, in which university students learn basic approaches and concepts of cultural and anthropological analyses of computer games, the history and theory of media and computer games, and the structural and generic features of computer games and computer games, and they learn to competently discuss the problems of the uses of computer games in culture everyday life. D. Galkin from Tomsk State University, Russia developed following content of the training course on computer games:

- Introduction to the study of the phenomenon of culture studies problems of the game.
- Historical and cultural analyses of the development of computer games.
- Genre structure and variety of computer games.
- Aesthetic features of computer games.
- The narrative and visual structure of computer games.
- Cognitive effects: computer games and the development of age-related problems.

- Social effects: the proliferation of computer games and violence.
- Therapeutic effects: computer games as medical instruments.
- Gaming experience in a multimedia environment: trends and technologies (Galkin, 2008, p. 2).

Russian researchers of the 21st century have repeatedly addressed the topic of computer games (Fedorov, 2005; Tkachev, 2006; Savitskaya, 2012; and others). According to I.V. Anisimova, 78.1% of computer game players are 30 years old or younger, and 90.3% of them are male. At the same time, young men prefer games with three-dimensional graphics, role-playing games, strategy games, and puzzle games, while girls prefer adventure games and card games (Anisimova, 2004, p. 20). These studies proved that computer games have aroused people's aggression, anger, addiction to the scenes of virtual violence, emotional alienation (Anisimova, 2004, pp.), and have become addictive (Lipkov, 2008; Piljugin, 2010). Similar phenomena were identified by my own study of underage gamers in Taganrog (Fedorov, 2005).

Comparing the responses of children from different years, we find an increase of interest in the virtual world not only in adults, university students, and grade school children, but also in pre-school children. In 2007, 80% of Russian pre-school children said that they have a home computer; by 2008, this figure had increased to 92% and by 2009, it had risen to 98%. The percentage that were able to play and enjoyed playing computer games rose from 58% of preschool children in 2007, to 82% in 2008, to 94% in 2009. An even more rapidly growing number of children play computer games on their own, without the help of adults from 28% in 2007 to 62% in 2009. The most popular games among preschoolers are various computer game simulators that allow the player to control cars, planes, and helicopters. Naturally, boys are more passionate about these games. Then there are the simple puzzle games, arcade games, and games that require caring for virtual animals (which are played more by girls) (Brevnova, 2012, p. 20-21).

While the sociological study of the urban population of Russia (with a sample of 2,033 respondents in cities with a population of over 100,000 residents) showed that 87% of the urban Internet audience plays computer games more often than once a month, and 50% play every day ("Game Market in Russia", 2012, p. 11, 20-21), in the whole of Russiathese figures are much more modest, according to the research company GfK-Rus, who conducted a survey in April, 2010, in 52 regions, territories, and republics of the Russian Federation with a sample of 2,205 respondents (including small towns and rural population, for whom Internet access is often difficult). According to GfK-Rus, the number of Russians who play computer games totaled 28.4 million people (that is, not more than 24% of the adult respondents), 34%of which play computer games each day, which is 16% less than in cities with a population of over 100,000 residents. The number of computer gamers in rural areas (17.7%) is significantly lower than both the urban average in Russia (Davydov, Nemudrova, 2011, p. 110-111).

In general, the share of gamers among Russian men is 32.6% (including 12% who are active), and among women these figures are much lower (16.5% and 4.9%, respectively). The 16-19 year-old age group accounts for the peak gaming activity (62.1% of these, including 30.3% with a very high level of activity). Among Russians aged 40-49, 15.1% are active players in the computer games, and with a further increase in age, the figure is sharply reduced (Davydov and Nemudrova, 2011, p. 111). In addition, if 45% urban gamers (in Russian cities with a population of more than 100) are married (Game market in Russia, 2012, p. 13, 29), in general, only 19% of Russian married respondents play computer games.

According to sociological studies, the typical domestic employment of computer game players are school or university students(66.6%), employees with higher education (33.1%), or unemployed (31.5%), with the time spent by Russian gamers on computer game at 126 minutes, on average (Davydov, Nemudrova, 2011, p. 111). The largest subgroup, 34.2% of the total number of Russian players, makes up the so-called "conservatives", for whom games are an insignificant part of their lives. The average age of its members is 34.6 years, and is the only subgroup in which the majority (56.2%) was women. Only 14.5% of "conservatives" play computer games daily. However, gamers who are "fans" (9.1% of Russian computer game players) are young men with a mean age of 25 years. The average playing time for this group (often spent on on-line games and social network games) is the highest of all groups, at 195 minutes. "These people tend to collect media about their favorite games, are interested in software development (a little less than half of them also want to become a developer). The most active fans get their information about new games from the media." (Davydov and Nemudrova, 2011, p. 113-115).

Moreover, among the entire gaming audience, the most popular genre of games was puzzle games and jigsaw puzzles. They attracted 47.5% of respondents, whereas 30.8% prefer games like everyone else. In second place were racing games (41% of gamers' preferences), and in third, shooting games (27.1%) (Davydov and Nemudrova, 2011, p. 117).

As mentioned earlier, in recent years computer games have become more and more popular in Russia, which led to the fact that at the end of 2012, fees from sales of various types of computer games for the first time exceeded the fees of film distribution. Due to the rapid growth in sales of new generation TVs, a significant increase in games is possible, especially those capable of Full HDand3D.

With the development and further expansion of the Internet in Russia (including niche rural areas), we can expect a significant increases in the on-line game market. In addition, with the increase in sales of smart phones and tablets will come increased profits from mobile games and cross-platform games.

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ABOUT THE IMPORTANCE OF MONITORING OF TEACHERS' READINESS TO WORK WITH E-LEARNING TECHNOLOGIES

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Abstract - The article deals with the current problem of professional readiness of teachers to implement e-learning technologies to improve the efficiency and quality of teaching and learning processes. It shows the importance of monitoring studies on a regular basis to maintain up to date readiness of teachers to the implementation of e-learning technologies (e-learning).

A key factor of global implementation of e-learning technologies into the modern education system is still teachers who possess high level of professional competence, continuously raise it and provide the efficiency and quality of education [1]. However, according to UNESCO, a major international and regularly occurring problem is to provide the required quantity and quality of professionally trained teachers. UNESCO sees the solution of this problem in holistic and systematic approach to improving the system of teachers' education and their professional development through access to high-tech digital educational resources.

In our opinion, the main problem of the modern teacher, working at any educational level: both secondary and vocational education in any country in the world is the optimal combination and constant update of:

- competence in the subject area;
- competence in the field of information and communication technologies;
- competence in appropriate use of a wide range of tools and e-learning technologies for improving the effectiveness of teaching and learning , as well as for performing pedagogical and subject- professional tasks.

We see the solution of the designated problem in the systematic approach to modernization of Russian education for reaching the goals and objectives of informatization in education, as providing educational process with only computer technologies does not create sufficient conditions for effective implementation of e-learning technologies. Implementation of national priority project "Education", the efforts of the UNESCO Institute of Information Technologies in Education, methodical elaborations in Institute of Informatization of Education, a partnership of state and regional education departments with various companies (Microsoft, DELL, Kaspersky, C-Systems, MS Surface , etc.) allow the system to carry out the process of modernization of Russian education:

Equipping schools with computers and necessary network system (for example, in educational institutions of the Rostov region indicator of the number of computers per student reached 9.5; 100% of schools are provided with broadband access to the Internet);

- Implementing a variety of projects ("electronic textbook", "Online class", "ProstoKlass", etc.);
- Creating own electronic educational resources, implementing a Learning Management System (LMS) and providing access to open world's resources with teaching and learning materials for all levels of the educational process;
- Developing distance education technologies for people with disabilities;
- Monitoring the teachers' level of competence in the field of e-learning technologies and their willingness to effectively implement these technologies;
- Using the monitoring data to generate a high level of preparation of teachers to work in the e-learning environment;
- Updating professional competence of teachers through refresher courses;

- Adjusting the program of study based on the data of monitoring.

The Laboratory of Problems of Education Informatization in Taganrog State Pedagogical Institute (TSPI) carries monitoring studies (acquisition of data, analysis and preparation of a report [3]) of teachers' readiness in educational organizations of Taganrog city to implement e-learning technologies in their professional activities, as well as students and teachers of pedagogical institute. Research is determined by the rapid implementation of e-learning tools and technologies at all stages of secondary and vocational education: electronic teacher's portfolio; virtual educational community ; electronic diaries; electronic multimedia learning tools ; LMS; open educational resources etc. A modern teacher must not only possess a sound knowledge of information and communication technologies which are the basis of the learning process in the e-learning environment, but also actively, constantly, efficiently and effectively apply them in their professional activities [2].

We present the results of monitoring stages of teachers' readiness in educational organizations in Taganrog, Rostov region to work with e-learning technologies [4]. Teachers were asked to answer the following set of questions:

- Experience and frequency of use of ICT in the classroom;
- The level of Internet access for students and teachers;
- Experience of developing their own educational products for the digital environment;
- The need for additional training to work in e-learning environment;
- Preferred form of trainings or refresher courses.

Here is the analysis of the most significant results obtained from the monitoring study (Fig. 1-4).

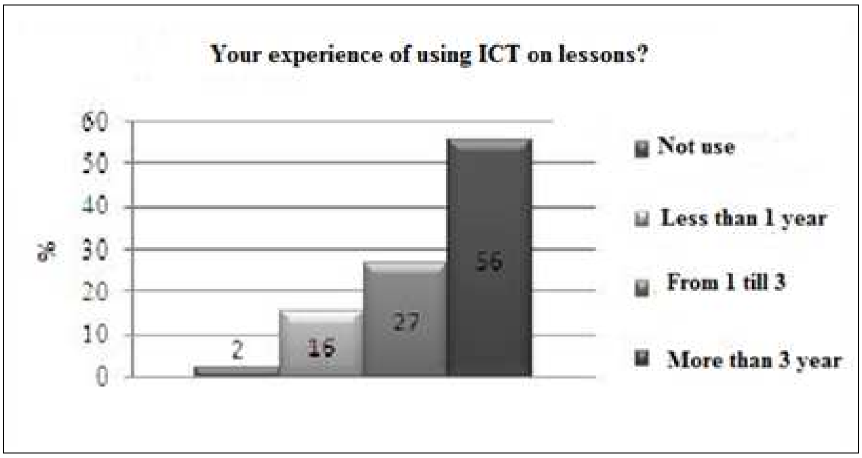

Figure 1. The experience of using ICT in the classroom

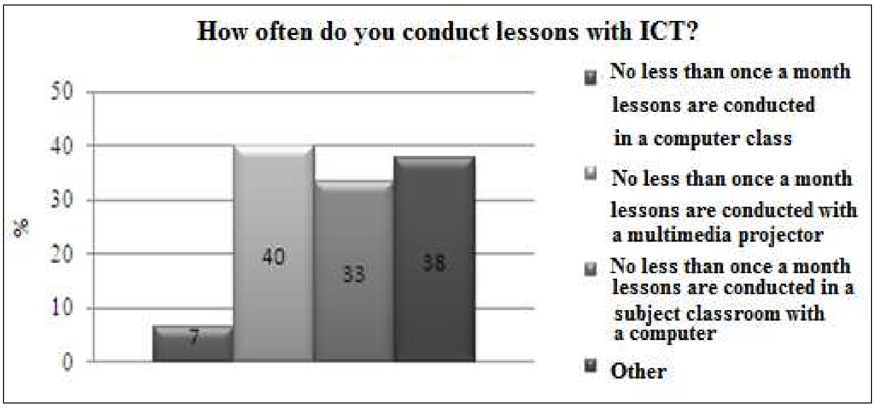

Figure 2. The frequency of using ICT on lessons

More than 50% of teachers used ICT more than 3 years and 25% from 1 year to 3 years. These data suggest that 75 % (2/3) of teachers use computer and multimedia projector in their work. 93% of teachers conduct lessons using ICT at least once a month.

In the matter of preference of professional developing courses, votes were distributed as follows (the survey participants were able to select several courses- Fig.3):

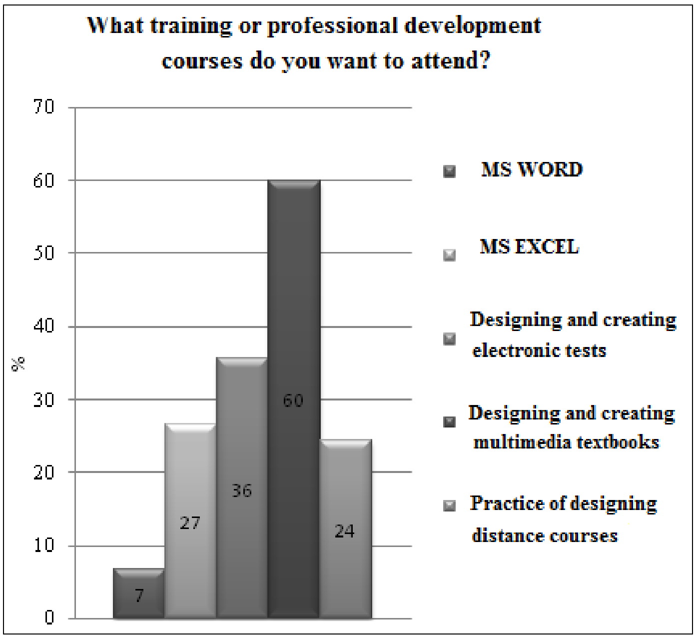

Figure 3. The choice of topics of training and professional development courses

The data shown in Figure 3 demonstrate that a small percentage of teachers still expressed the need for the development through courses of elementary computer skills (work with text documents - 7% and spreadsheets - 27%). About 40 % of teachers do not have or think that they have not mastered the technique of designing and creating the assessment tools for electronic testing. There is an interesting fact that teachers need the creative implementation of their professional knowledge and skills, which is reflected in the desire to acquire the necessary competence for the development of multimedia training tools (60%) and distance courses (24%).

About 20 % of teachers have experience in the development of electronic textbooks, thematic Internet - resources, copyright training programs. 80 % of respondents chose the answer "other", 30 % indicated the development of presentations and tests, 70% - lack of necessary experience.

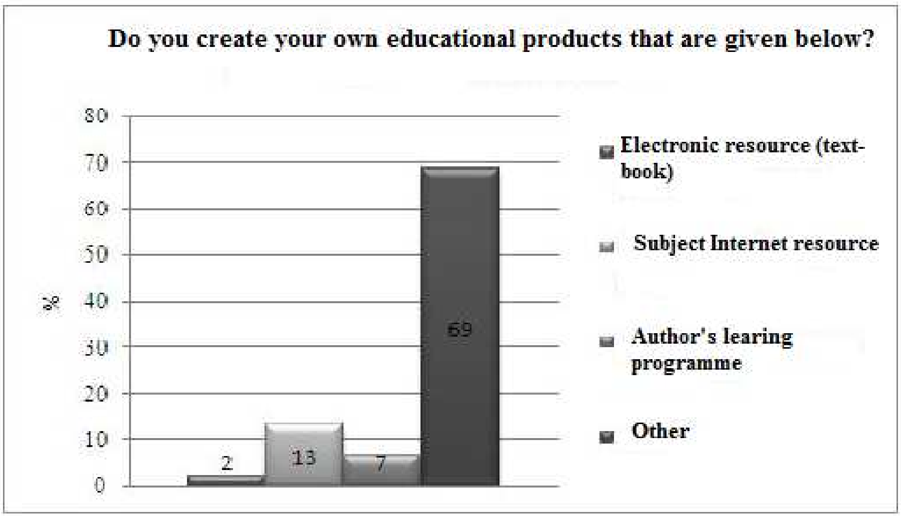

Figure 4. Creating own educational resources

Analysis of the summarized results demonstrates insufficient teachers' preparation in educational organizations to work effectively to implement e-learning technologies. In this connection, the Laboratory of Problems of Informatization of Education in Taganrog State Pedagogical Institute (TSPI) set the following objectives:

- Carry out ongoing monitoring studies aimed at determining the degree of readiness of graduate students of "Pedagogical education " program, teachers in educational organizations and educators to work in the e-learning environment;
- Constantly update teaching and learning materials for full-time and distance training courses.

Dealing with the problems associated with the effective use of e-learning tools and technologies by teachers, the Laboratory of Problems of Informatization of Education in TSPI was the initiator of the development of teaching and learning materials for the course «Teacher in e-learning environment» and the inclusion of this course in the curriculum of «Pedagogical Education» program.

E- Learning environment - is an innovative technology of organization of educational process that is constantly evolving and improving. E-learning tools and technologies are based on innovations in the field of information and communication technologies that are embedded not only in education. The ICT industry is evolving constantly and rapidly and aims at computerizing the whole society. In connection with this, education system must respond adequately to meet all the modern advances in these areas.

A modern teacher must maintain a consistently high level of professional competences in the subject area, as well as in the improvement of teaching and learning processes, which is impossible without e-learning technology. Constant monitoring of teachers' readiness to work with e-learning technologies allows of monitoring the level and development of ICT competence according to the latest achievements in the field of ICT application in education. Analysis of the obtained data should serve as a basis for making management decisions (development of methodological and training materials, organization of training courses etc.) to correct the discrepancies between available and required levels of competence.

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DIGITAL DIDACTIC GAMES IN ELEMENTARY SCHOOL

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Abstract - The paper presents a research of application and implementation of didactic games in elementary school. Didactic games were traditionally represented in teaching practice, but contemporary trends are giving them more importance. Computer supported education can be easily game based, especially in elementary school, due to the technology advancements and increasing educational games availability. Incentive of cognitive processes allows the discovery of new aspects of experience accelerates the intellectual maturation and encourages the development of creative potential. Paper presented analysis of didactic computer games application strengths and weaknesses, with the main goal to encourage improvement of teaching practice and popularization of game based learning.

I. Introduction

Due to the accelerated development of multimedia and computer technologies, different aspects of using computer games in teaching process are often being considered. Educational computer games can represent efficient tools for creating interesting learning environments [1]. Numerous researchers [2][3][4] concluded that using computer games in education enhanced students' motivation and interest in learning, hence their proper didactic design can potentially improve students' achievement.

Games can be defined as an "immersive, voluntary and enjoyable activities in which a challenging goal is pursued according to agreed-upon rules" [5]. Combination of didactic games with educational goals can enable opportunities for interactive learning and increased motivation as it is the most natural form of learning, and developing strategic and collaborative thinking. Compared to the traditional teaching process, introduction of gaming significantly influenced educational value and students' knowledge retention [6].

II. Learning gamification

According to [7], the idea of Gamified learning is to use game mechanics and elements of game design in non-game contexts in order to motivate a desired learning behavior. Elements like timing, accuracy and scoring can be applied to any task, process or context. The term "Gamification" is often used as a synonym for educational games and game based learning. Actually the concepts differ: Gamified learning originally meant to add elements like points to learning situations (extrinsic motivation) and the term "Game based learning" is used for games with defined learning outcomes (intrinsic motivation). However, both concepts have the same intent; they want to engage students [8]. Creating Gamified learning is a complex and time-consuming process [9]. Related learning theories which would support this practice include Gardner with Multiple Intelligences [10], Bloom with his concept of Mastery [11] and Hargreave's [12] notion of the teacher as entertainer to enhance motivation.

Development of diverse interactive computer platforms provided powerful environments to ensure optimal learning process. Shift towards technology based didactic games has widened social dimension of teaching. Omnipresence of computer games created new challenges and influenced learning environment perspectives to promote student-centered learning [13]. Research question of collaborative learning with computer games is considered very important. Modern games are often very imaginative because of collaboration between academic institutions and gaming industry [14] in a way that new technologies are combined with contemporary educational theories. Commercial computer games represent an alternative approach to educational implementation. Gaming with portable devices (e.g. smartphone, tablet) is another example to how the modern technology can change perception of using games for educational purposes. Portable devices' interface allows natural and direct interaction with objects that can be used for learning.

Literature has shown that training and learning can include deliberately selected computer games that provide players with skills, support lifelong learning, and improve reasoning [15] and digital artistry [16]. Enhanced visual intelligence is a documented benefit of playing computer games [17]. Manipulation of screen images is relevant to areas of teaching science and technology [18], as computer games can enhance coordination, visual scanning, auditory discrimination and spatial skills [19]. Even more, visual information processing emphasis can be associated with a significant increase in average non-verbal results and various psychological tests at different ages. Comparative study of children aged 10 and 11 that played two different computer games, show improvement of spatial orientation while playing one with emphasized visual content, while the other game that was based on text show none [18].

Design of educational games should consider educational theories, game design and game development [20]. However, previous studies using commercial computer games in classroom setting proved positive learning outcomes, even though researchers emphasized problem of integrating this approach into the curricula [21][22]. For example, *SimCity* can be used to educate about planning and sustainable development, *Colonization* to improve critical thinking about history, *World of Tanks* for teamwork and physics, and *The Sims* for social interaction.

Considering that the majority of human life, and therefore learning, takes place outside of formal educational institutions, the question remains how much of this learning might be gained from playing games [23]. Because of the methodological problems of researching learning in informal settings, there are few experimental studies in the area of learning with games in informal settings. Multiple theory based educational games have been developed with consideration of making them motivational so that they can be played both in and out of school. *WolfQuest*, an educational massively multiplayer online game (MMO) about wolves, is an example to such effort (http://www.wolfquest.org/). A summative evaluation report on *WolfQuest* presents evidence on its effectiveness in achieving its educational goals. Among those goals was motivating players to research about wolves in outside resources. They also found that the more players played the game the more they showed this kind of behavior [24].

III. THE ATTITUDE OF STUDENTS TOWARDS DIGITAL DIDACTIC GAMES

In the period 31/03/2014 to 11/04/2014 at “Kralj Aleksandar I” elementary school in Gornji Milanovac a research was conducted by an anonymous survey. The data on the attitudes of students towards the digital games usage in education and its impact on the style of learning were collected. The sample consisted of 52 students, 30 boys and 22 girls, age 11 to 13. The survey consisted of eight questions whose answer structure will be further discussed:

- Do you think that games are good for learning?
- What have you learned by playing games?
- Do you think that educational games are fun?
- Are difficult games better for learning?
- Is game narrative useful and helpful?
- How well did you understand narrative in English?
- What is your favorite game genre?
- Which device do you normally use for playing games?

We asked participants whether they thought that games were good for learning. 57.7% (n=30) reported that they have learned various kinds of information, knowledge and skills because of playing games. Majority of responders (80.7%) believed that educational computer games would aim to teach them not in a fun way. However, 84.6% (n=44) think that difficult games are better for learning, which can be interpreted as their expectance that they will trigger thinking and reflection. It is obvious that through adopting game mechanics students acquire skills such as mathematical thinking or faster reflexes.

Game narrative, although not always present, can facilitate learning historic facts, expand vocabulary or improve reading skills. Majority of 88.5% (n=46) of students reported that they find narrative useful and helpful, while 53.8% (n=28) reported that they had difficulties understanding English, which was expected considering participants’ age.

When we asked what their favorite genre was, 21.1% (n=11) chose *Action*, 19.2% (n=10) chose *Sport*, 13.4% (n=7) chose *RPG*, and 11.5% (n=6) chose *MMO*. Other genres were represented with less than 10%.

Regular gaming with portable devices was reported by 55.7% (n=29) of students, while 32.7% (n=17) played games on their PC's and game consoles. Minority of 19.2% (n=10) students did not play games. Such high percent of regular players suggest the need for devising ways of engaging games for educational purposes. There was none significant gender difference in results.

IV. CONCLUSION

Digital games pervade the daily lives of our children, so it is critical to understand how they affect learning process and influence life-long learning skills. Games in general teach goal setting, perseverance, resource management, and encourage persistence [23]. Five conditions for the experience in a game that needs to be useful for learning are identified [25]: specific goals, immediate feedback, application of previous experience, learning from peers and experts, and interpretation.

Students are highly motivated to spend hours on hobbies like playing games, so there is an obvious need to make use of this potential for learning. Previous technological barriers and economic factor virtually disappeared, thus the gamer student population in Serbian elementary schools is in most cases equal to the rest of the world. Future research should consider learning environment, e.g. school, home, or mobile context, and its particular influence on children experiences to better understand and assess the quality of the acquired knowledge and skills.

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THE APPLICATION OF INTERACTIVE EDUCATIONAL SOFTWARE IN PRESCHOOL AGES

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Abstract - This paper investigated how much teachers are ready to change the current way of working and to turn to innovations and technologies. The role and importance of the application of interactive educational software for exercising the influence on a child, child development and the process of knowledge acquisition are defined.

I. INTRODUCTION

Today the educatoinal institutions are equipped with modern didactic media that enable modernization of mehods and forms of works with students. It’s deliberately used the word “allow” because these media without proper interactive softwares can’t do anyting in terms of modernization of education. Using application programs it is possible to create interactive educational softwares that combines text, images, sounds and video recordings. Using this tipes of softwares children can independently master the required content, progressing their own pace and receive timely feedback [1].

“Developed countries have long experience in application of IT in their work with children of preschool age. In addition to numerous researches and analysis, there are still those who are for usage of technologies in this age of period and those who are more or less against it”[2].

II. EDUCATIONAL SOFTWARE

“Software in the field of education represents an intellectual technology and it’s called educational computer software, which includes programming languages and tools, specific organization of teaching and learning and which is based on logic and pedagogy”[3].

Educational computer software has become an attractive learning tool for preschool children, too. Its peculiarity is that it allows interactive learning - currently troubleshooting and identification of the acquired knowledge and skills, [4].

Designing the educational software (ES) is huge challenge. ES of high quality affects on positive attitude of child towards the computer. It is very important to involve children in the process of designing the ES, because the children are not afraid to express their feelings and opinions. It would be ideal to create an ES, which satisfies the needs of all three-personality types (visual, auditory, kinetic) with possibilities of participation and exclusion of certain option at any time. Having in mind differences in individual personality characteristics, capabilities and features the famous American psychologist and pedagogue B. Blum has developed taxonomy of educational objectives and tasks, which consist 6 main categories: knowledge, comprehension, application, analysis, synthesis and evaluation, [5].

III. DEPENDANCE OF INTERFACES IN RELATION TO AGES

Interface characteristic should depend on the age range of children. The division of children by groups is:

- Children between the ages of 3-4 years

Many children at these ages are first met with computer. Since they are still small, ES must be in the form of games. ES must satisfy their aspirations for the activity, they should be without text on the screen and every action should be accompanied by a voice. Scenes on the screen should be dynamic, because in this age attention is very short. Simple menu layout, usage of certain number of colors and small number of options on large touch screen perfectly “fits” ES designed for children of this age.

- Children between the ages of 5-6 years

Children at these ages better corporate and behave more conscientiously. Their glossary is richer, so they can describe the events, feelings, etc. They are aware of themselves; they develop social relationships, better control their actions, show interest for reading and writing and become aware of flow of time. Work in-group is possible, so it is possible to design software in that way. User interfaces can be richer with multimedia content, in terms of adding text and music, larger number of icons... [5]

IV. ROLES OF ADULTS

With careful attention to the establishment of physical training, assistance, a good choice of ES, as well as improving of learning, adults can do a lot to optimize the benefits of computers, [6].

Initially, the role of adults should be more demonstrative, to help children in problem solving, goal setting and planning. However, when children gain confidence and skills, adults need to step back and be available only when it is needed.

Adults need to consider and carefully select the software materials. The computer should do what textbooks and worksheets do not work well. An effective teacher will organize and lead a “rich” teaching with goal that children must acquire strong, mathematically and scientifically valid ideas. Those children who are only encouraged to explore freely quickly become disinterested.

During the educational work with preschool children, special attention is paid to:

- process of learning and interacting with the child (through which the teacher is learning and planning next steps by listening the child) and
- review (evaluation) and analysis of the validity and the achievement of the learning process and goals and objectives that teacher have set, [2].

“…A child in the educational process isn’t a passive object which is handled by adult. The child always has its part of initiatives in that process, which is based on curiosity as a natural desire to understand, try, familiarize and learn. Besides that, child has its own motivation for the development, which is reflected in the receptivity of the child to those influences from the environment which goes to “meet” its developmental and personal needs, but also closed for those who don’t fit him...” [7]

V. IMPACT OF IT ON EDUCATION IN PRESCHOOLS

Motivation of a child for computer usage and desire to try the different programs is the first confirmation that the preschool period is a time when the implementation of IT in education work should start, [2].

Preschool education is a part of general education. We can say that it prepares children for what awaits them in the future life. As kids in kindergarten are prepared for the later adoption of reading and writing, as well as they are introduced through game in world of educational computer usage. Already on the preschool level, computer and IT have the ability to make a strong impact on the processes of educational work in a highly effective manner.

In preschool period the speed and the number of creation of the synapses between the neurons are much greater that after the 7^{th} year. Inside the brain are happening battles for dominance between neurons; new connections are creating between active neurons and new pathways control. The development of important centers in the brain is being stimulated, forming a whole network of paths. Inactive neurons die and inactive paths are lost. In that, simulation of neurons lays the answer to the question whether the child will reach its biological potential or not, [8].

It is necessary, among other things, that teacher go through a process of specific education and implementation of IT in practice through work with children, so this task - encourage the creation of several hundred synapses between neurons within the brains of children, could be performed successfully.

Under specific education is implied the need for teachers to acquire basic IT skills, specific IT skills and basic theoretical skills about possibilities of applying IT in their work with children, the influences which it can achieve on specific areas of children development, the risks of its inadequate application etc.., [8]

The application of IT in the practice of work with children should be logical continuation of education of teachers in which they will learn how to develop skills in children for independent usage of this technology and how to apply IT in didactical purposes in daily educational work and integrate into the work i.e. is associated to all other areas of educational work, educational goals and objectives, and contents.

VI. MISMATCH OF THE EDUCATIONAL SYSTEM WITH TODAY’S CHILDREN

“What I hear I forget, what I see I remember, but what I do I know” [9]

One of the theories of efficiency of learning is theory of Edgar Dale from the sixties, better known as the pyramid of learning. On Figure 1 is shown how certain activities affect the efficiency of learning. The least efficient method is at the top of the pyramid and in this case, the top shows the efficiency of learning in case that the subject follows the verbal teaching. During the past decade, conditions were created that the methods at the bottom of the pyramid of learning are used more and more in practice [9].

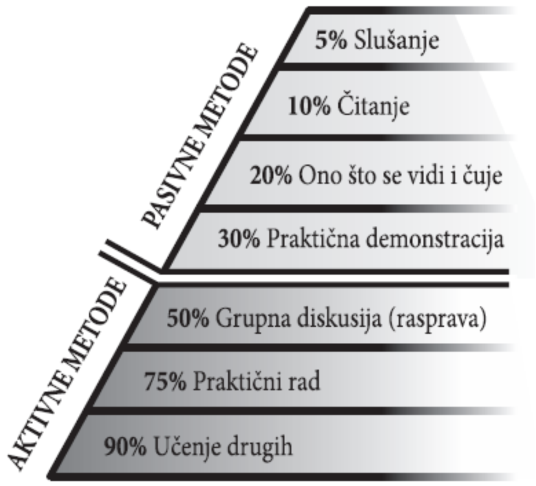

Figure 1. Dale's pyramid of learning [10]

Research such this has encourage the development of interactive teaching methods, which are used in parallel with traditional didactic methods. They are not proposed as an alternative to traditional didactic methods, but in addition to them.

We must accept the fact that today's kids are different by many characteristics and living conditions from former kids (Table 1). Unlike the former kids, today's kids lives in "accelerated world", they do everything in random access (opposed to the access "step by step" which is characteristic for former kids), they often follow and work several things at once, are oriented more on graphic than on text, more on game than on studying and function with less independency and more connections with others [11].

TABLE I. EXAMPLE OF THE VIEW OF THE FORMER CHILDREN AND CHILDREN OF THE MODERN AGE [11]

FORMER CHILDREN	TODAYS CHILDREN
The usual speed	Acceleration
Step-by-step	Random access
Linear process	Parallel process
First text	First graphic
Orientation to work	Orientation to game
Independency	Connection with others

VII. AGREGATING IT AND PRESCHOOL AGE

According to survey 68% of American homes, at least one of the parents has such working hours that spouses pass each other in the house, and 40% less time spend with their children than their parents 30 years ago. Most of free time spends together with children watching TV or movies. Today 64% of children come home, and there is nobody home, because the parents or parent is at work [12]. Manu children are therefore left to their own devices.

Today Instant Messenger Generation grows up in new digital environment. For many of them there is not a time in their lives when they were not surrounded by computers, phones, video games, Internet and other digital wonders, which more and more redefine our word [13].

Like all other technical creations, so is the computer morally neutral, i.e. itself is not bad or good. It can become good or bad by human will - depending on how and why that "smart machine" is used for.

On the professional symposium "Educator for the 21st Century", held in Sokobanja 2005th year, for the first time is presented the proposal of the "Implementation and integration of IT in the education of preschool age", which was submitted to the Ministry of Education.

The Law of the Foundations of Education mentions functions of IT within two goals of education - as the development of information literacy and skills of IT usage in finding, analysis, implementation and communication of information [14]. In the Law of Preschool education is mentioned the possibility of computer literacy, but the law doesn't deals with the issue of IT and digital tools in general of preschool education or in relation to children due to the nature of preschool age [15]. In the Regulations of general basis of preschool program this issue is completely omitted [16].

Reviewing the current Catalogue for professional development in preschool education of ZUOV, it can be seen that there isn't a single offer of professional development for teachers that deals with the use of digital resources in working with children and there aren't offered on-line training and e-learning for educators, too [17].

According to data from the survey on the opinions and experiences of educators in Belgrade in less than half of working rooms there are computers (41.30%), an Internet is in 17% of working rooms, programmed toys in 13% and digital cameras to 10%. The computer never used in directed activities 64% of educators and 33% use it only as an auxiliary, demonstration tool in acquiring the knowledge. The use of IT in documenting together with the children does not mention one of the teachers. One-third of teachers use IT in their preparation for work, only one-fifth with the family, and 13% for record keeping. No educator stated that it uses them in professional development [18].

Almost half of the teachers cannot assess whether they used the potentials of IT in their work with children, one-third believe they are not used enough, and 18% said they did. The most common reason for the underutilization is the lack of necessary equipment, programs and incompetence of the teachers. Only 15% of teacher considered that there is a need to ensure greater use of IT in their work with children, and nearly half of teachers considered that for that are needed education of teachers, 30% said better material resources and one-fifth said wider awareness of the importance of IT in the region. However, 70% of teachers stated that they have positive experiences on the use of IT in their work with children, 20% are indeterminate, and 10% say that they have no experience.

VIII. FAMOUS ES AND QUANTITY OF THEIR APPLICATION

"Today in market in Serbia can be found numerous ES designed for preschool children. In their offers, authors emphasize, "These interesting programs with their rich graphics will interest your children to boldly go around the world, to meet the wildlife. It will help him to gain or increase self-confidence and stimulate the development of its intellectual, speech and perceptual abilities." These marketing recommendations are certainly not sufficient for the application of software in the implementation of the activities. It's necessary that the Ministry of Education actively involve and give consent for the use of some ES in the implementation of activities in preschools." [4]

Despite the large number of companies engaged in the production of ES for preschool children, such as:

- Shine Co - programs that can be found in the market are: Koliko znaš o brojevima, Koliko znaš o prirodi, Predškolica, Otkrivalica and many others, [18],
- Nivebia - programs that can be found in the market are: Junior English, Lets learn English, Junior and many others [19],
- Multisoft - programs that can be found in the market are: Ce De Bukvar, Moj prvi engleski rečnik - My first Sebian dictionary, Snežana i sedam patuljaka and others, [20],
- Centar za brigu o deci - programs that can be found in the market are: Družina znanja: Vile i princeze, Družina znanja: Vila Ružica, Družina znanja: Gašina družina and others, [21]
- and others,

there is educational open source software, which is free to use, and there are versions for various operating systems (Windows, Linux, Mac...). The most famous is the manufacturer Doudou Linux, which has all the programs translated into 43 languages, including the Serbian language. Some of the ES for children are: Childsplay, GCompris, Tuxpaint... GCompris by Bruno Kudoni is translated to the Serbian language thanks to Danilo Šegan and Slobodan Simić. As for Linux, there are distributions of Linux that contains ES such as: Edubuntu, Freeduc-cd, Xplora and others which can be started from the CD/DVD-a (Desktop CD known as Live CD) without hard disk in computer system or can be installed on hard drive. Some of them are localized in the Serbian language. Versions that do not need to be installed are convenient, because children can easily delete some system programs on the hard disk that are needed for its operation, which in the case of a CD is not possible. [4]

In Serbia, there are only few kindergartens with an interactive whiteboard. Some of them are „Orašćić“ and „Veseljko“ from Belgrade. In these institutions the children are mostly using free interactive educational portal called „Maša i Raša“.

ES are very widespread in Europe. Many software manufacturers produce ES for children. However, for example, in Croatia the application of ES is in its infancy mostly because of the problem of language barriers [22].

According to data from the survey:

- 5% of teacher said they often use computers in preparation, implementation and evaluation of educational activities, 10% often, 34% sometimes, 30% never, 2% said that they aren't sure how often they use computer in preparation, implementation and evaluation of educational work, and 19% of teachers didn't answer this question;
- 25% of teachers reported that they use computers only in the realization of educational activities;
- 37% of teachers said they use the Internet to prepare for activities with children;
- 30% of respondents use IT to follow and evaluate educational activities;
- 83% of teacher use a digital camera in the preparation, implementation and evaluation of educational work with children, 58% stated that digital camera is used often and very often;
- 80% of teachers did not specify the programs used for the preparation, implementation and evaluation of educational work, and the remaining 20% of teacher stated that for the purposes of the educational work use the most the Power Point, [11].

According to data from the survey of the Swedish National Agency for Education:

- 16% of teacher use computers or tablets in the preparation, implementation and evaluation of educational activities, 31% once or several times a week,
- 50% of them believe that ICT is very important pedagogical tool;
- 83% of teachers said they use the Internet to prepare for work with children;
- About 66% of all preschools have Internet access;
- About 70% of teachers said that they have a desire to use the computer more often than usual. [23].

IX. RESEARCH METHODOLOGY

A. *Formulation of research problems*

Modern educational technology is "living matter" which is changing every day and progressing. The fact is that the field of ICT is huge and that today children are growing up with computers, so it's easier for them to follow the trends and changes in that field. Therefore, teachers need additional education to keep up with the changes in this field and to help them motivate children to work. As in most institutions, so in the preschools it is insisted on digital literacy of teachers, with an emphasis on the skills needed to search the Internet to improve their knowledge, create multimedia presentations, share experiences with colleagues, etc.

The wider problem of the research is:

1. determine the motivation of teacher to work and readiness to application of interactive ES,
2. determine the dependence of interactive ES and the motivation of children,
3. determine the dependence of interactive ES and the quality of learning.

The short research problem is:

- determine the relationship between age of the teachers and their willingness to professional development.

B. *Subject of the research*

It is necessary to determine how many teachers are implementing the interactive ES in educational process. In this paper will be examined the willingness of teachers to use interactive ES. The subject of the research is to examine whether teachers need additional training to facilitate the management of modern technologies in the educational process.

C. *Aimes and objectives of research*

The primary aim of this research is the analysis of modernity of forms and methods of work with children in preschools and the teachers that works there, i.e. whether they apply interactive ES and how they affect on children.

The secondary aim of the research is related to the narrower problem of research - determine the relationship between the ages of the teachers and their attitude to modern educational process, i.e. use of modern education resources, as well as the attitude of teachers to professional development.

Having in mind aims, the objectives of research are:

1. examine whether and how much are teachers ready to accept modern methods of work and to develop their skills, i.e. apply interactive ES,
2. examine the level of training of teacher for use of modern educational technology,
3. examine whether and how often teachers use interactive ES in their work.

D. Hyphothesis

From the given problem and the subject of the research, in accordance with the purpose of research raises the main hypothesis:

- Teachers underuse interactive ES in the educational processes.

The main hypothesis we will check through auxiliary hypotheses. Auxiliary hypotheses:

- Years of work negatively affect the willingness of introduction of modern technology in the classroom.
- Teachers need additional training to manage modern technologies in education.

E. Sample and research techniques

The sample is consisted of 20 preschool teachers from preschools “Crvenkapa”, “Bajka” and “Bambi” from Zrenjanin.

As a measuring instrument for this research it will be used the survey for teachers, which will be determined by the number of hours of professional development in the past year. One of the questions will be in relation to the nature and forms of professional developments. The main part of the survey is scale, which examines the representation of various contemporary educational resources in the first part and in the second part attitude of the impact of professional development on various aspects of the quality of educational processes. In the final part of the survey, teachers will be given the opportunity to provide comments and suggestions regarding the analysis of problems.

F. Research instruments

Survey will be used as main instruments used in this research.

G. Expected results

Modern educational technology, and therefore interactive ES, marks the degree of sensory information that refers to things, event and their properties, enabling conditions for lasting memory, a better way of learning, recognition and safe use of what is remembered. The expected results of this study are to demonstrate positive justification of interactive ES usage.

Thanks to the interactive ES: children learn more by recognizing, researching, problem solving, they encourage them to work, independence and accountability; teacher will easily customize the intended topic for the processing by the children's interests, abilities, and will successfully implement educational contents and perhaps most important - he will ensure the active participation of children during implementation; children are much more interested in educational work.

X. Conclusion

Who has the access to the information, which put them in the practice first, who knows to use advantages of IT, he will be evolving and much faster steps going forward. This is true both fort the whole society and individuals. Therefore, the strategic framework for the digital space is urgent task on all levels of preschool education.

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INTERACTIVE WHITEBOARD INFLUENCE ON EDUCATION

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Abstract - The paper presents how throughout the years information technology has developed to such an extent, that it has started influencing the education system, making it faster and „smarter“, and has started replacing common elements, such as the blackboard. We will present different kinds of interactive whiteboards that are used in schools, as well as their impact on lectures and classes as well as how students can use them to enhance their education.

I. INTRODUCTION

The continuous development of information and communication technologies has made a significant impact on the society as a whole, including on the education system. The need of the teachers and professors in the realization of teaching content has changed dramatically. In their desire to motivate their students and bring the content closer to them, they have turned the attention to these technologies and their vast capabilities. These technologies have started replacing the everyday classroom equipment and utilize the students' use of computers to their advantage. Through these technologies, teachers and professors can connect with their students on a wider scope and bring useful information closer to them.

II. WHAT IS AN INTERACTIVE WHITEBOARD?

As time goes by the influence of information technologies has gone to such an extent that it has begun to change even the most common elements of a classroom, including the standard blackboard and chalk. These so-called "smart boards" have revolutionized the way children and students can learn a subject through simple interactivity. However, what is a smart board?

An interactive whiteboard is a device through which a teacher or a professor can present his subject in an interactive and interesting way. This gives them an opportunity to adapt the subject to different styles of learning. It is very similar to a classic whiteboard, but instead of a chalk, you write with an electric pen, which is a standard part of the equipment for the smart board.

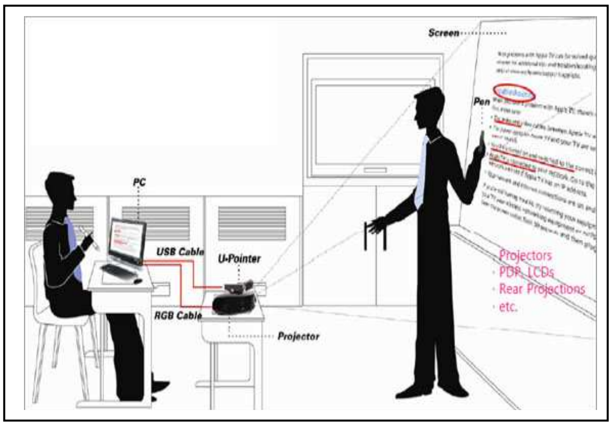

Figure 1. Parts of the interactive whiteboard system

The biggest strength of a smart board is the ability to display multimedia content and educational software. It can also highlight a part of the text, take a screenshot of the text and/or of a picture, zoom in to an important part of the text, so the students can know which part of the lecture is important for their studies.

Therefore, the interactive whiteboard is an information and communication technology (ICT) device, which appeared in the business sector (in the late 80's), but has been successfully applied in teaching. The electronic board is, actually an educational and technological system, consisting of a computer (laptop), multimedia projector, electronic board sensors and a whiteboard or a corresponding special surface. With the help of this system, the blackboard is replaced with a user interface system. A Whiteboard is controlled by a computer, and the computer mouse is replaced by a finger or stylus pen.

III. TYPES OF INTERACTIVE WHITEBOARDS

After the appearance of the first interactive board, they began to be improved more and more, and today they are different not only by the technology which they use, but also by using the touch technology, laser scanning and electromagnetic writing tools, and all of them offer different levels of reliability and cost.

Interactive whiteboards can either be Front-projection or Rear-projection boards. Front-projection interactive whiteboards have the problem of the user's shadow obscuring the image on the board. Some of them have the projector mounted on the top of the board, which helps with this issue. With these whiteboards are used the traditional projector and projection. 90-95% used interactive whiteboard belongs to this group of smart boards; while in Serbia the dominance of this model is even more important. This system is popular because it is easy to use and because of the accessible prices. Another type of the interactive whiteboards is the Rear-projection board. This model has a built-in projector and the image is projected with the help of special mirrors and lenses. Another type of this table is created by merging TV and the touch pad (touchscreen). In these models, the light of the projector does not interfere with the teacher while teaching and teacher does not obscure the projected image. Because of the high cost of these models, they are not accessible for educational institutions.

There are three different kinds of interactive whiteboard technologies:

- Resistive Membrane - These whiteboards have a soft, flexible surface similar to vinyl. Because of that, the surface is touch-sensitive. However, the soft nature of the surface makes it more prone to damage.
- Electro-Magnetic – These whiteboards work differently than resistive membranes, but they are very similar to the traditional whiteboards, because their surface is hard. They can be drawn on with a pen, which requires a small battery that emits a small magnetic field. The whiteboard software registers the location of the field, which was emitted by the pen to detect what happens on the screen. This board cannot be drawn on with the standard pen or finger.
- Infrared/Laser scanners – These whiteboards have infrared scanners in the top corners, and they detect pen movement. However, these pens are not standard but special felt pens, each of which has a uniquely encoded reflective collar that the lasers use to register its color and position. The surface of these whiteboards is hard and they are quite rigid to the touch.

IV. HOW DOES THE INTERACTIVE WHITEBOARD WORK

Interactive whiteboards is usually comprised of four components: a computer, a projector, the appropriate software and the display panel. The computer is connected to a projector and an interactive whiteboard. A computer transmits a certain application program or the whole screen image to the projector. Everything that appears on the computer's screen is beamed through the data projector onto the board. Communication between the computer and the display panel is achieved with a cable or a wireless connection with the use of the appropriate software. The amazing thing is that we can use a pen or sometimes even your finger, to write on the board. If we tap on the board, it is the same as if we would click with a mouse. Whatever we do on the board is sent via an electronic message to the computer.

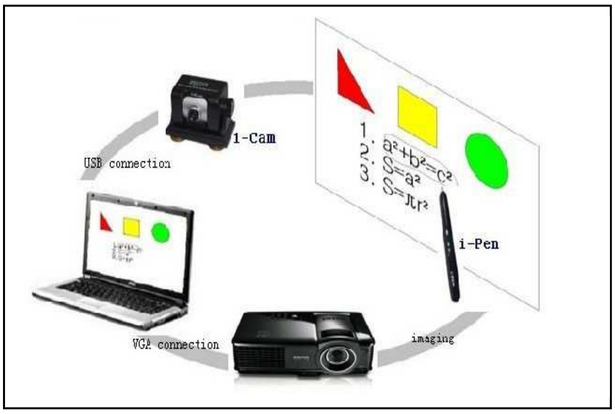

Figure 2. An example how the system works

V. INTERACTIVE WHITEBOARD IN EDUCATION

Interactive whiteboards have become popular over the last few years, and it appears that their use will continue to grow exponentially. Although it is designed to be used in business systems, this board is widely used in education systems and institutions, too.

Optimal use of an interactive whiteboard involves both teacher and student use. It can, for example, be used to:

- Allow the student presentation to work in a more interactive and collaborative way
- Show video clips that present and explain difficult concepts (in any curricular area)
- Demonstrate how an educational software program works, e.g., an art program with students using their fingers or pen to draw rather than using a mouse

- Promote group work. Groups can view and solve different types of problems together
- Enable editing on screen, and recording and storing the edited data on the hard drive or any storage unit
- Enable search and display Web sites so that everyone in the classroom can see them
- Help teachers to keep the attention of students by enabling them to make a lecture more interesting
- Replace the traditional pen and paper with the computer mouse and keyboard.

VI. THE ADVANTAGES AND DISADVANTAGES OF USING THE WHITHEBOARD

Like every technical innovation, it comes with a good side and a bad side, the interactive smart board is no exception.

A. *The good side*

Since its rising popularity among the educational institutes, these smart boards bring many upgrades to the traditional classes and lectures. Some of these are:

- Teachers have increased flexibility when planning their lecture and can easily adapt to the situation at hand
- Teachers can hold lectures with increased involvement from the students, witch transforms the traditional lecture into a group work that involves the teacher and the students
- The use of a large number of educational software
- Increases student creativity and attention
- It has a strong visual effect that helps the students remember more information that is presented to them, which overall helps with their studies
- The problem for students that are allergic to the chalk powder fades away because chalk is not used
- The quality of the lecture as a whole is dramatically improved
- It allows recording student activity on the whiteboard
- It allows the use of digital ink
- It allows the creation drawings, notes and concept maps in class time which can be saved for future reference or issued as instant handouts for the lesson you have just given
- Allow the tutor to monitor or see what each
- Students have on their screen and choose which screen to display on the whiteboard in a networked environment.
- Offer the same features as a traditional whiteboard such as writing directly on the
- board, marking objects, highlighting or labeling elements on the screen, and erasing errors but with the ability to save or print out the results without any additional effort.
- Run on-line tests and refresh the lecture with new examples from the internet.
- Students are able to cope with more complex concepts because of clearer, more efficient and more dynamic presentation.
- Without whiteboards, students often are not motivated. They can become bored and off task.

B. *The bad side*

Because it is still relatively, it still has some problems that need to be addressed before it becomes a standard part of every classroom. Some of these problems are:

- The interactivity draws more attention from the lecture then to it
- Using the interactive whiteboard demands a lot of extra time used for educating the teachers in using it and to prepare the educational material before the class starts
- At this time, in the educational system there is no real need for new technologies to be used
- They still have a very high price, which is the biggest problem to most educational institutes seeing as they can’t afford them
- Not all interactive whiteboard software packages offer the same functions.

VII. CONCLUSION

Even though we are in the age where technology is evolving at a fast pace, and has become a part of every institute, in the traditional schools, the old fashioned pen and paper classes are still dominant where students are still copying what’s written on the board while listening to the teacher. However, it has started to change slowly with the introduction of interactive classes and technologies. In the United Kingdom schools, colleges and universities are already using the interactive whiteboards since 2002. These interactive smart boards motivate students and let them focus more on what the teacher is saying rather than copying what is written on the board.

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SIGNIFICANCE OF WEB -ORIENTED INFORMATION SYSTEMS FOR E-BUSINESS IN SERBIA

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Abstract - The development of various e-business models conditioned and predetermined the necessity for the implementation of ICT in the economy at the local as we globally level. To develop business in the countries in transition, and in the Republic of Serbia, especially in a time of transition and globalization, as well as the integration of world market companies need to be competitive. Competitiveness refers to the domestic and foreign markets and representing a variety of indicators of which emphasizes the application of information technology and information systems. The information system is a component that greatly affects the competitiveness of enterprises. If a company such organizational structure that has profit centers or departments to geographically different areas, then the information system must be based on a network environment. This paper points out the ways and means of the application of information e-business systems, their advantages and disadvantages, as well as the ways in which they can be applied in an environment such as the economic environment in the Republic of Serbia.

I. INTRODUCTION

It is very much written on this issue by different authors and in different aspects, but what is specific to this study is that it will treat the problem locally, i.e. at the level of the Republic of Serbia. The application of electronic business information systems in transition countries, and indeed in the Republic of Serbia requires a special approach. While the use of information systems in e-business world is very complex and required, and in Serbia due to poor infrastructure and technological equipment, the majority of companies do not realize the importance of such information systems. In the application of web-oriented information systems in Serbia, lead the firms, mainly large companies with large investment funds, but the small and medium-sized enterprises lags behind in this area, and this is exactly prompted this research.

The paper points to the need to embark on a scientific basis to reform one part of the business, to contribute to the development and competitiveness of our companies and to facilitate the operation and implementation of information systems of e-business to all those who feel they need that environment. Information technologies are of great importance in modern business. The world has become a big global village, and all the businesses are in the same market, which is called the Internet. The information in these operating conditions is very important resource, and who at times receive adequate information receives a fight for market position. Information technologies are a very important factor that is. resource in the strategic positioning of the company. The transition process that incorporates the processes of globalization and market integration provides businesses with our field output to foreign markets, but at the same time opens the borders of our country for the inflow of foreign capital and investment products. In such an environment, the company, like the country itself and the economy must transform. A large amount of information must be provided with the management team of the company to make the process of the company take place at an optimal level [1].

Speed, globalization, improving productivity, getting to new customers and distribution of knowledge across organizations and institutions in order to achieve competitive advantages are the conditions that require the application of information systems in e-business enterprises in Serbia. The application of electronic business information systems began in the seventies, but it was mostly limited to large corporations and the very small number of users. By the commercialization of the Internet, their use has grown rapidly. In the last ten years many innovative application of this technology have appeared.

II. ELEMENTS AND CHARACTERISTICS OF INFORMATION TECHNOLOGY

Information technology includes the collection, processing and transmission of information.

According to the type of resources that are used, the following technologies vary:

- Information technology (IT), whose main source is information to handle,
- Traditional manufacturing technology (TPT) handle physical Resources include traditional equipment manufacturing
- hybrid technology or modern production technology (SPT) process natural resources under the control of automated information systems including flexible manufacturing systems (FMS), robots, automated factories[2] .

Differences between information technology and the traditional based are on the difference between the resources that rejoice, between information and classical material goods in physical form. Differences of information technology to the traditional: that the information as indivisible goods in production and that the information as a commodity and as a resource cannot be appropriated.

Differences of information technology to the traditional: that the information as indivisible in the production of goods and information as a commodity and as a resource cannot be appropriated.

Elements of technological packages are:

- Technology" know how"
- Equipment (machines, tools, equipment ...)
- Material
- A man's work
- Buildings
- Energy
- Organization
- Management
- Measures and means of environmental protection
- Products (services) [3].

III. IMPORTANCE OF INTERNET MARKETING

Internet brings innovations in the way of doing business, including communications, sales and distribution. When it comes to communicating, it insists on the interaction and two-way relationship one to one where the customer expects momently response, while sales and distribution should allow for customization and offers closer to the customer. Internet is considered to be an important means of market research. To get the data from various sites on the Internet, users need to register. Registration involves filling out the appropriate questionnaire. Requiring user registration, companies are trying to come up with information which could later identify the appropriate profile customers. This research makes it possible to offer fully adapt to the characteristics of individual customers or selected target group that is classified by some characteristics.

You must take into account the limiting factors of this method of obtaining information about customers. Users can register under any name, whenever they want and how much time they want, whenever entering different data, and these data may not be accurate and users can show great resistance to these sites and whenever it is necessary to avoid to be recorded in such a manner. An additional problem carries an ethical issue, and the right to privacy of Internet users. Research on the Internet is impersonal research, which means that its performance is far less compared to the information received by the seller in a personal meeting with the customer.

The use of the Internet in the modern business enterprise contributes to increase their effectiveness and efficiency. By the use of the Internet, companies want to increase their benefit for all participants in the supply chain, particularly for consumers, because it directly affects the achievement of the objectives of all other participants. Involved in various networks of relationships create the conditions for more efficient operations. As the number of Internet users is constantly growing network this means that the utility of engaging members explicitly increases the number of users in the network. When there is a new user of a network not only adds value to it, but it becomes valuable to all existing members of the network. The benefits that businesses have on the application of the Internet in their business are: to increase the speed of transactions; Improving the efficiency of an information management; increase the quality of products and services that are delivered to customers; elimination of disparity in time; elimination of disharmony in the area; efficient evaluation of the global market. In addition to communication skills that the Internet provides a new medium, it represents a new way of doing business that is based on the establishment of direct contact between companies and potential customers. Electronic commerce has become the modern way of selling that every day attracts more businesses and potential customers. Information about its current growth is mostly in favor of the thesis of the inevitable reduction in the proportion of conventional trade.

Unlike private sales, which are a very expensive form of communication with a very small range, Internet marketing allows significant cost savings and establishes a personal contact with a number of customers that are distributed to a broader geographic market. Internet enables the expansion of the market, where potential and existing customers are not necessarily grouped according to the territory in which they are located. When it comes to the final consumers, it allows the formation of market segments according to the criteria of similarity of individual customers, regardless of which country they come from. Members of different nations now make up the so-called "virtual communities" who have built their own culture and behavioral patterns that reflect the behavior of consumption.

With the use of the Internet in conducting marketing activities, the companies realize the economic and communication effects. Internet marketing contributes to the increase in sales volume by winning new customers and markets, more effective selling to existing customers and increasing cross selling. In addition to increased income, Internet use contributes to reducing costs by shortening the time for customer service, online sales and reducing costs of marketing communication [4].

Web site enterprise makes sense only if it is placed in the context of the overall marketing performance of companies, as part of integrated marketing communications. Otherwise, the company risks being set once and rarely updated presentation, which is occasionally visited by those who are internally referred to its existence. It is better not to have a presentation, but to have not updated amateur one, which has a pair of pattern pages that no longer can harm the company but help in the promotion and building a corporate image of their products.

IV. E-BUSINESS

Electronic Business (EB-Industry) is the conducting business on the Internet, it is not just about buying and selling, but also care about our customers and business partners, as well as the organization of business in their own online businesses and organizations to customers. Electronic commerce and, in a broader sense, the electronic commerce has come along 80s of the last century and that such operations are conducted with the use of computer and telecommunications technology. With the spread of the Internet the idea emerged, and soon the practice, with its mass application in electronic commerce. The development of the Internet took place in stages:

The first stage is related to innovation (1961 to 1974) when it comes to concentration and realization of the Internet development through software and hardware. For this period as the basic purpose of the Internet, connection appears large computing systems KAPOV college. The second phase is related to institutionalization (1975 to 1995). Larger institutions such as the Ministry of Defense of National Science Foundation have provided funds for the further development of the concept of the Internet. Thus, for example The Ministry of Defense has proposed military and communication system whose warp task was to defend a nuclear war ARPANET (Advanced Research Projects Agency Network).

They used the web site and secure communications over the IP protocol. E-business was first mentioned in 1996. by the U.S. company IBM. Experts IBM wanted to describe business processes using Internet technology. In addition to the above broader definition, some authors believe that the most proper electronic commerce is defined as the performance of business operations using modern electronic technology. Electronic business achieves more efficient commercial transactions and increases the overall efficiency of operations at the store. Message development is clear: successful companies will be those that earlier and more effectively embrace integrated solutions through heterogeneous platforms, between organizations of different functional units and application, within a secure environment, which is essentially dealing with customers.

E-business achieves more efficient commercial transactions and increases the overall efficiency of operations at the store. Message development is clear: successful companies will be those that earlier and more effectively embrace integrated solutions through heterogeneous platforms, between organizations of different functional units and application, within a secure environment, which is essentially dealing with customers. Positive effects are numerous and almost there are no organizations, which by using the technology of e-business can realize significant savings. These effects are reflected primarily in the following advantages: cost savings in paper documents are replaced by electronic, the increase in sales volume due to a much larger market, the availability of buyers is the time constant, 24 hours a day, 365 days a year, significant savings in the time enabled better communication between employees, as well as with suppliers and potential customers, the possibility of working together to make a larger number of ideas and potential solutions of specific problems, which contributes to the quality of business decisions, it enables small organizations to present themselves at the same level as the big companies , to be "just in time" operations, automate production through e-business technology creates the conditions for reducing the cost per unit of product, etc. ...

The e-business and electronic commerce (e-business and e-commerce) experience expansive growth in recent years with the development of internet technology, associated services and applied cryptographic mechanisms. Electronic Signature Law, that was recently adopted, introduces the legal and business environment of the new concepts, such as electronic document, electronic signature, qualified electronic signature, electronic certificate, the certification body and the like, and the business world must quickly accept, learn and apply it.

The electronic document is a document in electronic form. Electronic message-is a series of data that are electronically generated, sent, received or stored by electronic, optical and other similar media. Credible messages is each electronic message, whose authenticity is proven by relevant, pre-arranged, procedures and methodologies, as to the identity of the sender, as well as the integrity of the information contained in the message. Electronic contract-a contract in electronic form, which is signed by exchanging electronic messages in which the contracting parties their consent to the conditions set out therein confirm by the electronic signature. Electronic signature and a set of data in electronic form that have been added to or logically associated with electro plants, message or document and serve as a method for the identification of the signatory. Qualifications electronic-signature is an electronic signature that reliably guarantees the identity of the signer, the integrity of electronic messages or documents and the inability of subsequent denial of responsibility for their content. Qualifications electronic certificate-the electronic certificate confirms the link between the data for verification of electronic signatures and the identity of the signer, which was issued by the certification body and contains the necessary information to standard X.509 v3. Certification body-is a legal entity that issues electronic certificates and qualifications meet the necessary conditions for the work prescribed by the appropriate national regulatory bodies [5].

V. RESULTS OF SURVEY

The survey was conducted on a sample of 150 representative of small and medium-sized enterprises located in Novi Sad. A plan of simple random sample was implemented. The collected data are presented graphically with circle / pie called "pie-chart". The largest number of surveyed companies (50%) employ 40 or more workers, then coming companies with 7-10 employees (24%), 11-20 employees (20%), while the remaining 6% are enterprises with 4-6 employees.

Figure 1 Structure of enterprises by number of employees

All the researched companies have a computer and use it in their daily operations. In as many as 52% of the companies computer is effectively used 3 hours or more, 18% of companies from 1-3 hours, while in almost a third of companies the computer is effectively used less than 1 hour during working hours. That the computer is very essential deemed owners / managers 70% of the surveyed companies, 20% required a somewhat essential in the business 10% of the surveyed companies. All investigated companies have Connection to the Internet. A half of the companies (50%) use the Internet regularly in their daily operations, sometimes using 30% of respondents, while 20% of companies use the Internet infrequently. What is the importance of the speed of the Internet in business is concerned, it is very important for 55% surveyed companies, while for 45% of companies speed is somewhat important.

It is impossible to do business without the internet is considered by the owners / managers of 50% of the surveyed enterprises, it is very important they considered in 28%, while in 22% of enterprises an important Internet business. In all

Examined companies, the Internet connection is enabled at all times. Only 2% of the surveyed companies use a cable Internet, DSL connection uses 72% of the surveyed companies, while the rest (26% of them) uses the Wireless Internet. Less than a half of the companies (40% of them) are familiar with the law relating to legal software packages used while 60% of respondents somewhat are familiar with these laws. All examined companies use some of the antivirus program; half of them (50%) use AVG and the other half NORTON. Person / company that maintain a computer / Internet are 92% of the surveyed companies, while 8% of the surveyed companies do not.

The owners / managers of the studied companies on the question "Do you use the Internet more if the same was financially advantageous?" answered "maybe." What additional hardware devices are concerned, the printer uses 50% of the surveyed companies, 40% of them, scanner, fax them to 80%, while Webcams used 20% of the surveyed companies. To the question, "Do you think you could run your business without the Internet?" 70% of them answered "UNTHINKABLE", 20% of them with a "maybe", while 10% of the surveyed firms answered "YES" to this question.

Based on the results derived based on the use of questionnaires can be concluded that they are adequately prepared questionnaires of this type are suitable for the analysis of the use of information (computer) technologies and systems to facilitate the functioning of the company. According to all the above, the aim of the research is completed. Thoroughly examined the application of computer technology in the operation of small and medium-sized enterprises mainly in the city of Novi Sad. Based on the data from the questionnaires the great importance of the use of information technology and systems for the successful operation of small and medium-sized enterprises is established. Information Systems electronic business is very important factor in the strategic positioning of the company. Management of small and medium enterprises needs a professional assistance in the selection and implementation of electronic information systems business.

VI. Conclusion

In the field of management of information technology, this paper shows the problems closer infrastructural adjustments transition countries, such as Serbia and possibilities of implementation of new business and the use of information technology in improving the performance of the company and strengthen its competitive advantage. This paper presents the application forms and various segments of Information Technology at the level of small and medium-sized enterprises. In the area of small and medium-sized enterprises this paper deals so far with little-used issues, dealing with small and medium-sized enterprises as actors on the world market, will deal with market positioning and competitive advantage. Authors have come up with general rules and principles that should be guiding the the process of integration of information technology in small and medium-sized enterprises, in the example of Serbia, in the belief that these models can be applied to the small and medium enterprises in any other developing country.

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ADVANCED PARALLEL COMPUTING METHODS FOR MATRIX MULTIPLICATION

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Abstract - The introduction of computer calculation everywhere and the general evolution of information society brought the necessity of processing “Big Data”. The “Big Data” are processed effectively only by using parallel computations. Parallel computing is a form of computation in which many calculations are carried out simultaneously, operating on the principle that large problems can often be divided into smaller ones, which are then solved concurrently ("in parallel"). There are various different kinds of parallel computing like parallelism in bit-level, in instructional level, and in data level. Thither is much different architecture, which supports those kinds of parallelism. Traditional methods of parallelism are those based on Control Flow Computing. Another paradigm of parallel computing is Data Flow Computing. This offers, in the program level, the possibility to reduce the latency, to increase the speedup and to improve the performance of algorithm execution. This paper is an investigation in different previews Control Flow parallel architectures for solving problems of linear algebra, compare to the Data Flow architecture. Herewith are comparisons in speedup, efficiency and complexity of one of well-known algorithms of linear algebra, Matrix Multiplication, in different parallel architectures.

I. INTRODUCTION

A new alternative for fast parallel computing is considered the Data Flow computing. Data-flow computing was developed about 30 years ago as a way of solving the parallel processing problem and then faded away over time. But, the decades-old technology is making a comeback. The data flow computing is experiencing a rebirth, so it is worthy to invest in possibilities to use the technology in large numerical calculation. Data Flow computers would provide plenty of computing power. However, a direct implementation of computers based on the Data Flow model has been found to be a monumental challenge [1]. This paper presents a survey of characteristics in Data Flow computing and a comparison to the old parallel computing techniques. Parallel techniques in

ControlFlow computing are very powerful and effective, but speaking allegorically, it is like having many experts leading the process of work. DataFlow is an alternative that in our allegory can be compared with too many specialized workers. Experts are expensive and slow, since the workers can be cheaper and faster. The Data Flow approach of computation offers many advantages for parallel processing. The hardware implementation of this approach is very difficult, but nevertheless there are really good successful efforts and still these efforts are continuing nowadays. Since the early 1970s, a number of hardware prototypes have been built and evaluated [2] and simulation studies of different architectural designs and compiling technologies have been performed [3]. The experience gained from these efforts has led to progressive development in Data Flow computing. However, there are many doubts and the question still remains as to whether the Data Flow approach is a viable means for developing powerful computers to meet today’s and future computing demands [4].This electronic document is a template and is used to format your paper and style the text. The template, saved as “Word 97-2003 & 6.0/95 – Document” for the PC, provides authors with most of the formatting specifications needed for preparing electronic versions of their papers. The various components of your paper (title, text, heads, etc.) are already defined on the style sheet, as illustrated by the portions given in this document. All margins (top and bottom margin of 25 mm, and left and right margin of 20 mm), column widths (of 82mm with the space between the two columns of 6mm), line spaces, and text fonts are prescribed; please do not alter them.

II. CONTROLFLOW COMPUTING MODEL

The Von Neumann or control flow-computing model consists of a program, which is a series of addressable instructions, each either of which specifies an operation along with memory locations of the operands or it specifies not conditional transfer of control to some other instruction. Essentially, the next instruction to be executed depends on what happened during the execution of the current instruction. The next instruction to be executed is pointed to and triggered by the PC. The instruction is executed even if some of its operands are not available yet.

Alternatively referred to as the flow of control, control flow when talking about computer programming is the order function calls, instructions, and statements are executed or evaluated when a program is running [5]. In this article, we are talking about ControlFlow architecture, which is the traditional architecture.

III. PARALLELISM IN CONTROLFLOW

What is important in our discussion is the parallelism potential of such architecture. Let us see some terminology and basic concepts of parallelism.

Flynn's Taxonomy for Parallel Architectures

A parallel computer can be characterized as a collection of processing elements that can communicate and cooperate to solve large problems fast.

A simple model for describing the parallelism in control flow machines is given by Flynn's taxonomy (http2). This taxonomy characterizes parallel computers, according to the global control and the resulting data and control flows.

There are four categories of architectures:

1. Single Instruction, Single Data (SISD): There is one processing element, which has access to a single program and data storage. In each step, the processing element loads an instruction and the corresponding data and executes the instruction. The result is stored back in the data storage. Thus, SISD is the conventional sequential computer according to the von Neumann model.
2. Multiple Instruction, Single Data (MISD): There are multiple processing elements, each of which has a private program memory, but there is only one common access to a single global data memory. In each step, each processing element obtains the same data element from the data memory and loads an instruction from its private program memory. These possibly different instructions are then executed in parallel by the processing elements using the previously obtained (identical) data element as an operand. This execution model is very restrictive and no commercial parallel computer of this type has ever been built.
3. Single Instruction, Multiple Data (SIMD): There are multiple processing elements, each of which has a private access to a (shared or distributed) data memory. But there is only one program memory from which a special control processor fetches and dispatches instructions. In each step, each processing element obtains from the control processor and the same instruction and loads a separate data element through its private data access on which the instruction is performed. Thus, the instruction is synchronously applied in parallel by all processing elements to different data elements.
4. Multiple Instruction, Multiple Data (MIMD): There are multiple processing elements, each of which has a separate instruction and data access to a (shared or distributed) program and data memory. In each step, each processing element loads a separate instruction and a separate data element, applies the instruction to the data element, and stores a possible result back into the data storage. The processing elements work asynchronously with each other. Multicore processors or cluster systems are examples of the MIMD mode [6].

Platforms of parallelism in ControlFlow computing (OpenMP, MPI)

OpenMP (Open Multiprocessing) is an API that supports multi-platform shared memory multiprocessing programming in C, C++, and Fortran[7] on most processor architectures and operating systems, including Solaris, AIX, HP-UX, GNU/Linux, Mac OS X, and Windows platforms. It consists of a set of compiler directives, library routines, and environment variables that influence run-time behavior (OpenMP Tutorial at Supercomputing 2008) (OpenMP Tutorial at Supercomputing 2008) [8]. Standard API for writing shared memory parallel applications in C, C++, and Fortran OpenMP API, consists of: Compiler Directives, Runtime subroutines/functions, Environment variables [9].

OpenMP is managed by the nonprofit technology consortium OpenMP Architecture Review Board (or OpenMP ARB), jointly defined by a group of major computer hardware and software vendors, including AMD, IBM, Intel, Cray, HP, Fujitsu, Nvidia, NEC, Microsoft, Texas Instruments, Oracle Corporation, and more [10].

OpenMP uses a portable, scalable model that gives programmers a simple and flexible interface for developing parallel applications for platforms ranging from the standard desktop computer to the supercomputer.

An application built with the hybrid model of parallel programming can run on a computer cluster using both OpenMP and Message Passing Interface (MPI), or more transparently through the use of OpenMP extensions of non-shared memory systems [11](http6)

IV. Matrix Multiplication in C++ OpenMP

Let us treat the C++ OpenMP by using a simple example. Here with includes an implementation of the matrix multiplication in OpenMP. The directive of processor # pragma omp parallel for default (none) shared (a, b, c) is the simple modification of the normal source code in C++, which can parallelize the entire loop below this directive. Let us see the entire program for matrix multiplication.

```
/* multiplication_matrix_openMPI.cpp */
constint size = 1000;
float a[size][size];
float b[size][size];
float c[size][size];
int main()
{   //
Initialize buffers
for (inti = 0; i< size; ++i) {
for (int j = 0; j < size; ++j) {
a[i][j] = (float) i + j;
b[i][j] = (float) i - j;
c[i][j] = 0.0f;
     }
   }
   //
Compute matrix multiplication
   // C <- C + A x B
#pragma omp parallel for default(none) shared(a,b,c)
for (inti = 0; i< size; ++i) {
for (int j = 0; j < size; ++j) {
for (int k = 0; k < size; ++k) {
c[i][j] += a[i][k] * b[k][j];
         }
      }
   }
return 0;
}
```

This platform works very well in shared memory systems like multicore computers. Let's suppose that our source code is executed on a shared memory machine. What happens in the source code after we add our parallelization directive? Let' suppose that our machine has 4 cores. A sequential algorithm uses just one core to accomplish the loop. While the use of the parallelization directive makes active all cores like in figure 1.

The directive, #pragma omp parallel for default (none) shared (a, b, c) does implement the parallelizing process. The runtime creates 3 additional "worker" threads at start of the OpenMP parallel region. OpenMP programs start with a single thread; the master thread. At the start of the parallel region master, creates a team of parallel "worker" threads (FORK). Statements in parallel block are executed in parallel by every thread. At the end of parallel region, all threads synchronize, and join the master thread (JOIN).

V. MPI Platform in C++

MPI is a directory of C++ programs, which illustrate the use of the Message Passing Interface for parallel programming. MPI is a library of message passing routines. The library allows a user to write a program in a familiar language, such as C, C++, FORTRAN77 or FORTRAN90, and carry out a computation in parallel on an arbitrary number of cooperating computers [12]. This platform is used in distributed memory [13] parallel systems.

Herewith is a simple example, which uses the MPI library, which executes from each core an execution thread for matrix multiplication loops:

```
/* multiplication_matrix_MPI.cpp */
#include <mpi.h>
#include <stdio.h>
#include <stdlib.h>
```

```
#define TAG 13
int main(intargc, char *argv[]) {
double **A, **B, **C, *tmp;
intnumElements, offset, stripSize, myrank, numnodes, N, i, j, k;
MPI_Init(&argc, &argv);
MPI_Comm_rank(MPI_COMM_WORLD, &myrank);
MPI_Comm_size(MPI_COMM_WORLD, &numnodes);
  N = atoi(argv[1]);
if (myrank == 0) {
tmp = (double *) malloc (sizeof(double ) * N * N);
   A = (double **) malloc (sizeof(double *) * N);
for (i = 0; i< N; i++)
    A[i] = &tmp[i * N];
  }
else {
tmp = (double *) malloc (sizeof(double ) * N * N / numnodes);
   A = (double **) malloc (sizeof(double *) * N / numnodes);
for (i = 0; i< N / numnodes; i++)
    A[i] = &tmp[i * N];
  }
tmp = (double *) malloc (sizeof(double ) * N * N);
  B = (double **) malloc (sizeof(double *) * N);
for (i = 0; i< N; i++)
   B[i] = &tmp[i * N];
if (myrank == 0) {
tmp = (double *) malloc (sizeof(double ) * N * N);
   C = (double **) malloc (sizeof(double *) * N);
for (i = 0; i< N; i++)
    C[i] = &tmp[i * N];
  }
else {
tmp = (double *) malloc (sizeof(double ) * N * N / numnodes);
   C = (double **) malloc (sizeof(double *) * N / numnodes);
for (i = 0; i< N / numnodes; i++)
    C[i] = &tmp[i * N];
  }
if (myrank == 0) {
for (i=0; i<N; i++) {
for (j=0; j<N; j++) {
     A[i][j] = 1.0;
     B[i][j] = 1.0;
    }
   }
  }
stripSize = N/numnodes;
if (myrank == 0) {
offset = stripSize;
numElements = stripSize * N;
for (i=1; i<numnodes; i++) {
MPI_Send(A[offset], numElements, MPI_DOUBLE, i, TAG, MPI_COMM_WORLD);
offset += stripSize;
   }
  }
else {
MPI_Recv(A[0], stripSize * N, MPI_DOUBLE, 0, TAG, MPI_COMM_WORLD, MPI_STATUS_IGNORE);
  }
MPI_Bcast(B[0], N*N, MPI_DOUBLE, 0, MPI_COMM_WORLD);
for (i=0; i<stripSize; i++) {
for (j=0; j<N; j++) {
    C[i][j] = 0.0;
   }
  }
for (i=0; i<stripSize; i++) {
for (j=0; j<N; j++) {
for (k=0; k<N; k++) {
     C[i][j] += A[i][k] * B[k][j];
```

```
      }
    }
  }
if (myrank == 0) {
offset = stripSize;
numElements = stripSize * N;
for (i=1; i<numnodes; i++) {
MPI_Recv(C[offset], numElements, MPI_DOUBLE, i, TAG, MPI_COMM_WORLD, MPI_STATUS_IGNORE);
offset += stripSize;
    }
  }
else {
MPI_Send(C[0], stripSize * N, MPI_DOUBLE, 0, TAG, MPI_COMM_WORLD);
  }
if (myrank == 0 && N < 10) {
for (i=0; i<N; i++) {
for (j=0; j<N; j++) {
printf("%f ", C[i][j]);
      }
printf("\n");
    }
  }
MPI_Finalize();
return 0;
} (http9)
```

Modern alternative architectures for parallel computing (Data Flow)

Data Flow architecture is a computer architecture that directly contrasts the traditional von Neumann architecture or control flow architecture. Data Flow architectures do not have a program counter, or (at least conceptually) the executability and execution of instructions are solely determined based on the availability of input arguments to the instructions, so that the order of instruction execution is unpredictable: i.e. behavior is undetermined. Although no commercially successful general-purpose computer hardware has used DataFlow architecture, it has been successfully implemented in specialized hardware such as: digital signal processing, network routing, graphics processing, telemetry, and more recently in data warehousing. It is also very relevant in many software architectures today, including database engine designs and parallel computing frameworks.

Synchronous Data Flow architectures tune to match the workload presented by real-time data path applications such as wire speed packet forwarding. Data Flow architectures enable deterministic in nature programmers to manage complex tasks such as processor load balancing, synchronization and accesses to common resources [14].

Meanwhile, there is a clash of terminology, since the term Data Flow is used for a subarea of parallel programming: for Data Flow programming.

The execution is driven only by the availability of the operands! No Program Counter is used and global updateable store, which are the two features of von Neumann model that become a challenge in exploiting parallelism are missing in Data Flow architecture.

The execution algorithm of the Data Flow instructions in pseudo code can be:

```
WHILE (AVAILABLE_OPERATIONS
(STATE)) {
STATE = EXEC (AVAILABLE OPERATION(
STATE), STATE)
}
OPERATIONS "FIRE" WHEN
ALL INPUTS ARE AVAIALBLE [15]
```

We can write a program, and send it to the MAX2 card, for the MAX2 card kernel, and the kernel will bring it back to the host. In addition, we will give a modified Java program for execution in Data Flow architecture:

```
package ind.z4;
import com.maxeler.maxcompiler.v1.kernelcompiler.Kernel;
import com.maxeler.maxcompiler.v1.kernelcompiler.KernelParameters;
import com.maxeler.maxcompiler.v1.kernelcompiler.types.base.HWVar;
```

```
public class example4Kernel extends Kernel {

public example4Kernel(KernelParameters parameters) {

        super(parameters);

        // Input

        HWVar x = io.input("x", hwFloat(8,24));

        HWVar y = io.scalarInput("y", hwFloat(8,24));

        HWVar result = x + y;


        // Output

        io.output("z", result, hwFloat(8,24));

        }

}[16]
```

Nevertheless the implementation of the parallelism into Data Flow architecture is still a process in the beginning. The hardware created is expensive and rare to find. This technology is still developing and not yet consolidated. But we can say for secure that the Data Flow is the future of parallelism.

VI. Performance issues

After the programs are executed in OpenMP, MPI, and Maxeler, the results of speedup, latency, and the overall performance, is expressed in the table below.

TABLE I PERFORMANCE OF EXPERIMENTAL BENCHMARKING

Platform	Matrix rank	Cores	Processors	Speedup
OpenMP	10000	4	1	5.6x
OpenMP	10000	2	2	8.2x
MPI	10000		4	10.4x
Maxeler	10000			27x

VII. Conclusions

An adaptive parallel matrix multiplication algorithm is optimized for a shared memory architecture running in OpenMP and distributed multicore architecture running in MPI.

Parallel computing is a trend of our age and is pushed and forced into the computing paradigms just as Object Oriented was pushed in the previous millennium into the programming issues. There are several types of parallel computing, regards to the hardware architectures (shared or distributed memory systems and data flow architecture systems). The hardware is parallel so the Kernel is parallel. There are many levels of difficulties in the parallelism. Some problems do not have work-efficient parallel algorithms that allow the effective parallelism. Some of the parallel algorithms do not have the same level of numerical stability as well-known sequential algorithms. It is needed a very careful benchmarking process to be secure for the effectiveness of the chosen architecture for parallelization, because some time choosing an inappropriate platform can yield to a failure parallelism.

As a final conclusion, we would like to stress the fact that the Data Flow computing is the future of parallelism in data processing.

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ANALYSIS ICT KNOWLEDGE OF STUDENTS: FACULTY OF TRANSPORT AND TRAFFIC ENGINEERING

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Abstract - The aim of this study was to examine the level of ICT knowledge and skills among the student population at the Faculty of Transport and Traffic Engineering. How would we have contributed to raising ICT skills of students? The main task is to establish a methodology improvement and harmonization of curricula with European standards and the needs of traffic faculty.

I. INTRODUCTION

The students at the Traffic science Universities are expanding their knowledge of the Information and Communicaiton knowledges (ICT[1]) through the subject of Computer science, at the first year of the study. The students are achieving their basic knowledge in this field during the primary and secondary school education. The goal of this research is to determine the ICT knowledge of students, which have been achieved during the primary and secondary school education, to increase the level of ICT student competence at the higher level.

The ICT student competence needs to be synchronized with the European standards (*FCDL-Finnish Computer Driving Licence* and *ECDL-European Computer Driving Licence*) and the courses of professional computer science education, in the field of traffic science.

The appliance of ICT technologies in the system of education could be divided in two groups:

A. Individual teaching and instructions

- Practice and repetition at the knowledge and skills acquire
- assistance in the search of information and data-bases;
- the communication with the expert in the given field;
- text processing and work with the tables;
- The function model of complex system simulation, with the goal of understanding the system operation.

B. Group teaching and instructions

- E-Mail communication (student, teacher, parent)
- program support for the presentation of the work results within the group work
- video presentations
- program support for the video conferences for the distant groups;
- Communication within the unapproachable locations;

Which ICT competences should the students at the universities for traffic sciences acquire, during the Computer science courses? Should the emphasis lay upon the improvement of their general IT competence, or, should the pedagogic work basis lay on the specific computer science competence?

One of the most significant pre-conditions, enable students to achieve specific IT knowledge in the field of traffic science, is that the students should hold the previously achieved knowledge in the field of computer science. The informatics literacy, which the students acquire during primary and secondary education, as well as during the individual education. The equipment at the computer labs, usage of adequate study books, software legalization and the teaching personnel in the primary and secondary school education are the key factors, which have the influence on achievement in basic ICT student competencies. European Commission started the initiative for improvement of informatics literacy in Europe in 1995. The document, titled “European frame for the key-competencies” has been created a result of this initiative. It has an important role in raising the informatics competencies in European countries. This document also helped to achieve a

[1] ICT- *Information and communication technologies*.

standard of the informatics competencies and knowledge (*ECDL-European Computer Driving License*) as well as to adjust the education systems in the EU countries. As a part of the reform of primary and secondary education, Ministry of education of Republic of Srpska had earmarked significant funds for equipping the computer cabinets, teaching personnel education and forming of school information systems. The investment had an objective to enable the creation of better conditions for achieving the basic ICT competencies for the students of primary and secondary schools. That represents important input level to raise the ICT knowledge among the students at the traffic science universities.

II. ACHIEVING THE ICT KNOWLEDGE AT THE TRAFFIC SCIENCE UNIVERSITIES

Due to the long interval of teaching "Informatics" through the primary, secondary and individual education, the questions for the need of realized lessons in IT at the traffic science universities, have been imposed? The assumption is that the students have achieved necessary ICT knowledge to be able to attend the lessons at the traffic science universities and that there is no need to raise the student ICT competencies at the higher level of knowledge.

Upon organization of informatics classes at the Universities for Traffic Science, the question is imposed, if the general educational model for realization of informatics classes should be used, or traffic science universities should make the education models, which are adapted for their personal needs.

The process of adoption of IT knowledge, from the point of view of beforehand developed methodologies, could have larger significance in the matter of value, than the effects by itself, presented through the number of (*ESPB- European Credit Transfer and Accumulation System*) points, results of learning, or, quantity and quality of achieved knowledge, respectively. We must take the fact in consideration that the student achieves a part of the IT knowledge through the individual activity (Internet, social networks).

Some IT contents need a longer time to learn, as they need the time to revolve and discover the knowledge through engagement of various cognitive abilities and creative-critical approach to learning. In such manner, the students are achieving the high-level knowledge, which would not be easily forgotten, which is easy to structure into the existing cognitive schemes, and which is easy to use, transform, and apply in the different professional subjects, which are requiring IT knowledge.

We could conclude that the informatics literacy, with reference to the raising of ICT competences of students, represents one system overall.

"One complex system of evaluation must drive; it must generate developmental changes in didactical-methodical and pedagogic organization in the faculty education as a whole" (V.Banđur, 1997).

III. RESEARCH AND RESEARCH RESULTS

The research is based upon the measuring of ICT knowledge among the students, which the students achieved during the primary and secondary education.

To determine the ICT knowledge of students, it is necessary to analyze the student achievement during the secondary education, with the insight in the IT subjects and grades. These grades should serve as a diagnostic parameter. Due to the data transparency, the input test of skills and knowledge of students has been done, in accordance to the educational informatics modules and rules following the logic of knowledge tests.

The students have been tested through two diagnostic tests of same structure, the multiple choice questions, which were used in order to check the informatical knowledge and skills. The test-questions have been formed out of the European standard data base (*ECDL-European Computer Driving Licence*).

- First diagnostic test (Test of Knowledge) has been realized in hte classic maner. The task was to determine the informatical knowledge among the students, in accordance to the European standard.
- The second diagnostictest (Test of Skills) has been realized as an online test. The task was to determine the informatical skills among the students, in accordance to the European standards.

One of the basic parameters, which were used to evaluate the informatics knowledge and skills is a system of measurement of the achievement of students, where the concept of „measure“ represents a certain standard, which has been used to examine the level of ICT knowledge and skills of students attending the traffic science universities.

To evaluate the variable informatics parameters, we have used a different measure instruments. One of the measure instruments used to make a poll among the students concerned their final grades achieved in the secondary school and the type of the school they attended.

IV. METHODS

The target group is consisted of 219 students, which are attending the first year at the University for Traffic Scinence in Doboj, as a part of the University from East Sarajevo. The students are registered for the 2013/2014, and which are attending the Computer science[1] course for the first time. The target group falls under the category of intentional sample, and is consisted of the group of 170 first-year students at the Traffic Science University in Doboj.

The target group represented in percentages, represents 77.63% of total population. Therefore, we can use the sample in the further researches as a valid one.

The variables in this analysis are represented in the data acquired from two diagnostic tests (*Test of Knowledge, Test of Skills*), which have been performed at the class of the subject of „Informatics“, while, the third variable represents the achievement of the high school students in the field of informatics, as part of final grades. *(Average grade in high school).*

The goal of these two diagnostic tests was to present the knowledge and skills as an aggregate (informatic competence) achieved from students in their previous education.

We have acquired the following data through this research: demographic information about the student gender, the information about the structure of high schools, the information about the achievement of students, in a form of final grades, the information about the results of diagnostic tests of skills and knowledge. All information, acquired through the research, has been presented in the following diagrams.

According to the demographic information related to the student gender, 170 students took part in this research. Out of this number, 109 were male and 61 female students. The larger number of male population is also noticeable at the Chart 1. The reason is that the research took place at the Traffic Science University, where we have a significantly higher level of registered male population among students. Therefore, such gender ratio is expected.

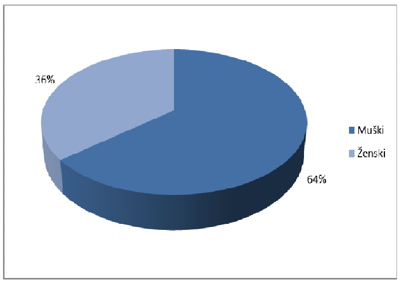

Figure 1. Demographic structure of students.

Using poll-techniques, we have polled the students at the Traffic Science University in Doboj and gathered the information about the structure of obtained high school level, as shown in the Chart 2.

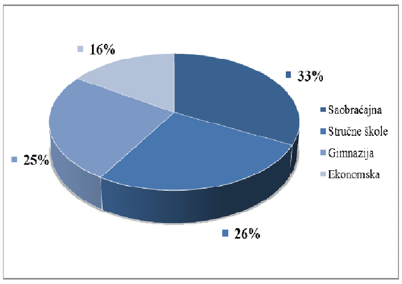

Figure 2. The percentage of obtained high schools by the polled students.

As an indicator of the student achievement in the field of Informatics throughout the high school, the average final grade from the informatic subjects has been taken, as it is shown in Chart 3.

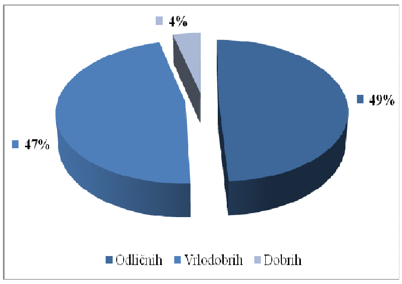

Figure 3. The display of average final grades in high school

The data collected through the tests (*Test of Knowledge i Test of Skills*) have been displayed percentual, as it is shown in the Chart 4 and Chart 5. Total number of students is 170, where 128 students took part in the diagnostic tests (*Test of Knowledge*), whereas 127 students of Traffic Science University in Doboj took part in the second diagnostic test. (*Test of Skills*) The numeric discrepency between the total number of students who took part in the tests and the number of studets who took part in the partial diagnostic tests occurred while a certain number of students did not take part in one of the tests.

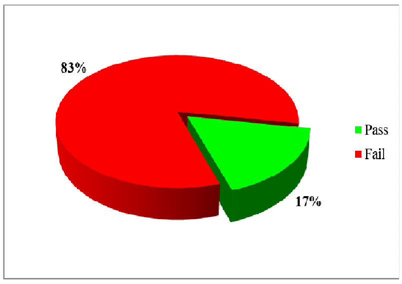

Figure 4. The percentage of success at the IT knowledge test (Test of Knowledge)

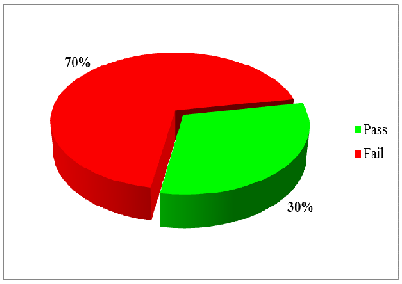

Figure 5. The percentage of success at the test of IT skills (Test of Skills).

The information obtained through the research has been processed, using standard software tools and they have been analyzed using statistical methods.

The following tools have been used in the statistical processing: Microsoft Excel 2007 and IBM SPSS Statistics 20.

The data process and analysis have been submitted to the following statistical methods:

- The display of distribution of variable frequencies (Test of Knowledge , Test of Skills and Average grade in high school)
- Descriptive statistical method: minimal value (Minimum), medium value (Median) maximal value (Maximum), arithmetical medium value (Mean), standard deviation (Std. Deviation), standard error (Std. Error of Mean).
- The Kolmogorov-Smirnov (KS) test used ot demonstrate normal distribution of variable results (Test of Knowledge , Test of Skills and Average grade in high school).
- The Correlation analysis method has been done using Pearsons coefficient between the variable pairs (Test of Knowledge - Average grade in high school Test of Skills - Average grade in high school).
- We have examined the correlation coefficient significance, using Student test, or t test
- The analysis have been realized with the level of confidence of 95% (where the error possibility is $r \leq 0,05$).

Table I. DESCRIPTIVE STATISTIC

		Test of Knowledge	Test of Skills	Average grade in high school
N	Valid	128	127	128
	Missing	0	0	0
Mean		24,898	20,457	4,388
Std. Error of Mean		0,3159	0,381	0,049
Median		25,000	21,000	4,330
Std. Deviation		3,573	4,294	0,553
Minimum		16,000	8,000	3,000
Maximum		35,000	27,000	5,000

The descriptive analysis has been made over the collected data and the results are shown at the Table 1.

The distribution normality has been done using Kolmogorov-Smirnov (K-S) test.

TableII. K-S TEST RESULTS

		Test of Knowledge	Test of Skills	Average grade in high school
N		128	127	128
Normal Parameters[a,b]	Mean	24,898	20,457	4,388
	Std. Deviation	3,573	4,294	0,553
Most Extreme Differences	Absolute	0,074	0,121	0,209
	Positive	0,074	0,064	0,204
	Negative	-0,074	-0,121	0,209
Kolmogorov-Smirnov Z		0,840	1,360	2,370
Asymp. Sig. (2-tailed)		0,481	0,050	0,000

a. Test distribution is Normal.
b. Calculated from data.

Based upon the results shown in Table 2, where the KS tests results for variables are larger as largest empirical distribution discrepency from normal curve, we surely can conclude that the distribution for all three variables is normal.

We have examined the link between the variables, using the correlation method (*Test of Knowledge, Test of Skills and Average grade in high school)*. To be able to examine the normal division of research results, wehave used the Pearsons correlation coefficient.

Since the standard deviation and covariance between variables are apparent, than we can use the Pearsons correlation coefficient in accordance to the Equation 1,

$$r = \frac{\sigma_{xy}}{\sigma_x \sigma_y} \quad \text{..(1)}$$

where the values are:

Σ_{XY} - covariance between variables (*Test of Knowledge - Average grade in high school and Test of Skills - Average grade in high school*)

Σ_X – standard variable deviation (*Test of Knowledge and Test of Skills*)

Σ_Y - standard variable deviation (*Average grade in high school*)

The results obtained through the Pearson's correlation test for variables are:

Test of Knowledge - Average grade in high school

$-1 < -0{,}040 < 0$

Test of Skills - Average grade in high school

$-1 < -0{,}099 < 0$

To be able to determine if the correlation coefficient is statistically significant (different as Zero), we need to make further tests, using student or t-test. The hypothesis for correlation coefficient test is:

$$H_0 : r = 0$$

$$H_1 : r \neq 0$$

The t-function calculation is performed in accordance to the Equation 2:

$$t = r\frac{\sqrt{(N-2)}}{\sqrt{1-r^2}} \quad \text{..(2)}$$

Since t_1= -0,4456 is a value for a correlation variable coefficient (Test of Knowledge - Average grade in high school), and t_2= -1,1141 is a value for correlation variable coefficient (Test of Skills - Average grade in high school).

We are taking the coefficient of a theory of t-test out of the table of students' distribution. The level of freedom is calculated, using the Equation 3.

t_t=1,96 for the 95% confidence

$$DF = N - 2 \quad \text{................................(3)}$$

Since the values t_1 and t_2 are lower than tabular values (t_t) we can accept the H_0 hypothesis in both cases, and consider that r = 0.

Based on the correlation test as well as significance test, we can say that the dependence between the diagnostic tests and the average high-school grades is negligible.

The diagnostic knowledge and skills tests, as well as the average grade in the informatic subjects in high school could be used as a valuable evidence of informatic competence of students, before they start their lessons at the Traffic Science University in Doboj.

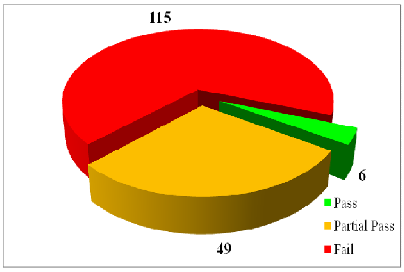

Figure 6. Total successful pass grade by students

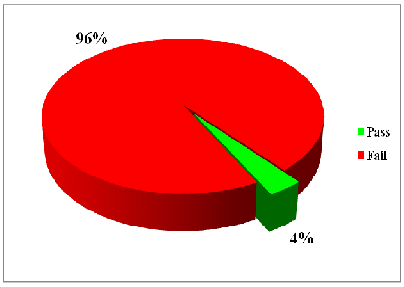

Figure 7. Total percentual succesful pass grade

Based on the diagnostically tests results (Charts 4 and 5) and the high-school pass grades, we have obtained the following conclusions.

We can confirm the H0 hypothesis, that the student` informatics competences at the first year of studies at the Traffic Science University are not satisfying the competences defined by European standards, which we have demonstrated through a number of statistical analysis. The insight in the previous statistical analysis could help us to make a conclusion that there are no statistically significant correlations between the average grades from the high school and diagnostic tests.

V. CONCLUSION

Based upon the presented analysis results of ICT competences for the students of Traffic Science University in Doboj, we can consider following needs and possibilities.

Newly designed syllabus, which implies standardization of informatics education (ECDL).

Introducing new informatics knowledge and skills with the goal of increasing of ICT competences of stunts and their realization, with the objective to optimize the learning process.

Modelling the system of informatics education at the Traffic Science Universities, in order to support students to obtain the ICT knowledge and skills individually.

Implementation of value system, in order to control future steps in organization of future IT education and to accommodate the IT education to the needs of Traffic Science Universities.

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STABILITY SAFETY AND ABUSE OF BUSINESS INFORMATION SYSTEM

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Abstract - Information systems are inevitably facilitates business and increase profits at the global business scene. Benefits of new technologies bring many risks. Inadequate protection of business information systems often leads to the loss and misuse of valuable and confidential data loss database often leads to liquidation of the subject. This paper presents the basic principles and specifications of the protection system, disruption of security systems, and business systems layer of protection with regard to adopted standards pertaining to the subject. Although modern technological solutions aimed at preserving the information systems of an information system is not completely safe. Prove that frequent incursions into the world's most closely guarded information systems. The aim of this paper is to bring the issues mentioned scientific public and users of business information systems.

I. INTRODUCTION

E-business is much broader and easier defined term used by the general idea of e-commerce. Electronic commerce is narrowly focussed on shopping on the Internet, and in a broader sense means each virtual electronic commerce and support to these business activities. Thus, there is an assertion that electronic commerce encompasses the entire electronic world, the organizational activities of market exchange, while others suggest that e-business includes total internal and external electronic-based activities, including electronic commerce.

This means that e-business is composed of the same elements as well as e-commerce, but also includes the business activities (e.g., management). In order to understand better this there is a need to distinguish between these two concepts, because these are two quite different things. Studies show that e-business e-commerce turns into exactly when it appears exchange values, as can be seen from the following example. E-commerce primarily involves transactions that cross-organizational boundaries. E-business primarily involves the application of digital technologies for business process within the organization.

II. RISKS OF INTRODUCTION OF ELECTRONIC BUSINESS

The main risks associated with the introduction of e-business are certainly that, this investment will pay off as the competition scooping forward. In addition, any participant in the supply chain now has an increased chance (and desire) to skip all the other participants who share the final consumer.

This is first reflected in the market CDs, and software, but does not require deep thinking to the development of e-business and the associated higher tectonic disturbances at all possible markets, products and services. In any case, the conclusion is that the great flexibility stands out as the only way of survival for each participant in the supply chain flows of goods.

Experience has shown that several basic mistakes of users, as well as the weaknesses of this type of business differentiated in practice:

- lack of sensitivity compared to existing partnerships (fear of exclusion from the distribution chain, the development of e-business uncoordinated compared to partners, etc.). ,
- excessive demands by customers or service users, who want to take advantage of e-business, which are probably formed because they promised everything and (presumably and collected)
- Fear of increasing taxes on the use of internet, when a company completely switches to it,
- the need to increase knowledge of various international regulations, directly associated with the globalization of markets (as well as for their development, because it is much more still insufficiently regulated in this area),

- data security on the Internet [1].

From all the foregoing, it is not surprising slow and uncertain enterprise integration to a new way of doing business. Often faced with everyday problems, companies do not have the courage to try to improve their business in some way unknown to them yet. However, there is another side to the coin. There are companies that have the time to see greater benefits provided by electronic commerce. These companies are knowingly took the risk in the distant future (if not closer) and will feel the positive effects of the brave actions that are taken. Unfortunately, in our country it is still slow, but bold move that signals a different, innovative and more reforming thinking and doing business. In addition, it is all in the direction of world globalization, often disputed, but in a way necessary. Improvements in physical and electronic bandwidth are produced by the new challenges of managing the volume, velocity and variety of data. Central to these challenges is that they are all the same information that can be stored in the same manner and transfer. A simple analog digitization flow between data points cannot lead to a continual flow of information.

III. E-BUSINESS MODELS

E-business today integrates all aspects of interaction. Different authors give different interpretations. Some mention the topic of e-business model thinking in B2B (Business to Business) and B2C (Business to Consumers) business.

These models are very important, because it is in a completely different way of accessing e-commerce, according to it. The communication on the Internet takes place between different organizations or individual customers.

A. B2C e-business

It is one of the most popular types of on-line business-oriented individual consumer in electronic commerce. This type of e-commerce is focused on marketing the sale of products and services. Among the most famous companies of this type are Dell, Amazon.com and E-Bay, which are sold to consumers done over the internet. Internet users are increasingly attitude toward the Web as a new market space.

Nevertheless, it should be noted that, currently, the placement of the on-line form has problems, since many countries impose taxes on such sales (e.g., USA), protection of privacy, protection of intellectual property rights, consumer protection, speed, network reliability, and security feature.

Nowadays in the world, there are hundreds of sites via electronic commerce that are very successful in business and consumer markets. Through this model, companies are looking for new innovative ways to sell products and services online. Through this type of trade buyers have a much greater choice of products at lower prices as compared to buying in the traditional trade system [2].

B. B2B e-business

B2B e-business model is a business model that is based on business relationships between business entities with a turnover that is three times higher than the B2C e-commerce. B2B e-commerce covers a very wide range of applications (e.g., computer electronics, household utensils, motor vehicles, food, etc.) which allows to entrepreneur to form an electronic relationship with distributors, suppliers and other stakeholders. Through the Internet most economical platform for B2B e-commerce is provided, and there is the possibility of connecting companies with no need for supplementary network. Time B2B electronic trade contributes to lower procurement costs, reduce inventory, improve logistics efficiency, increase sales and reduce sales and marketing costs. Key entities B2B for all the shops are:

- the sale of the company (marketing management)
- Acquisition Company
- Electronic intermediaries (providers of intermediary services by third parties)
- suppliers
- network platforms (Internet, intranet and extranet)
- protocols and communication
- background information system [3].

IV. IMPLEMENTATION OF B2B MODEL ON THE EXAMPLE OF: ELEKTROVOJVODINA D.O.O. "ELEKTRODISTRIBUCIJA NOVI SAD"

E-commerce business explains where all transactions are carried out primarily by electronic means. As has been repeatedly pointed out huge advantage is the liberation of the time required for these tasks, and providing space orientation on strategically important tasks. The realization of e-business is achieved through various communication tools (Internet services), but in this paper we will present two software which can perform electronic payment: Halcom and FX Clijen-PEXIM.

Electronic payment system can be defined as a way of performing financial transactions in the country and abroad. Expressions specify the mode of operation such as e-banking, banking for the company (so called corporate banking). Creating an account to transfer monetary assets of the company to a commercial bank with multi e-banking (B2B models using E-Bank). Multi-Bank E allows payment system and payment operations. This system provides a payment system with two types of orders for transfer: Transfer Payments and compensation.

Creating electronic accounts in dinars is a multi-phase and only a person can perform each phase with the proper authorization by one or more of the software, depending on the business of the bank where the company has a current account and the necessary amount of funds in these accounts for the execution of the given order. The processing of electronic order entry makes payment orders, signing and sending (Shipping) payment order to the bank. The next phase of the operation said: the person responsible for creating an account via the smart card (if the program requires that a) applying their work, entering data and form a package that the option "export" through the network forwards the authorized signatory. Authorized signatory through ownership of the card through "Import" data, or order, supervise them and check them, sign and sent to the bank for execution.

Multi-Bank E enables electronic payment transactions abroad by using two types of orders: orders for payment abroad VP-70 and General transfer order. The method of operation is carried out as follows: Name of the person starts to create order from the main menu preparation / orders. The result is a tabular presentation of accounts that are in a state of "prepared", "Error" or "checked". All orders to "Halcom" can be administered to the surviving or create a new one. If they exist, shall be made only to be changed, and occur starting on the button (to / from) and selecting Import. After this operation receives new orders, which are tabulated overview. After their checking and signing and send to the bank, executed orders are stored in the file archive.

V. ELECTRONIC CONTROL

Control of electronic payment is done by an authorized person who is entitled to a special authorization granted. Verification is performed using a smart card and by direct inspection of the condition of all current accounts (if the company has more current accounts) and looks at what stage are to send orders to the bank. In this way, an authorized person receives a realistic picture of the situation, without any special intervention in the bank's payment system. Information is new and up to date as such objectively useful for further channeling business moves. In both implementation of software for electronic payment, check is made to access to the archives in which orders can be found under the following status: sent, pending, completed or rejected (with comments rejection reason).

Control of implementation of electronic payments must always begin by giving orders to update the situation. This means activating the option communication / synchronization and an agent then enter your code to work smart cards "Halcom" While in the software package FX Client PEXIM in the main menu, choose Sync. Only after these procedures, which practically means "See what has been done" you can see the true state of the balance of the order if an order should be implemented in a very short period of time is assigned a label "urgent" and he is transported, but at the expense of those who were sent to about 15 minutes (rapport during the first treatment by the bank, i.e. shall not be retained in the Bank's operations or little), but is charged at higher rate than a commercial bank in which the customer have a current account.

Authorized person carries out control of local currency and foreign currency statements perform payment transaction, which prints and forward them for further processing. Entering data in the executed orders must be placed on the printed statements. Both software supports freedom of the press from the database statements with terms of payment required [4].

VI. BENEFITS AND REQUIREMENTS OF E-BUSINESS

Digital age, in which humanity has already embarked; change is traditionally present on the current way of life and work. Information technologies have led to changes in all areas of human work and life.

Technological blend of modern computers and modern communications announces Revolutionary changes that affect fundamental changes in the way of payment transactions of companies, both at home and abroad. Business that we do now know in the near future will no longer exist. New concepts, based primarily on digital technology will have a strong influence on the creation of new business models of companies.

With the advent of these new models formed requirements and imposes advantages in the application of e-business:

- electronic-payment processing client banks can carry out your work area (or through the laptops if the software installed on it) without the help of bank employees and at any time (24 hours a day, 365 days a year)
- digital signature provide transaction security, because the sender of the message may have an interest in each other using cryptographic message signs, ensuring the safety of transaction, can always be mathematically proved that it's the same sender. Therefore, that he can always be measured, while his own signature is difficult to identify with certainty.
- request-largest in the application of e-business practices in the company's originality documents and information. This is a serious obstacle, because the request is usually reduced "in writing signed original" paper documents also in order to ensure the integrity of the document and the information in the document can be changed. An electronic environment makes an artificial distinction between "original" and up because when transmitting messages from one computer to another, you string that can be called original no different from the other, called "copy". This is essential to determine the integrity and credibility of the message, or that an electronic message is sent from a person and that changes are not done. This is essential, as this proves its originality [5].

There are reliable procedures that exceed this uncertainty and to connect with the requirement in respect of the original and the national regulations. Therefore, UNCTRAL law in Article 8 provides that: "Where the law requires information to be presented and preserved in its original form, that requirement in relation to the post is met if:

- There is no reliable guarantee of the integrity insufficient activities information from the moment it was first generated in its final form, as a message or other form,
- When requested to Information By present, such information can be presented to a person who needs to be present.
- Biggest fear when performing electronic transaction of the company is just a question of their protection.

Asked how much is it sure, only one answer can be given: there is no the absolute safety and security of transactions. In other words, although there is a remote possibility that an unauthorized person question the integrity of the transaction it still exists. Consequently, the question arises which minimizes these risks? It is a technique encryption (encryption). In fact, there are various measures of physical and logical security while protecting data in order to prevent unauthorized access or unauthorized alteration of data, but the "public key cryptography" or "double-key cryptography" known as a digital signature has been the most appropriate to protect the system.

VII. Conclusion

It is possible to have a good protection of business information systems without spending additional resources. Using advanced technology and a wide range of protective measures, operating systems and applications are more efficient than ever before, and do not require constant maintenance. These programs provide permanent protection and may even in some cases to accelerate the operation of the computer. Advanced generation of enterprise brings better stability. Features and functionality at a higher level, which seems to have become a versatile business IS. This paper is a proven second hypothesis to strengthen competitiveness in the areas of enterprise systems and can provide the legal protection. Business software a licensed and their illegal use are punishable unless it is a free application. By using the Licensed Software, it provides the smooth operation of the electronic mail, banking, shopping on the internet, and others.

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BLENDED LEARNING AS THE INTEGRATION OF TRADITIONAL AND ELECTRONIC EDUCATIONAL MODELS

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Abstract - The article reviews the issues of integration of traditional and e-learning. It shows the possibility of eliminating the drawbacks of the traditional model of education using e-learning technologies (E-Learning) and building a mixed model.

For centuries, the traditional educational model has been exposed to all possible modernization and reforms, standardizing elements of the educational system, activating the process of learning or improving teaching methods and upbringing, but they never affected the traditional structure of the organization of the educational process with the model «face-to-face». The Introduction of information and communication technologies (ICT) in education mainly perceived as technical innovation, and processes of informatization of education had success:

- Technical upgrading of all educational institutions(computerization phase);
- Increased a basic level of ICT-competence of teachers(training phase).

High rate of ICT development and networking technologies, their practical implementation in the educational process, the improvement of remote technologies and informed understanding of the benefits of digital technology have led to the introduction of «E-Learning» in the 90s. E-learning technologies based on ICTs, all firmly are coming into the traditional educational model to improve the effectiveness of teaching and learning. The complex structure of the e-learning allows it to integrate all components of the educational system (objectives, content, tools, methods and activities of teachers and students), to enhance their capabilities and functionality, changing the role of participants in the educational space, complementing and improving the methods, approaches and technology cooperation, teaching and learning processes.

Different learning models are created which are based on a combination of traditional and innovative technologies in various ratios depending on current pedagogical and organizational tasks:

- distant learning;
- blended learning;
- on-line learning;
- off-line learning;
- mobile learning (m-learning);
- electronic tutoring etc.

The concept of e-learning does not involve a revolutionary change in the traditional model of the educational process. History has shown that only those innovations can have success in education, which do not oppose to the traditional and fundamental principles and basic education system. The forecast about the death of the traditional «face to face» model and a full transition to open education, in our opinion, maybe justified, but only in a corporate training, adult education, or to obtain an informal education. Classical Russian education (general and vocational) must preserve the best traditions and enrich itself with technological innovations based on interdisciplinary achievements in the field of informatics, cybernetics, information - communication technologies, psychology, mathematics, philosophy, and management [2, 91].

Educational institutions in the implementation of tools and technologies of e-learning face contradictions, which are natural for innovation process:

- Betweent radition and modern tendencies, associated with technological progress: "adaptation without denying their roots" [UNESCO Report, 1, p.10].
- Between having a plenty of modern electronic media for educational purposes(EMEP) and lacking of conditions

for optimal functioning EMEP and related technologies that improve the efficiency and quality of the educational process.

- Between developments in ICT, providing a great opportunity of using them in the educational process, which are definitely obvious, but theoretically and experimentally not proven benefits of e-learning in terms of pedagogical appropriateness and effectiveness.

These contradictions raise a typical problem for educational institutions in the process of organizing and managing the effective implementation and optimal functioning of the tools and technologies of e-learning to improve the quality of education.

The complexity of implementing e-learning as a pedagogical innovation is that all innovations in pedagogy were born in the very teaching science or practice in innovative workshops of individual teachers or educators. The base of e-learning is technological advances in computer technology, information and communication technologies, and their improvements are not parallel to the improvements of the educational process, based on the technologies of e-learning. Implementation of e-learning is hampered by the fact that it should systematically affect methodological, conceptual and human resource base of the educational process [3, p.117]. E-learning is a system that, embedded in all elements of the educational process, affects both didactic and organizational frameworks, extending the range of its participants. In connection with that, administrators and organizers of the training process join the teacher’s work, as well as service of creating a content and relevant tools and technologies of e -learning.

The process of implementing e-learning tends to have the same reasons of being unrealized, like most pedagogical innovations: the lack of necessary professional expertise and validation of pedagogical efficiency; unpreparedness in organizational, technical, personal and psychological ways.

Nowadays, the benefits of e-learning technology are obvious:

- increasing levels of collaboration and feedback between participants in the educational process (blogs, forums, video conferencing, wiki - libraries, e-mail, etc.);
- going higher the level of accessibility and visualization of educational material (presentations, videos, simulation models, etc.);
- appearing more opportunities for independent learning through access to additional sources of information (digital libraries, knowledge bases, databases, access to global information and educational resources, etc.) that allow students not only to form a critical attitude to the studied issues, but to gain knowledge in advance.

However, the educational community has not yet fully prepared to adopt e-learning as a technology for solutions of didactic tasks and means of improving the efficiency and quality of education.

In our opinion, a prerequisite for the successful implementation of e-learning is the integration of traditional techniques and methods of teaching with e-learning technology and the formation of a mixed model learning (blended learning). In a foreign practice, blended learning is a kind of compromise between the traditional model and e-learning. The essence of the blended learning model is the optimal combination and integrated way to the classical pedagogical methods and approaches. Implementation of the principles of optimality and integration should be based on systematic studies. Constructing a model of blended learning must consider all the factors and properties of the system, which will be selected for mixing formula. Integration of e-learning technologies in the traditional educational model allows a classical educational process of teaching and learning to be optimized by:

- exempting from certain obsolete ways of transmission and acquisition of knowledge (in the form of lectures to inform students and the requirement to write down information, etc.);
- increasing the level of organization of feedback through interactive learning with each other and with the teacher, so it becomes as cooperation, enriching interaction in systems "student -student" and "teacher-student".

In our opinion, it is impossible to oppose the traditional to electronic training. Only the integration and synergetic processes can help to eliminate the shortcomings in the traditional model of training "face to face", through the construction of a mixed model. It is necessary to consider some of the shortcomings of the traditional model of education that became apparent with the advent of the achievements in the field of informatization, computerization and development of communication technologies:

- Irrelevant contents of educational material;
- Obsolete forms of presenting the theoretical material (lectures in the form of dictation or explanation on the "fingers" of things which are possible to show, getting closer to real situations and etc.);
- The low productivity of practical and laboratory works;
- The low level of feedback and interaction of participants of educational process;
- Outdated approach to the assessment of learning outcomes;
- Low involvement of students in the learning process.

Table 1 shows the analysis of the reasons and ways of their elimination with the help of e-learning technologies.

Table I. ANALYSIS OF DISADVANTAGES AND THEIR REASONS IN TRADITIONAL MODELS OF LEARNING AND WAYS OF THEIR ELIMINATION WITH E-LEARNING TECHNOLOGIES

Disadvantages of the traditional education model	Reasons	Ways of elimination of lacks with the help of E-learning technologies
1. Irrelevant contents of educational material	• Obsolescence of knowledge; • Large time gap between writing and publishing of textbooks.	• differentiated approach to fundamental and applied knowledge (suitable combination of traditional and electronic technologies, the delivery of educational material); • e-learning tools and technologies can effectively organize the educational process, which will not depend on the ICT-competence of the teacher or the technical capacity of the educational institution - e-courses, e-books, other educational resources etc.
2. Obsolete forms of presenting theoretical material (lectures in the form of dictation or explanation on the "fingers" of things, which are possible to show, getting closer to the real situations, etc.)	• **Weak basic training of students:** the inability to listen and to perceive the information aurally, to focus attention on the main, to analyze and make conclusions; • **Insufficient level of teachers' professionalism:** monotonous dictation of theoretical material without reference to the real conditions	• Variable set of theoretical material accommodation: CD, electronic textbook, electronic course, LMS, OOP will help highlight the difficult moments on lectures and pay attention to the practical orientation in class; to consider issues that are impossible to learn without a teacher; • E - Learning lets increase the efficiency of classes for those who visit them and gives working students or students with disabilities. an opportunity to learn the theoretical material (free of charge)
3. The low productivity of practical and laboratory lessons	• Lack of necessary laboratory equipment or its rapid obsolescence; • Difficulties in the classroom to create the conditions which are close to real: banking; insurance cases; judicial activities; oil production, etc.	• Virtual laboratories, workshops, art galleries, museums, etc.; • Simulation of real situations and processes; • E-courses with integrated video, animation, illustration, etc.
4. The low level of feedback and interaction	The predominance of the traditional model of group interaction: "teacher - student" hampers: • implementation of pedagogical technologies of personality-oriented education; • communication of students and teachers, students and teachers; • monitoring the progress, achievements and challenges in mastering educational material by each student.	E-learning tools and technologies (e-mail, forums, blogs, e-magazines, e-tests, LMS, Skype, etc.): • expand the set of models of engagement ("student-teacher", student-student, teacher-teacher"); • increase the level of feedback; • allow to support the monitoring of progress up-to- date.
5. Low involvement of students in the learning process	The classical model of the educational process in higher and secondary vocational training does not require daily homework, except for certain specialties.	E-learning tools and technologies cannot be limited by the framework of the training sessions. The involvement of the students in the educational process can be ensured at the stage of preparation for classes, during and after them.

Integration of e-learning technologies in the traditional educational model creates conditions for building a mixed model of the educational process, based on traditional methods and classical approaches and technologies of E - Learning, depending on the levels and forms of education and learning forms and formats of organization of teaching and learning. The implementation of a mixed model allows of achieving results more efficiently and in less time, expanding access to education, and effectively solving pedagogical problems.

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ANALYSIS OF THE STEREOTYPES OF SOVIET FILM IMAGE OF THE WAR IN A MEDIA EDUCATION CLASSROOM

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Abstract - Media education classes at university involve the analysis of media texts of various types and genres. The film analysis plays an important role. For instance, students examine films on the theme of the Second World War. This article describes a possible technique of film analysis about the Second World War as an example. Applying methodology, designed by Umberto Eco, the author use three lines that are meaningful in a film: an author's ideology; market conditions that determined its plot, and the process of script writing/creation; and story-telling techniques. This approach correlates to the key media literacy concepts, such as media agencies, media/media text categories, media technologies, media languages, media representations and media audiences. All these concepts are directly linked to the ideological, market, and structural-contents aspects of media analysis.

I. INTRODUCTION

Media education classes at university involve the analysis of media texts of various types and genres. The film analysis plays an important role. For instance, students examine films on the theme of the Second World War. This article explains a possible technique of film analysis about the Second World War using the film by Valentin Vinogradov *Eastern Corridor* (USSR, 1966) as an example.

II. THE STRUCTURE OF THE IDEOLOGY AND PLOT STEREOTYPES OF SOVIET WAR-THEME FILMS MADE IN THE 1940S-1960S

The structure of the ideology and plot stereotypes of Soviet war-theme films made in the 1940s-1960s was like the following:

The historical period, action taking place: any time of the war between 1941 and 1945, the USSR, Germany, more seldom – other countries.

Environment: military headquarters, vehicles (tanks, airplanes, ships, trucks, etc.), front line, trenches, dug-outs, of Soviet officers and soldiers; modest dwellings of civilian Soviet citizens in occupied territories and in the rear, more comfortable housing, military technics and property of German and/or Western characters.

Methods of representation: more or less realistic (especially it is true of films made after the second half of the 1950s) or conventionally grotesque (characteristic feature of comedies, filmed in the 1940s, and later Stalin period epics like *The Fall of Berlin*) picture of people's life during the war.

Majority of mainstream Soviet films on the war theme were based on uncomplicated dichotomies:

- hostile and aggressive imperialistic "new order" of the Nazi's Germany vs. peaceful, friendly Soviet regime, the country of advanced workers, athletes, cheerful children and enthusiastic builders of the happy communist society;
- positive, ideologically correct (i.e. true to communism and patriotic) characters vs. villains – Nazis and their toadies, with cannibal ideology of hatred towards everything non-Aryan;
- heroism/self-sacrifice vs. aggression/treason;
- honesty/sincerity vs. betrayal/guile;
- plans (Soviet vs. Nazi) and results (defeat, although often put off for Nazis, victory, although often put off as well, for Soviet characters).

Characters, their values, ideas, clothes, verbal and nonverbal language. Positive characters are exponents of Soviet, communist ideas; negative characters embody anti-human, Nazi, military ideas. As a rule, characters are not only divided by social, but also by material status. Nazi characters are usually shown as rude, violent people, well built, with rude language, evil faces, active gestures and unpleasant guttural voice timbres. They are dressed in military uniforms of Wehrmacht and SS; sometimes appear on the screen in their underwear (when running out of the house on fire or blown up dug out). Traitorspolizeis are shown cringing before Nazi-masters: disgusting, often miserable appearance, violent, drunk, dumb faces, revolting mimics, shrill voices, dressed in stolen clothes, often out of size…

Soviet officers and soldiers are dressed of course poorer than Germans: during the battle/afterwards, their uniform is covered with dust and dirt, at the time of the short breaks they try to look according to the regulations. In addition, certainly, a situation may occur when a soviet soldier gets a secret scout/intelligence assignment: in this case, he is dressed like a Nazi. Soviet characters may be shown on the screen either like good-looking athletes or like ordinary people. The main accent is that while they are cruel to enemies, they are humane and sympathetic people. Their lexis may not be always correct according to the literature canons; however, they have kind faces and pleasant voices. Soviet civilian people are shown mainly as victims of Nazi cruelty, suffering from evil occupants and helping soviet soldiers and partisans. Workers in the rear in spite of all the difficulties give it all "for the front, for the victory".

Crucial change in characters' lives: evil characters (Nazis and their servants) begin to implement their antihuman ideas (aggression with weapons, mass murders of helpless civilians, explosions, bombarding, terror acts and other crimes).

Problem occurring: life of good (Soviet) characters, and life of the whole nation is under threat.

Searching for the problem solution: armed struggle of good characters against evil ones.

Problem solution: mass heroism of soviet nation, termination/arrest of evil Nazis, victor of good characters (intermediate or final), return to peaceful life.

Besides the victory of the soviet army over the Nazis not only was represented as the victory of the great nation, defending their motherland from outer aggression, but also as the victory of the only true communist ideology, soviet regime over the fascists, imperialists, traitors, etc.

III. THE LINE OF MEDIA EDUCATION LITERACY ANALYSIS

Applying methodology, designed by Umberto Eco, let us distinguish three lines or systems, which are meaningful in a film: an author's ideology; market conditions that determined its plot, and the process of script writing/creation; and story-telling techniques (Eco, 2005, c.209). This approach is to my mind correlates to the media texts analysis scheme by A. Silverblatt (Silverblatt, 2001; 2014) и C. Bazalgette (Bazalgette, 1995) based on the key media literacy concepts, such as media agencies, media/media text categories, media technologies, media languages, media representations and media audiences. All these concepts are directly linked to the ideological, market, and structural-contents aspects of media analysis.

As an example of the media text analysis we are going to examine the film by Valentin Vinogradov *Eastern Corridor* (1966), created contrary to the stereotypes of Soviet cinematic image of war. This will enable us to distinguish the ideological, social-historical context of the time when the film was made and its structure.

Authors' ideology in a sociocultural context (dominating concepts: media agency, media representation, media audience). By main authors of the film in our case, I mean the director and scriptwriter Valentin Vinogradov (1933-2011), scriptwriter Oles Kuchar (1910-1996), and the camera operator Yuri Marukhin (1938-2001).

By the time of filming *Eastern Corridor* (1966) Soviet cinema has collected a big number of moving pictures connected to the theme of the second world war (some of them – *Secretary of Regional Committee, She Defends Motherlands, Zoya, Two Soldiers, At 6 pm after the War, The Fall of Berlin, Feat of the Scout, Star, The Cranes are Flying, The Alive and the Dead, Ivan's Childhood, We're Taking the Fire)*, including films of the "partisan" series, filmed in Belorussia (*The Girl is Looking for her Father*, *Cross the Cemetery*, and others). The most common genre was understandably, a drama, but rarely, it was a detective story, a melodrama or even a comedy.

The authors of the "Eastern Corridor" against the widespread stereotypes, and practically for the first time in the history of the Soviet cinema, offered a different ideological concept of the war theme: the war as the destruction of the humanistic origin on the whole. Of course, still in *Ivan's Childhood* (1962) by Andrei Tarkovsky (by the way, a fellow classmate of V. Vinogradov, who played one of the roles in Tarkovsky's course work) there was a piercing theme of the destructive influence of war of the psychology of a child. The *Eastern Corridor* authors go even further, proving that the war is a both sides sharpened sword, crippling souls, hearts and bodies of all parties involved…

The title of the film is allegoric itself. It is known that Nazi's Germany on the eve of the World War the second insisted on Poland giving it the so-called "eastern corridor" one-mile wide free, extraterritorial communication with Konigsberg enclave. In 1939-1943 a kind of "eastern corridor" (supposedly, towards the world supremacy) for the Third Reich was not only Poland but also most part of Eastern Europe, including Belorussian territory, of course. On the other hand, Baltic republics, western part of the Ukraine, Belorussia, and Poland in 1939-1941, and later during the war and after it, were viewed as the "eastern corridor" of the Soviet geopolitical power in Europe. In 1945, this corridor (in the slightly softened regime of the "social camp countries) included Poland, Czech Republic, Hungary, and other eastern European countries.

Market conditions that promoted the idea and the creation process of the media text (key concepts: media agency, media categories, media technologies, media audiences).

The philosophical parable *Eastern corridor* was created in the times of the end of "the thaw", when Soviet artists got some (although limited and censored) freedom. Because film industry as any other industry in the 1960s belonged to the state, the question of commercial profit from screening the film, although considered, was not the dominant one. There was so called state order on important for soviet ideology films, such as revolutionary, war, historical, and some other themes. It was only logical that within framework of the "war theme" they allowed some detective films like *Feat of the Scout* or *Far Away from Motherland*, and some films originally not aimed at the mass audience, but significant for a year's state thematic plan.

Thus, undoubtedly *Eastern Corridor* was on the thematic plan of the "Belorus-film" studio, in the division of partisan dramas, telling about the heroic deeds of soviet people in occupation. However, in the result the film turned out to be not like the studio bosses expected, and was met with hostility both by Party's officials and film critics.

That is how Vinogradov's film was evaluated, for example, in the article of 1968, written by Tatiana Ivanova: *Eastern Corridor* belongs to those films after watching one needs to read the synopsis: to understand the sequence of events, to make head or tail of it. It feels as if a simple picture was cut in many pieces, big and small, shuffled and shaken and was laid down in a new odd puzzle (curiously enough, Ivanova almost word for word anticipates the complaints of other critics about A. Tarkovsky's *Mirror* (1974) – A.F.). So is the general compositional structure and so is the artistic expression of each episode. A suffering, lifted wooden arm is coming out of the streaming grain – turns out to be a cross, a cross with the broken wooden bar; an oddly twisted branch is filling the screen, is shown in different angles, is hypnotizing our imagination – this is the beginning of the scene at the river. Really, a puzzle inside a puzzle. In the end, one can make head or tail in here. However, one question remains, it is a question about the necessity of such a form, about the artistic justification of this mixture of violent naturalism and visual sophistication, which reigns on the screen… There will be a lot of other scenes, but the very first one reveals something very significant for the general atmosphere of the film. It is the abundance of cruel effects. It is the extravagance of the entourage. It is a refined mastership of the camera operator. Taken together – it's the anesthetization of naturalism" (Ivanova, 1968, p.94).

It is amazing that after two years of staying "on the shelf" (i.e. forbidden to be shown), the film *Eastern Corridor* however was shown on limited number of screens in 1968.

It seems that if the film had been presented at any European film festival in the late 1960s, it would have most surely enjoyed triumph as if *The Cranes are Flying* or *Ivan's Childhood*. However, alas… After the film, the career of Valentin Vinogradov obviously went down. The outstanding director's talent stayed unrealized, he had to surrender to creative compromises, making "ordinary cinema" (*Countrymen, White Dance).* A brilliant camera operator Yuri Marukhin made a few more visually interesting films (*Lion's Grave, Night's Chronicle),* and then also gave up and began making standardized film works…

The structure and techniques of storytelling (key concepts: media categories, media technologies, media language, and media representation).

By the time of the filming *Eastern Corridor* besides ordinary, now forgotten films, there had been made such outstanding pictures as *The Cranes are Flying* (1957) by M. Kalatosov and S. Urusevsky, *The Sodier's Ballad* (1958) by G. Chukhrai, *Ivan's Childhood* (1962) by A.

Tarkovsky, *The Alive and the Dead* (1963) by K. Simonov and A. Stolper. Each of these films breached the official cinema stereotypes: dramatic life of the "wrong" from the point of view of orthodox communists, Veronika (*The Cranes are Flying*), tragic image of underage front scout Ivan, whose childhood was taken away and who was turned into a ruthless revenger by the war (*Ivan's Childhood*), bitter episodes of horrible defeat of the Soviet army in summer 1941 (*The Alive and the Dead*)…However even these films didn't break the traditional codes of distinct division of characters into good and evil ones.

As S. Kusnetsov correctly observed, *Eastern Corridor* is a film about the partisan war in Belorussia that makes you understand Soviet censors who decided to protect their people from such a shock. It's not another war "eastern" with shootings and Lenin-style kind secretaries of partisan committees, but a hard and frightening mystic picture that leaves unrevealed not only such trifles, as who is the traitor, but also the motives of almost all characters, acting as if the field of unknown forces, directing them, transforming and in the end, killing them. A dark and mysterious film, some episodes of which become imprinted in one's memory forever, that may like a nightmare haunt you afterwards" (Kusnetsov, 1999). I can add that during the whole film, the authors create an ambivalent feeling of ominous reality and phantom non-reality of action.

Certainly, *Eastern Corridor* relied to a perceptible degree upon the achievements of the best films about the war. Like in *Ivan's Childhood*, the visual language of *Eastern Corridor* is notable for the sophisticated black-and-white graphics, permeated with the complicated play of space and symbolism. But this is the case when cinematic quotations (visual tunes of early Andrzej Wajda, Miklós Jancsó, Andrei Tarkovsky, war themes in the Czech "new wave" cinema (*The Fifth Rider is Fear, A Waggon to Vienna, Diamonds of the Night),* black-and-white parables by Ingmar Bergman of the late 1950s-early 1960s, etc.) have naturally entered the film, not damaging its existential meditativeness, philosophical and visual authenticity.

The expressive, dream-like style (torn montage with interrupted dialogues and events in the mode of French *nouvelle vague,* deep compositions of the shots, nervous, sharp camera movements, weird play of the lights and shadows, with all the spectrum of black and white tints) and the parable plot of Valentin Vinogradov film today fell subject to Roman Volobuev's sarcasm who decided that *Eastern Corridor* is *Reservoir Dogs* about Belorussian partisans, made under the impression by Bergman, new wave cinema, and who knows what, with Tariverdiev music and absolutely crazy camera work. Characters captured by fascists through flashbacks try to understand who betrayed them (by the way, not succeeding in that until the end). The film is based on two similarly riotous things – Christian symbols and a cold, pathologically as-if-Bergman erotic. A collaborationist rapes a peasant girl in the elevator, the elevator is a former church, and she painfully crawls through the grain towards the cross. Insolent muscular fascists are going to torture a young Valentina Titova with electric shock, and order to take her clothes off…There is also a daughter of Jewish scientist, who looks like Anna Karina parody (the actress in lots of Jean-Luc Godard's 1960s films – A.F.) walking around wearing a short black dress and high heels. A concentration camp is more like a metaphorical thing – people come and go, almost voluntarily. One more thing – only fascists sit in the film. Good characters stand, casting shadows, or lie down with broken legs. If a good character sits down, it almost means his change for the dark side. In the end the director goes mad: the extermination of the Minsk ghetto is shot in the form of expressionist mystery play, with a utterly foppish flight of the camera along a complicated trajectory, while in the background people are being drowned, and a naked young blond running to and fro, arguing with God in the front" (Volobuev, 2008).

However the ironic vigour of Roman Volobuev once again proves that Umberto Eco is right: "Texts, aimed at certain reactions of more or less distinct circle of readers (let it be children, "soap opera" fans, doctors, good citizens, youth subcultures, Presbyterians, farmers, middle class women, divers, tender snobs or representatives of any other imaginable sociopsychological category), in fact are open for various "erroneous" decoding" (Eco, 2005, c.19).

That is why both the dislike of the *Eastern Corridor* by T. Ivanova in 1968, and its sarcastic seizure by R. Volobuev in 2008, do not cancel the opinion of Alexander Shpagin, which I share, too: "Valentin Vinogradov, and absolute heretic, has come 30 years ahead of his time…In the film *Eastern Corridor* the town occupied by Nazis is shown in the mode of the absurd carnival, where all customary signs and stereotypes are shifted from their usual places. Each act is twisted into nonsense, into chaos. It is only the concentration camp that makes sense – there one can feel oneself among others, same as you, prisoners, and try to escape into the obscure and paranoiac "freedom", where everybody is suspected. "Give me another war!" – cries one of the characters thrown in prison, being unable to distinguish, who he is. The level of alienation is so high, that I wonder – something like this in the end of the 1960s one could only see in Czech cinema about war!" (Shpagin, 2005).

There is one inaccuracy in the Shpagin's quote. The character captured by Nazis is crying out the phrase far more dangerous for the censorship: "Give me a normal war! Without hostages! So that nobody beats your bladder, so that nobody saws living rats into your guts!". This scream is becoming sharper in the context of the film because *Eastern Corridor* starts with the voice-over quotation of field-marshal W.Keitel encouraging nazi army to the most sadistic actions against soviet soldiers and partisans, because they were not obeying the rules of the "normal war".

The authors of the film unambiguously assert that there is no such a thing as a "normal war". It's always inhuman, always oppresses a personality by violence and fear. Partisans in *Eastern Corridor* are afraid of, suspect everyone, and are ready to kill anyone – a man or a woman – under a slightest shadow of doubt.

Here appears a counterpoint with the clear-cut voice-over, reading the victory news about feats of the partisans. However, it is only on the radio where everything is simple and clear – black vs. white, heroes vs. enemies. In reality, some Nazi characters are different. One of them is the head of the prison, inclined to ironic philosophical dialogues about "a hangman and a victim" with his prisoner – an artist. A special authenticity of these scenes in contributed by the fact that this Nazi is played by the Lithuanian Voldemars Akuraters, who had been first in the German army and then in Stalin prison. Among the partisans there is Lobach (played vividly by Regimantas Adomaitis, resembling a little bit Evgeny Urbansky in this part). He is a stranger everywhere, suspected of treason; he passionately goes inevitable deathwards.

Touching upon the approach to war in the Czech new wave cinema, Y. Lukesh has correctly noticed the importance of anti-mythological and disturbing themes in such films as *The Fifth Rider is Fear* (1964), *A Wagon to Vienna"(*1966), *Diamonds of the Night(*1964). But this influence is especially vivid in the film *A Shop on the Square* (1966), directed by Jan Kadar and Elmar Klos, that made the audience face the principal dilemma of moral responsibility of a person, surrendering to authority (Lukesh, 2002). I suppose, *Eastern Corridor* emphasizes this problem again and again: the pressure of the Authority (Nazi, Soviet, partisan, and other), reaching its peak during the war, breaks down characters' lives, making them sacrifice, make impossible decisions, and in the result turning them all into puppets of the history.

Despite reproaches for graphic violence scenes, the authors show horrifying scenes of murders and tortures without blood details however creating emotionally terrifying effect. Especially the mass Holocaust scene, Jews drowning in seething water flows, is like a death itself versus the prayer.

In fact, the religious theme in *Eastern Corridor* sounds very bold. A beautiful character played by Valentina Titova, tells her husband, a sculptor, that he looks like Apostle Peter (the one who seized by the spiritual weakness three times gave up Christ). However after she was arrested the sculptor did not join partisans in the woods, thinking that thus he would betray the beloved woman. He shows the reproduction of the Michelangelo' fresco *The Last Judgment* to his friends, artists, and finds "his" face there – the face of the terrified sinner, who has no power either for struggle, or for denial, not even for life.

Religious symbols as if from the paintings of Renaissance epoch are felt in the composition of lots of shots, especially ones in the cathedral and in the former church, turned into the granary.

Irony and allusions to intellectuals of the 1960s, lyrically praising "commissars in dusty helmets", accompany the image of collaborationists in *Eastern Corridor*. The editor-in-chief of the local newspaper had probably written some pathos articles about the happy communist future short time before. Artistic bohemians are being adjusted to the new regime.

A special place in *Eastern corridor* is taken by the female characters. Sexually attractive, ready for self-sacrifice, they remain unattainable (at least within the film shot) for male characters.

Valentin Vinogradov uses music totally contrasting the picture. Micael Tariverdiev melody has some light notes of hope, and what we see on screen is hopeless. Even the incredibly lucky escape of a partisan right from the Gestapo office is ruined by the accidental meeting with an old acquaintance who had long been spied on by the Nazis.

IV. CONCLUSION

In my opinion, *Eastern Corridor* is the forerunner of not only a partisan drama by Alexei German *Road Control* (1971), but also his phantasmagoric *Khrustalev, the car!* (1998). Moreover, some episodes of V. Vinogradov's picture can be paralleled to not yet made at the time *Stars and Soldiers* (1967) by M. Jancsó and *Death of Gods* (1968) by Luchino Visconti with their fascinating plasticity of the shot and distanced erotism in orchestrating violence.

A lot of films and TV series about the war have been filmed in Russian over the last decade. The media texts authors are not influenced by censorship any longer, they reveal dramatic pages of the horrible 1940s for the audience. Still even compared to them, apparently criticized and forgotten, "Eastern Corridor"'s film language seems very modern. "Manuscripts" actually do not burn.

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THE USE OF SCHOOL WEBSITE FOR MOTIVATION LEVEL IMPROVEMENT

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Abstract - Achieving appropriate student motivation level during classroom activities is of crucial importance when it comes to creating high quality educational work. This paper aims to present the ways in which ICT as well as other teachers can increase the motivation level of their students. In short, this paper presents the possibilities of using school site for increasing student motivation level.

I. INTRODUCTION

A very important task that the teacher has to do in order to reach high-quality teaching is to achieve a satisfactory level of students' motivation to work. One of the most important motivational tools in teaching is assessment.

"Assessment is a continuous pedagogic activity that expresses the attitude to learning and knowledge, stimulates learning motivation and students are qualified for an objective assessment of their own achievements and the achievements of other students and thus the system of values is developed." [3]

Informatics and computer science is a course in the primary school, which is taught as an optional subject from the 5th to 8th grade. Teachers who are responsible for this course encounter a number of problems that have a negative impact on the motivation of the students.

One of them is certainly the system of assessment of students from optional subjects. Students are graded throughout the year and based on these assessments the student obtains the final grade, which does not affect the GPA. Today we are in a situation where students learn to get a good grade and not to gain knowledge. The main goal of students and their parents is to get the satisfactory grade. Teachers have a task to instruct students how to learn for knowledge and realize that the grade is only confirmation of their knowledge and not their main aim.

This research aims to show teachers of informatics and computer science and other subjects, how they can further improve students' motivation. The author, who is a teacher of informatics and computer science, is also the administrator of the school website, and this has led to the idea to use the website as a teaching tool and not just as a place for the promotion of school and school activities.

This paper presents the research that involves the implementation of the lesson and evaluation of student achievement in this class, as well as the survey for students.

II. RESEARCH METHODOLOGY

A. *The Research Problem*

Due to the position of informatics and computer science in the school system, teachers are often faced with insufficiently motivated students. A large number of previous studies related to the motivation have dealt with the psychological aspect of motivation, i.e. finding ways to influence the personality of a participant in order to increase motivation. This paper deals with analyzing the impact of the introduction of new teaching resources on students' motivation, i.e. the impact of the introduction of a school website in teaching.

The research problem lies in the following questions:

- How to increase students’ motivation to work?
- Can students’ motivation to work in class increase by the use of a school website?

B. *The subject of the research*

The subject of this research is the school website and possibilities of its use to increase motivation of students. If teaching unit is chosen, good research results can be transferred to other teaching units and thus there will be an increase in the motivation of students in the entire curriculum. The research was conducted in Nikola Tesla Primary School in Novi Sad.

C. The aim of the research

The aim of the planned research is to examine whether the school website can be used in other purposes other than for the purpose of advertising and promotion. The positive findings of the research about the increased motivation of students might be used for formulating suggestions for teachers about the ways that their school website can be incorporated into teaching as a very important teaching tool.

D. The objectives of the research

The objectives of the research are as follows:

- to get teachers acquainted with the possibilities of using the school website in teaching;
- to popularize the website and make recommendations for the improvement of school websites;
- to encourage students to develop a competitive spirit which is of high importance for the full development of their personality.

E. Hypotheses

The main hypothesis:

- Students' motivation is increased if they are allowed to publicly present their work on the school website.

The sub-hypotheses:

- The use of website in teaching encourages competitive spirit of students;
- Competition among students increases their motivation and achievements.

III. RESEARCH METHODS

A. The course of the research

At the end of the topic Making the Presentation, there are two classes planned for testing. When implementing these lessons in most cases, students are given a topic on which they should create a presentation that meets certain criteria. After completing the task, the student gets a grade. Since the grade from informatics and computer science is not included in the GPA, it is insufficient to be a motivator.

The research is designed so that particular groups of students, who are tested for the chosen area, are allowed to upload their work on the school website. The control group of students will work on a presentation on the topic and after completing the assignment, the students will be assessed. The experimental group of students will do a presentation for a specific contest. All the presentations will be uploaded to the school website and these files should be made public, which would be available to all visitors. After placing the presentations on the website, the visitors will be invited to vote for a presentation that they like the most.

When setting up a competition it is important to take into account all other criteria that increase motivation of students as well as the choice of topics. The topic is very interesting to most of the students is related to sport.

The students are told that the competition will be organized in the way that the visitors to the site will vote for the best presentation. Voting is done regardless of the grade, which was given for the presentation and regardless of meeting the criteria set by the teacher. Voting is a subjective opinion of voters on the quality or format of certain work. A student whose work wins the first place, i.e. receives most votes will obtain a certificate.

The students are instructed how to make their presentation:

- The title slide of the presentation contains the name of the sport that will be described and the appropriate sub-heading;
- The second slide: description of the selected sport;
- The third slide: personal commitment or personal attitude to the selected sport;
- The remaining slides are optional and dependent upon the wish of the student;
- Each slide must contain both text and pictures;
- Each slide must contain set animations and transitions.

The following parameters are assessed:

- Thematic structure of the presentation is satisfied;
- Compliance of the design with the topic;
- Diversity and compliance of animations and transitions;
- Diversity of the content;

B. Methods of data collecting and instruments

1) The average grade that students have obtained for their presentations

The first parameter to be taken for the analysis is the average score obtained by the students for their presentation. All students are assessed, including the control and experimental groups. The function of Excel to calculate the mean will be used for calculating the GPA.

2) The number of students who presented more content and used more advanced features

After the analysis and evaluation of the presentation by teacher, it is possible to perform the analysis of achievement of the defined criteria.

3) The interest of students for this kind of work and content presentation

This criterion is processed and shown based on the rubric for assessment for students. "The survey in pedagogical research is a procedure in which participants ask questions about the facts of scientific interest for pedagogy that are known to participants, or questions are about the opinions of the participants. The participants respond in writing." [2] If the participants are expected to assess, there is pre-printed scale in the answer sheet. This instrument is called the scale.

Considering the age of users, the assessment scale will include 8 questions at most. The assessment scale for student in this research contains statements and the task is to assess if they are true. The assessment scale for this research was anonymous.

TABLE I. – ASSESSMENT SCALE FOR STUDENTS

Claim	Claim veracity	
	correct	incorrect
1. I like competitions being organized for students' projects.		
2. It is important what place I will win in the competition.		
3. I would do the same work if I were not competing.		
4. I think that requests for the presentation are too demanding.		
5. The very theme of the competition is important...		
6. I wish some other theme had been chosen.		
7. I would like similar competitions to be organized in other subjects too.		
8. I do not like my work being publicly seen.		

IV. ANALYSIS RESULTS

The research was conducted in Nikola Tesla Primary School from Novi Sad. 74 students from 7th grade took part. They were divided in 5 groups. Three groups were chosen to be the experimental, involving the classes: 7_1, 7_3 and 7_4 (altogether 48 students). The other two groups were control groups, one including the students from 7_2 and the other mixed students from 7_2 and 7_3 (altogether 26 students). The research was conducted on classes during February 2014.

A. Average grade that students obtained for their presentations

The average grades of students from experimental and control groups are shown in Table 2. Table analysis shows that the average grade obtained by the experimental group is higher than the grade of students from the control group. The students did their work better because they were more motivated. Another fact, which can be drawn from analysis of the bottom table, is that there were no bad grades, since all students got 4 or 5. This indicates that either all students fulfilled required conditions or they did the work, which outdid the requirements by its range or quality.

TABLE II. – AVERAGE GRADES

grade	Experimental group		Control group	
	Number of students	%	Number of students	%
5	46	95.83	19	73.08
4	2	4.17	7	26.92
3	/	/	/	/
2	/	/	/	/
1	/	/	/	/
Average grade	4.96	/	4.73	/

B. The number of students that during the making of their work presented several contents and used more advanced possibilities than required

The analysis of achieved criteria based on the number of students proves their motivation for work.

- Criteria for evaluation of their works:
- The number of slides meets the required criterion;
- The number of slides is bigger than required;
- The background used in slide is one of given;

- The slide background used was self-created;
- The slide backgrounds were thematically colored;
- Animations over objects are uniform;
- Animations over objects are diverse;
- Text and images contain only requested contents;
- Text and images are more comprehensive than required;

If according to criteria number 2, 4, 5, 7 and 9 the number of students of the experimental group is bigger than the number of students of the control group, it can be concluded that the students were additionally motivated for work due to the competition and public presentation of their works.

By criteria 1 and 2 we just check the number of created slides regardless of their quality (design, text, structure, etc.).The analysis shows that the minimum number of slides in the experimental group was done by 8.33% of the students, and in the control group by 26.92% meaning that much larger number of students in the control group kept to the minimum number of slides. Since no students did fewer slides than the required minimum, the obtained information is that in the experimental group, even 91.67% of the students made a presentation with a larger number of slides than given minimum while that number in the control group is smaller and amounts to 73.08%.

The design of applied objects is checked by criteria numbers 3, 4 and 5.

"Offered design" refers to the use of ready-made slide layouts that include a predetermined arrangement of objects on a slide as well as the design of each embedded object. The highest percentage of students in both groups used ready-made slide layouts, which is 91.67% of students in the experimental group and 88.46% of students in the control group.

"Self-created material" refers to all objects in the presentation including paintings, frames for paintings, drawings, navigation arrows... From the table we see that the percentage of students who have themselves created objects in the experimental group is only 4.17% and in the control group is larger and is 11.54%

"Thematically colored slide backgrounds" are encountered in presentations where the overall design is in the service of design and can be found only in the works of two students in the experimental group which is 4.17% while in the control group, there were no such works.

Analyzing all three criteria, we conclude that a very small number of students self-created materials and designed the presentation.

Students are aware of the incentives offered by the software used for making the presentation. Students spent most of the time in finding the necessary materials, and less in designing presentations. They are aware that making of the entire design is time-consuming. Students tend to use ready-made solutions, not only in this case but when using any software. They live and learn in time when you have a smart phone and a computer with numerous possibilities, and they have been taught to use all advantages offered by these devices, although sometimes with a little effort they can get a better or more functional solution.

Criteria 6 and 7 analyze the use of animations and transitions in presentations. The analysis of these two indicators show that the larger number of students in the experimental group used a variety of animations and transitions (about 58.33%) compared to the students who used uniform animations and transitions (about 41.67%). In the control group, the difference is much more drastic and various animations and transitions were set by only 26.92% and 73.08% of the students left the monotonous animations and transitions. None of the students submitted a work in which animations and transitions were not used.

Students are aware of the significance of animations, transitions as well as the fact that is one of the basic things learned during their Power Point classes, and by their implementation in their work, they demonstrate acquisition of teaching material.

The last two parameters indicate the quality of presentation. The analysis shows that the higher quality content than the minimum was offered by 66.67% of the students of the experimental group, while the number in the control group is 38.46%. The number of students who retained only the requested content is greater in the control than in the experimental group. This clearly indicates that the students of the experimental group were more active in the search for content and were more motivated.

Considering the topic, students mainly had personal reasons for choosing sport, whether they train it or actively follow and support. Thus, the students were in a position to offer much broader content than the criteria required.

So, when we observe this analysis according to the four basic parameters: extensiveness, design, animation and content, we notice that in the three parameters the students whose work was involved in the competition did better this task, thus demonstrating that they were more motivated than students in the control group who did not take part in the competition. The only parameter which achievement was higher in the control group compared to the experimental group is that of design.

The total analysis clearly shows that the students of experimental group were more motivated to work.

C. Students' interest for this sort of work and content presentation

Students' interest in this kind of work, in addition to accurate statistical indicators in the form of achievement (grades), can be verified and proven by testing students on the accuracy of certain statements. Students filling in the character X in the appropriate field completed assessment scale. Assessment scale is anonymous. After processing all assessment scales, we get values in percentage for the veracity of these claims.

1) I like competitions being organized for students' projects.

A large percentage of students who declare this claim as true, show that the students' competition and public presentation of content has a positive effect on the motivation, i.e. they are interested in it. Even 87.5% of students reported that they liked the idea of organizing the competitions and only 12.5% did not.

2) It's important what place I will win in the competition

Percentage of students who declared this claim as true is 45.83. Students positively declared the claim that they like competitions being organized, but it was not important what place they would win. There are several reasons why it did not matter to students what place they would win. Students, regardless of the success of the work in competition, are graded so the motive for this kind of achievement was already met. Just publishing the work represents for students satisfaction of needs to prove and show. Here one can draw the conclusion that the public presentation of work and the possibility that the student gets to show the work to important people to him/her (parents, friends...), is of greater motivation than the competition itself.

3) I would do the same project if I was not competing.

87.50 % of students said they would be doing the same work even in case it was not a competition. The main reason is that these works are presented on the site. It is important to students that their work is on the site, that it is publicly accessible and what impression their work makes on others. Therefore, this is the basic motive that drives students to quality work. When creating work for this competition students are aware of the fact that it will be posted on the website and not to participate in the competition. This is one of the conclusions in favor of the thesis that the publication of work is a greater motive than the competition.

4) I think that requests for the presentation are too demanding.

This claim is intended to show the teacher whether the requirements were in accordance with students' knowledge. Also, if a large percentage of students did work that did not meet criteria for any reason, a large percentage of students who reported the claim as true would give an accurate explanation of poor student performance. During this assessment, a small number of students regarded requirements too demanding (18.75%) which is consistent with the results i.e. grades of students where only 4.17% of the students was graded 4.

5) The very theme of the competition is important

That the theme of presentation is important said 62.50% of students. This ratio indicates that the teacher certainly must choose topics that are close to students, they face every day, and that are a result of their private interests, so that the success of learning and practicing is greater.

6) I wish some other theme had been chosen.

This claim, or students' attitude towards it, is important in consideration of students' performance since poor average performance of students can be a result of students' dissatisfaction with the chosen topic. A large percentage of students stated that they would not like to have chosen a different theme (79.17% of them) which is at the same time the guideline for a teacher's selection of topics for the next tasks (about 79,17% of them)

7) I would like similar competitions to be organized in other subjects too.

This claim directly confirms or refutes the importance of competition as a motivator of students for work and may be a guideline for planning the work of other teachers. 85.42% of students said that they would like to see these competitions organized for other subjects, which means that they like this kind of work, and the introduction of competition in teaching.

8) I do not like my work being publicly seen.

The accuracy or inaccuracy of this claim directly confirms or denies the thesis that the public presentation of the work has a positive effect as a motivating factor. Only 8.33% of the students stated that they bothered that others could see their work. A large percentage of students who do not mind the possibility that others can see their work can be defined as the fact that students like to have their work be seen that is to show off. This is supported by the fact that all the students wrote their full name on the work, although they had the opportunity to fill in a pseudonym that would be known only to the teacher.

V. Conclusion

The main hypothesis, students' motivation to work is increased if they are allowed to display publicly their works using the school site, is confirmed in the survey by the following:

- The average grade was higher among students in the experimental group compared to the control group;;
- Criteria for evaluating students' numbered 2 (number of slides is greater than the specified criteria), 5 (background slides are especially themed colored), 7 (animation of objects is diverse) and 9 (text and images are more extensive than in criteria required) are better evaluated by students in the experimental group compared to the control group students. This confirms that students did better work according to the assessment of scope of work, design, use of software and content;
- Students have confirmed the main hypothesis and through their answers in the assessment scale, especially to the question number 1 (I like competitions being organized for students' projects.), 7 (I would like similar competitions to be organized in other subjects, too.) and 8 (I do not like my work being publicly seen.)

Auxiliary hypotheses have also been confirmed in the research:

- The hypothesis "using the site in teaching encourages the competitive spirit of students" was confirmed by the students' answers to number 1 (I like competitions being organized for students' projects.) and 7 ((I would like similar competitions to be organized in other subjects, too.)
- The hypothesis "competition among students increases students' motivation to work and success in the work" was also confirmed by better average grade of students in the experimental group, as well as the students' answers to the questions 1 and 7, where students confirm that they like competitions being organized and wish there were more such competitions.

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EXPOSURE STUDENTS FROM HIGH SCHOOL IN CACAK TO DIGITAL VIOLENCE

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Abstract - The paper presents the results of research on violence in the Digital High School in Cacak. For the analysis and presentation of results are used statistical results of the research of digital violence in primary and secondary schools in Serbia 2013th (Dragan Popadic and Dobrinka Kuzmanovic). The aim of the analysis and presentation of results of research of digital violence in the High School Cacak, is to gain insight into how the use of digital technologies, and the potential risks that the students are exposed to. The obtained data have shown that the High School students in Cacak were exposed to the risk at the Internet at least once during the last year. A large number of the students involved in the social network where they spent most of their time. From the analyzed data is observed that the most common risk behavior High School students in Cacak is accepting invitations to friends by unknown people, and the most common form of risky behavior is public disclosure of personal information.

I. INTRODUCTION

Violence and abuse implies as any form of, once done or repeated, verbal or nonverbal behavior which as a consequence has real or potential threat of health, development and dignity of a child and pupil or an employee.

Violence and abuse appears as: physical, psychological (emotional), social, sexual, digital violence, and through child or pupil abuse and exploitation etc.

Rapid development of informational technologies makes our lives easier, but negative influences are also present. The internet, computers, social networks and mobile phones have provided room for different types of digital violence to spread.

Digital violence and abuse, according to Institution Protocol in Response to Violence, Abuse and Neglect rulebook, is the abuse of informational technologies which may have for a consequence harm of another person and threat of one's dignity and is achieved through E-mail, SMS, MMS, via website, by chatting, forums, social networks etc.

Digital violence does not include friendly teasing and arguments over the phone or the internet, or accidental and unintended harm or damage. Digital violence may include messages of sexual violence, threatening, disturbing and insulting.

Most of their time, young people spend using digital technologies. By doing so they become main protagonists in creating, good or bad peer communication.

The internet and other digital networks have created new exciting world of communication and information for everyone with access to the Net and permit young people countless possibilities for studying, communication, and development of personal perception of the world. New technologies allow children and adolescents levels of approach to information, culture, communication and entertainment which were impossible to imagine just 20 years ago.

During November 2012 a research was conducted about digital violence in primary and secondary schools, goal was to determine in what ways do school children use digital technologies(computers, mobile phones,etc.), to what risks are they exposed and how can we protect them from those risks. The research was carried out within "School without violence" program. The program was conducted by ministry of education, science and technological development and UNICEF, with support from Telenor foundation, psychological institute of faculty of philosophy in Belgrade, "School without violence" mentors, and expert associates in schools.

II. FORMS OF DIGITAL VIOLENCE

Digital violence can occur in multiple different forms. Following forms will be further examined in the research:

- Sending SMS messages with insulting and threatening contents (insults, threats, etc.)
- Phone call disturbing (false introduction, silence, insults, etc.)
- Video recording by mobile phone or camcorder, distribution and uploading of the video to the Web
- Harassment by e-mails (insults, threats, etc.)
- Harassment on social networks (Facebook and similar) and on the internet (identity concealing, false introduction, another person's account misuse, uploading images and videos of other persons without their consent, sending viruses and malware, etc.)
- Blogs (uploading to YouTube, sending viruses and malware, etc.)

A. Sample

In the Republic of Serbia 3786 students, 3078 parents and 1379 teachers participated in this research.

Sample from Gimnazija Čačak contained 108 students, 106 parents and 44 teachers.

B. Exposure of Gimnazija students to potential risks on the Internet

The use of Internet creates array of possibilities for children to better communicate with others, for more quality education and good entertainment, however it caries a number of risks. Among most mentioned are different forms of digital violence, from disturbing to really serious forms of violence, and exposure toinappropriate contents, political, economical and religious propaganda, disinformation, intrusion of privacy, persuasion to gamble and perform illegal activities.

The fact that great number of tested students uses the internet every day or nearly every day(80% of primary school students and 90% of secondary school students) rises a question of their safety, or, are they and how often prone to risky behavior on the internet and which forms of these behaviors are most present. The more student is inclined to risky behavior the greater the possibility for them to experience direct (another person's password, another person's account, etc.) or indirect (disturbing messages, images, false introduction, etc.) digital violence.

Great number of tested students is involved in some social network (Facebook, Ask.fm, Twitter, MySpace...) and spend most of their time on the internet on exactly on social networks (80% of secondary school students and 65% senior primary school students frequently use social networks, while 24% of primary and 12% of secondary schools students use them infrequently.)

Creating safe profiles is one of the most important security measures on social networks. On the other hand, some of the riskiest behaviors include exposing personal info publicly.

The most encountered risky behavior among Gimnazija students is accepting friend requests from strangers (74%). Other forms are increased as well: 43% students left personal data on their profiles and blogs; 49% replied to messages from unfamiliar persons wanting to make contact. The riskiest behavior is the least present: 23% Gimnazija students gave personal data to strangers who they met online (Graph 1). 47% declared they never communicated via chat to persons who they didn't know, while 53% declared they have done it sometimes.

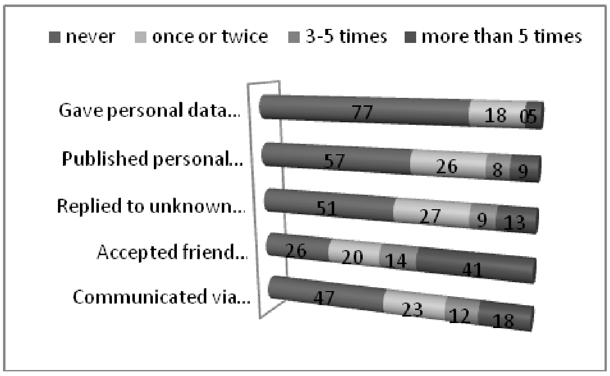

Figure 1. Exposure to risks on the internet

Based on gained data it is established that students from Gimnazija Cacak have at least once in the last year been exposed to some type of risk on the internet. Following graphs show frequency of different forms of risky behavior with tested students. The question is, if it is because students are less careful, more confident in their ability to recognize potential danger, or because they have been more often exposed to invitations for that kind of communication.

Most important specificity of digital violence, compared to traditional forms of violence are: high level of violator's anonymity, victim's permanent accessibility, infinite audience and durability of what has been done.

Considering that violator is concealing their identity, this form of violence some authors dub "Cowardly form of violence" [5]. Anonymity encourages violators, while increasing victim's insecurity.

C. Methods of informing students about the risks

Gimnazija students' most often response regarding informing about risks from the internet was: *I do not inform myself about that, Ido not care about that*. Only 20.4% of students have declared that they inform themselves about risks and means of protection on the internet, because they are interested in that (Graph 2). One way of protecting on the internet consists of knowing technical means that enable the ending of unwanted communication or protection of personal data.

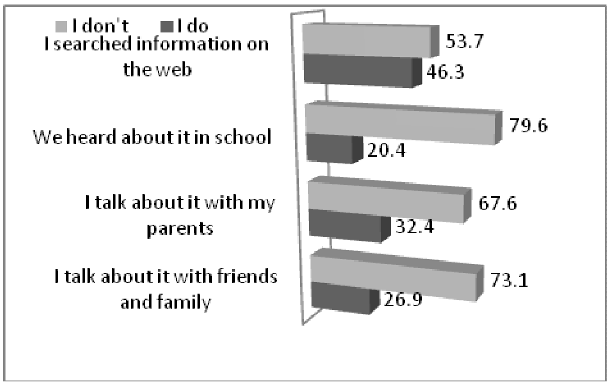

Figure 2. Internet risk awareness

Students' familiarity with actions of protection on the internet varies depending on the source of information: 46.3% get informed only by searching the web, 26.9% talk to their friends. Every third Gimnazija student has talked to their parents and every fifth says he got the information concerning the risks in school.

III. AWARENESS AND PREVENTION

A. *Parents*

106 parents, whom we compared with already filled questioners from their child, have done questioners for parents; analysis was done by comparison of test done by a student and by their parent. Our sample has greater number of mothers to fathers (78.3% to 21.7%)

B. *Parents' assessment of digital violence awareness*

Almost half of sampled parents (49%) think they are no experts, but are informed enough in digital violence; 35% knows as much as they get from television or newspapers; 9% is very well informed about types of digital violence and methods for its prevention, while very little knowledge possesses 8% of the parents (Graph 3).

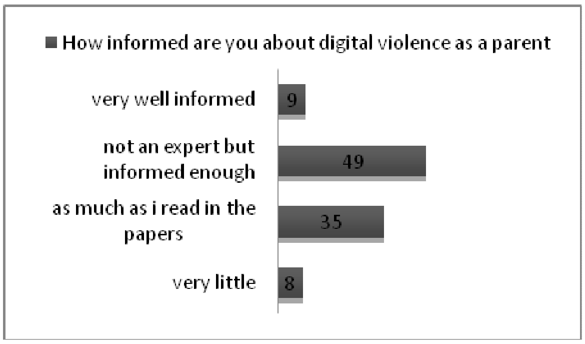

Figure 3. Parents awareness

Equally important to timely educationof children to safely use mobile phones and computers and take responsibilities for their own actions, is properly informing and educating parents about this subject. Even though tested parents assessed they are well informed about types of digital violence and actions for its prevention, they are more interested and would like to know more from school on this topic (58%). Significant number of parents would not like to be informed by school about the risks and types of digital violence (42%). Potential reasons for this are their unawareness of the dangers lurking every time a child is online and trust they have in their school kids believing they are mature enough and able to avoid potential dangers on the internet. Research determined that 52% of students said "No, I know as much as it is required" when asked "would you like to know more about digital communication , risks and protection?", while 48% said they would like to acquire new knowledge that would help them to identify and properly protect from dangers on the internet.

Distribution of parent's response to question" Do you intend, and how often, to discover what does your child do while online?" shows that every third parent of a Gimnazija student almost always intends to, and is informed of what does their child do while online; 32% only is their child spends a lot of time on the internet, 27% in most cases while 10% almost never intends to discover these things.

Parents think that they are well informed of their children's doings on the internet (only 10% of parents claim almost never). However, to question "Have you ever visited a web site you think your parents would forbid you to visit?) 43% of students declared they have never, while every third sometimes visited them, 8% have gone often and 19% have gone once or twice (Graph 4).

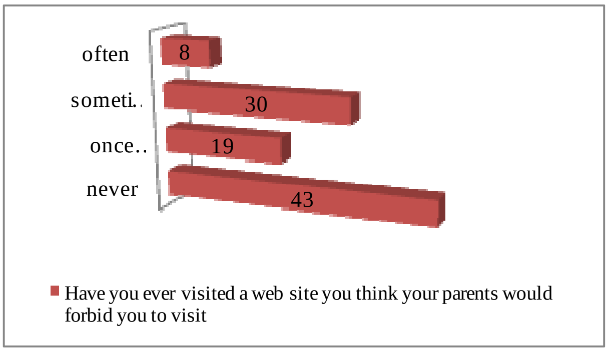

Figure 4. Web site attendance

C. *Students as victims of digital violence*

Frequency of some form of digital violence in the last year shows that [6]:

- Disturbance over the phone is the most represented form of digital violence among secondary school students in Serbia: Most of them (26%) have been exposed once (10%) to mobile phone disturbance while has been exposed two or more times (16%) [1]. This is the most represented type of violence in our environment as well 19%. Cacak high school children have been exposed to harassing phone calls: 8% once, 7% two to three times and 4% several times;
- In the last year 14% of high school students suffers disturbance via SMS (9% once, 5% two or more times)
- To harassment on social networks was exposed 13% of students (5% once, 9% two or more times)
- Video recording was the least represented form of digital violence: 3% once, 1% two times)
- Usage of personal account without consent of the owner upset every fifth Gimnazija student.

Concerning the fact that the most often response to the question regarding protection while online was: I don't get informed, I don't care about that, the results imply that ignorance is one of major risks when the find themselves online, and that one way of protection is knowing technical measures that enable stopping of the unwanted communication or protection of privacy.

***Teachers** had the opportunity to assess, among given forms of violent behavior, to what extent it represents a problem for the students and the school they work in (does such behavior disturb students and teachers to such extent that it doesn't allow for the normal activities to take place, causes concerns, demands time for those actions etc.?) Acquired results show that for 53.5% of tested Gimnazijateachers' disturbance via SMS a minor problem, while 46.5% assesses that it is not present in a school where the usage of a mobile phone is forbidden, and it reduces it only while they are in school.*

When discussingawareness regarding digital violence, every third Gimnazija teacher (34%) doesn't think he is not a digital violence expert, although is sufficiently informed about the problem. However, 48% of the teachers know only as much as they read in the press of see on the TV, while 11% knows very little.

D. *School role in preventing and solving the digital violence problem*

Teachers and parents have different opinion regarding school's role in this: 95% of teachers and 74% of parents agree that clear rules of internet and mobile phone usage while in school should be established.

E. *What additional actions could the school take regarding students safety?*

- 84% of teachers believe that it can supply technical protection form digital violence (anti-virus and anti-spam programs, signal scrambling devices);
- 23% of teachers is undecided, every other agrees with a claim that mobile phone usage should be forbidden in schools (51%) while 26% of tested teachers disagree with this;
- 81% of teachers thinks that school should keep record of cases of digital violence over students;
- 91% of teachers and 87% of parents thinks that it is schools duty to present parents with level of digital violence present as well as means of protection;
- Every other teacher is not sure, and every third thinks that school has enough capacities to face the digital violence problem. Parents are divided concerning school's potentials to face this problem: 42% thinks that school has enough potentials while 45% is not sure of it;
- School itself cannot do a lot, parents have the most important role, states 56% of

teachers and 69% of parents, while 19 of parents is not sure of it.

Teachers are required to plan, in regard with Rulebook of competitance standards for teacher's profession and their professional development(„Sluzbeni glasnik RS" 5/2011), upgrade of competitance regarding support of persona development, communication and cooperation, as well as copmetitance for teaching and educating.

IV. Conclusion

In the last several years, since informational technologies are more and more available to young people, which besides it provides countlessopportunities for education and development, modern technology supplies your people with an arsenal of tools for social cruelty (Shariff, 2008), and for that reason: ". . . more frequently can be heard among scientist and wider public, a new form of violence among young people, so called *digital violence" [6]:*

Digital violence is the abuse of informational technologies which may have for a consequence harm of another person and threat of one's dignity and is achieved through E-mail, SMS, MMS, via website, by chatting, forums, social networks etc.

Sample consisted of 108 Gimnazija students, 106 parents and 44 teachers. Based on data analysis, it has been concluded that 90% of students use the internet every or almost every day. 80% of Cacak high school students use social networks and spend most of their time on Facebook, Ask.fm, Twitter while online.

Based on acquired data is has been determined that Cacak high school students were at least once in the last year exposed to some risks on the internet. And that the most frequent type of risky behavior is publishing of private information, while the most encountered risky behavior of Gimnazija students was accepting a friend request from a stranger (74%).

One way of protection on the internet, aiming to prevent unwanted communication, is the education of students, parents and teachers about the risks of digital technologies; creating secure profiles and getting familiar with courses of action in case of violence. [8]

Parents find that they are enough informed about their children's actions on the internet, however they think that they need additional information and education.

Role of school in preventing digital violence is important, because it is the place where children spent most of their time during the day. Aimed at preventing violence, 95% of teachers and 74% of parents agrees that there should be implemented clear rules of mobile phone and internet usage in schools.

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MODELING AND SIMULATION IN DISASTER RISK MANAGEMENT EDUCATION

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Abstract - Modern society development started with, and is based on, industrial development. Currently, the most progressive industry around the globe is IT industry. Consequently, it has a significant influence on the social and economic changes. Any change in the development of society, economy or industry represents a chalenge for the educational system. Therefore, IT teaching subjects are an integral part of the curricula at the faculties worldwide. At the Faculty of Technical Sciences in Novi Sad, within study program "Disaster Risk and Fire Protection Management" students have an opportunity to deal with disaster risk modeling using contemporary IT tools. This paper elaborates a method for creating a model of hazard scenario in the Quantum GIS software throughout one of the student's projects.

I. INTRODUCTION

Development of information and communication technology (ICT) has become the core force that is shaping our present. Education and research as key elements in the formation of the global environment are the take-up of technologies [1]. Hence, they are implicated in all these changes. The upturns in the ICT domain provide significant opportunities to improve teaching and learning. The use of ICT in education offers even more advantages due to the attractive premises to simulate and interactively explore and test experiments which would be too expensive or too dangerous in real settings [2]. Technology enables students to learn actively, with increased motivation providing them alternatives to traditional teaching methods. In this technology-based education, the teacher helps the students to obtain, select, evaluate and store the information by the use of vast scope of sources [3]. ICT with its wide application possibilities converts people's thinking, knowledge and communication to digital and information form. It tends to redefine teacher and students roles and beliefs about teaching and learning [4]. Students have an opportunity to solve the real problems from practice and to create their own case studies through the work in the computer laboratory.

At the Faculty of Technical Sciences, University of Novi Sad, within the study program "Disaster Risk and Fire Protection Management" students are educated in the field of fundamental and applied information technologies since the beginning of their studies. In the third year of the study program, the subject "Modeling and Simulation in Risk Management" provide an opportunity for students to apply and integrate previously acquired knowledge about disaster risk management (DRM) and information technologies (IT). During the lectures and practical exercises at the subject, contemporary IT tools are used as a platform for creating different scenarios of various hazardous situations. Students are trained to use geospatial analysis for the modeling of hazardous phenomena. Since disaster risk management is interdisciplinary field, we tend to design our classes to be student-centered so that students can conduct their own scientific inquiries and engage in collaborative research programs. Therefore, this paper provides an example of the model for hazard analysis realized by students during the practical exercises at the subject. Method for the model realization was developed by use of Quantum GIS (QGIS) software.

II. DISASTER RISK MANAGEMENT STRATEGY

For the comprehension of the necessity and importance of the hazard scenario models realization, it is convenient to state basic definitions regarding hazardous phenomena.

Hazard could be defined as a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation [5]. Hazards have different origins. It can be natural (geological, hydrological, meteorological, biological) or human induced. Hazard becomes a disaster, only, when vulnerable communities are situated within hazardous areas.

Disaster can be defined as the set of adverse effects caused by social or natural phenomena on human life, properties and infrastructure, within a specific geographic unit, during a given period of time [6]. Disaster risk is the spatiotemporal function of hazard, vulnerability, exposure, and resilience [7]. Vulnerability can be analyzed as potential damage in terms of intensity of an unwanted event on the existing social, economic, cultural, technical and environmental conditions, while exposure to the disaster is determined by the final level of damage. In order to prevent communities from the disastrous consequences it is necessary to manage disaster risk.

The first steps in creating a disaster risk management strategy are identification of possible hazardous effects at the area of interest and identification of particularly vulnerable population groups in that region. Holistic disaster risk management encompasses actions before, during and after disaster occurrence, including technical preventive measures and aspects of socio-economic development designed to reduce human vulnerability to hazards [8]. This approach underscores the phase before disaster occurrence as the most important phase in the terms of vulnerability reduction at the lowest possible level. Preventive measures should be taken in every society, because disasters can affect everyone and decisions about this problem can make society either more vulnerable or more resilient to harmful event.

III. Disaster Risk Modeling

Before overall process of creating disaster risk management strategy, it is necessary to analyze the phenomena of disaster occurrence. Phenomena itself comprises natural processes and impacts of human activities. Both natural phenomena and artificial creations have to be analyzed in order to obtain satisfactory disaster prevention. Furthermore, interactions between these two systems are essential process to be analyzed in order to understand disaster occurrence possibilities.

All of the above mentioned systems and processes exist and take place in the real spatial environment. Therefore, subjects of hazard realization are characterized with spatial variables. Identification of the spatial and non-spatial variables of the elements significant for the hazard analysis is essential for the disaster risk modeling. Described approach is aligned with mandatory legislation and recommended standards in the field of disaster risk management. Therefore, teaching practice at the subject “Modeling and Simulation in Risk Management” is focused on the spatial data organization within models for hazard realization. Following is the example of the disaster model realized during the lectures and practical exercises at the subject.

IV. Methods for Disaster Modeling

During the semester students had a task to analyze hazardous situation of interest and to create a model based on the analysis. A few software applications were used as a tool for modeling: Quantum GIS, ALOHA, Pathfinder. One of the student’s projects for the result had a hazard and risk map for the Elemir settlement. Model of hazard and risk map had been realized in Quantum GIS 2.0.1.

A. Hazard map

Elemir is located in the region of Vojvodina, in the middle of Banat district. There are about 4000 inhabitants in Elemir and it is predominantly older population. The average age of the inhabitants is 40 years. The most dominant activities in the region are agriculture and livestock breeding.

As a source of hazard at the spatial area of interest, students have recognized the possibility of the hazard realization during performing technological processes in the Factory for production of synthetic rubber and in the Petroleum Industry of Serbia. Listed facilities are distributed at the inhabited parts of Elemir. In addition to the main facility for the production, NIS is consisted of a few facilities for the storage of oil and petroleum products, gas, and natural gas. Considered factories substantially increase the exposure of the population to the recognized hazard, due to the vicinity of the center of Elemir.

In the software application QGIS, hazards are represented as a separate vector layers with associated variables important for the hazardous situation analysis. First vector layer represents facilities for the production of synthetic rubber (FSK). FSK is chemical-industrial complex within the petrochemical complex "HIP PETROHEMIJA" from Pančevo. Within these factories, there are

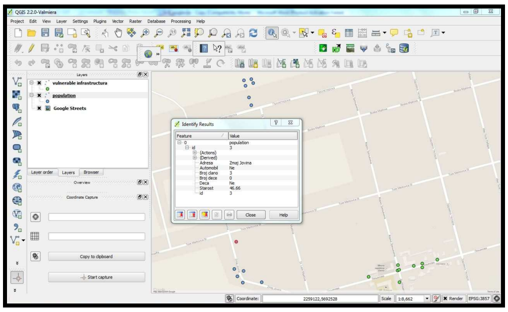

Figure 1. Vulnerable population and infrastructure displayed at the Risk map

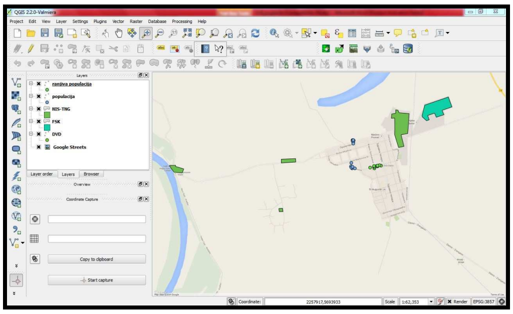

Figure 2. Hazard and Risk map overlaid in Quantum GIS

three production plants in Elemir: Plant for the production of methyl tertiary-butyl ether, Butadiene extraction plant and Plant for the production of styrene-butadiene rubber. Within vector layer representing these three objects variables describing hazard (the number of employees, production capacity, the amount of hazardous waste) with associated values are organized in the form of attribute table.

Within the second vector layer hazard map represents the Serbian Oil Industry facilities (NIS) located in the immediate vicinity of the FSK. NIS is compound of gathering stations distributed in Elemir and of the loading station at the bank of the Tisa river, in the vicinity of the weekend settlment Babatovo. Primary activity of the plant is the preparation of natural gas and the production of liquefied petroleum gas and gasoline. The raw materials for production are coming from central and northern Banat through the main pipelines and tankers. The company has about 100 employees.

B. Risk map

Elemir as a place inhabited predominantly with elderly population could be determined as a very vulnerable area. Specifically vulnerable objects and spatial distribution of the population are represented by the separate vector layers. Identified vulnerable infrastructures: primary school (attended by about 400 pupils), kindergarten (with capacity of 120 children per day), the local community, retirement homes, cultural association (which has about 100 members), and health center are organized within first vector layer. Separate vector layer presents vulnerable population distribution. This vector displays population and their age structure for two randomly selected streets. Based on the survey the age structure of the selected respondents is 55 years, and only 2 of 12 interviewed households have a vehicle. Both vector layers overlaid together represents the analysis outcome in the form of risk map (Fig. 1). Risk map overlaid with the hazard map, previously elaborated, constitute outcome of the completed student's task of the disaster modeling (Fig. 2).

V. CONCLUSION

Described case study and a method for the realization of a given task represent a strong evidence of the positive effects of the IT implementation in the multidisciplinary subjects. Also interactive and student-centered work at the lectures and practical exercises should become priority in our educational system, especially in the field of engineering. In order to educate individual, conscious engineers it is essential to put them in the collaborative context during the real problem solving. Therefore, Information Technologies, as a tool for the reality simulation, had proven itself as inevitable component of the educational system.

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TEACHING OF NOVICE PROGRAMMERS: STRATEGIES, PROGRAMMING LANGUAGES AND PREDICTORS

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Abstract - Research on the challenges of teaching novice programmers has long been a subject of interest of all the factors involved in the study of introductory programming objects. Novice programmers often try to understand too soon what really programming means. Such approach is usually superficial and can lead to frustration and withdrawal. The problem is reflected in the low passing grades and high dropout rates in subject of introductory programming at various universities. The aim of this study was to review the relevant literature and research on strategies for teaching novice programmers that have proven to be successful. The factors that can significantly influence the success in learning programming are identified as well as experiences about the impact of the first programming language election to the overall success of students in introductory programming subject.

I. INTRODUCTION

In the traditional teaching of computer science students have great difficulty in acquiring new concepts [1]. Over the last two decades there have been profound changes in the way we perceive and implement learning within the education system. Teaching places students in the center of the learning process rather than a teacher who dominates in the traditional approach to teaching. Teachers must adapt their approach to teaching novices to facilitate the adoption of intensive programming concepts and encourage them to greater involvement in the introductory programming. Computer science has an important task to identify what students are really interested in while programming, to discover the context in which students do it and how they do it. Today, students rather create real applications such as games and stories as part of a larger learning community instead of programming only to program [2]. New teaching methods influenced by development of constructivism advocate active construction of knowledge by students rather than passive absorbing from textbooks and lectures. In computational science emphasis is on building an efficient computer model.

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In the field of programming the construction of knowledge is associated with predicting and understanding what is going on during execution of a computer program [3].

II. NOVICE PROGRAMMERS TEACHING STRATEGIES

Experts and novices in a particular area have different approaches to building their knowledge. Experts prefer the emergence of generalization while beginners favor superficial observation [4]. Concepts of programming that are acquired, are ranging from simple, such as variables, branching, looping, through manipulation with input and output data and errors towards demanding concepts such as structured data types, recursion, pointers and references [5]. Previous studies have shown that teachers know little about what students actually learn in the introductory programming and poor knowledge of students' problems they face while learning to program [6]. Researchers are interested in how novices adopt difficult concepts of introductory programming, which problem-solving strategies they apply while doing it and if teacher can master a positive impact on students to develop a quality approach to learning. During seventies early phenomenographers found two different approaches to learning that students use: deep approach, in which students tend to develop a real understanding of what they learn and surface approach to learning in which students just want to do a task that they get from teachers without real understanding. Teachers and learning content strongly influence the choice of deep or surface approach to learning among students [7, 8].

Interactive approaches to teaching programming such as: syntax-free, computational literacy, problem-solving and computing as interaction have been analyzed [4]. All these approaches share the common view that students should learn coding and from that experience learn complex, transferable skills such as analysis, design and problem solving. These approaches stress the importance of supporting students in achieving this goal. Most universities in the introductory programming still work in the traditional way of teaching, which consists of lectures, assignments and perhaps a demonstration of individual tasks. For students it is not such a problem to learn the syntax and semantics of programming languages individually but to combine these components into a meaningful whole. Many of them gave up their classes because they were not able to solve the tasks, they felt inadequate and unfit for it. In order to break the practice of "being taught to" introductory programming courses sometimes emphasize student engagement rather than passive learning. One strategy that fosters such an approach is **cognitive apprenticeship** strategy that emphasizes the adoption of cognitive skills. Cognitive apprenticeship starts by showing the conceptual model of the process most often through working examples and constantly explaining each stage of the process by the teacher. Students gradually solve the tasks, first with minimal teacher’s assistance until the time when the teacher's help is no longer needed. Previous studies have shown that cognitive apprenticeship brings a higher retention rate of students in the introductory programming subjects [9]. A special form of cognitive apprenticeship strategy represents a strategy of **extreme apprenticeship** [10, 11], which emphasizes communication between teachers and students during the student's problem-solving process. This strategy emphasizes learning by doing and the importance of ongoing feedback from teachers. Students are introduced early in solving problems that are always divided into smaller parts. Such fractional tasks students find solvable and understandable. Extreme apprenticeship method in teaching programming can be integrated as part of the **pair programming** where students program in pairs while constantly revising written code. This software development technique, in which two programmers work together at one keyboard, showed significant positive results, particularly in the field of student's feelings of satisfaction and self-esteem [12, 13]. There is a long tradition of using students and undergraduate students as teaching assistants in general.

The method of **peer teaching** showed success in improving the pass rates of introductory programming subjects and retention in the same subjects. Peer teaching is a pedagogical practice designed to support student engagement in teaching and improve learning outcomes. This teaching practice begins with a certain number of questions that correspond to individual students. After individual responses smaller group discussions followed, and the process of teaching concludes with a discussion led by the teacher with the whole class. Studies applying these strategies in teaching computer sciences howedhigh satisfaction and higher rates of exam results in introductory programming subjects [14].

Many universities promote teamwork and cooperation among students, through the use of **collaborative learning**. Collaborative learning combines students into groups according to various criteria and characteristics of the students. Precisely, the model that connects students to their programming knowledge and involvement in the group, proved to be successful in improving students' knowledge, regardless of some of their characteristics and their habits of learning [12].

For teacher is extremely important to know the way in which novice programmers adopt difficult concepts to be able to select his teaching strategies. Experienced programmer applies strategies that are derived from solving the past problems, which is not the case for novice programmers [15, 16]. They can understand the syntax rules of the programming language very well and write simple programs, in the same time it is very difficult for them to find solutions to problems not having the experience of one expert. Knowing the difference between beginners and experts in analyzing and solving problems will emphasize concepts that beginners focus on. Teachers are often in a dilemma on how to organize the content of learning programming. Studies have shown that changes of teaching sequences will not affect what beginners really learn. However, the change to the sequence of the learning content influences the cognitive load and effort that students recognize while learning these sequences [15]. Students will recognize the difficult concepts regardless of the order in which they were present. Learning from the concrete to the abstract gives the lowest score of weight and maximum efficiency. Teachers should thoroughly work on basic skills and simple problem solutions before entering the complex planning. In this way, newcomers have the opportunity to acquire the necessary background for understanding and implementation of plans.

A potential cause of failure of students in introductory programming lies in the creation of non-viable mental models of programming concepts [3]. According to Craik the brain creates "small-scale models of reality" that can be used to predict and understand the events and supporting explanations of these events. Mental models are incomplete,changeable, have blurred boundaries, they are unscientific and prejudiced, while accepting new information they still retain the old one what canoften create additional problems in understanding. Exploring the mental models of students is very important, especially for the preparation of teachers and designing instructional materials. Although there are many studies that deal with the human mental models of natural surrounding phenomena, there are very few studies that have explored exactly the mental models of novice programmers. Learning to program involves the creation of viable mental models of basic programming concepts. Students with viable mental models solve programming tasks significantly better than those with non-viable mental models[17, 18]. It is assumed that many students, before turning to the subject of the introductory programming have deeply entrenched the ideas about some computer concepts such as assigning command. Constructivism advocates actively constructing knowledge of students combining experiential world with existing cognitive structures. Teaching strategy that particularly provokes existing ideas is just Festinger's cognitive conflict strategy. Applying this strategy causes students to recognize errors in their understanding by bringing them in to a stateof cognitive conflict. Then the student perceives the discrepancy between his cognitive structure and external conditions, or between parts of his cognitive structure. Model of teaching strategy that integrates cognitive conflict and visualization software tool through Jeliot gave good results in improving the non-viable model of programming concepts [17, 19].

For students with no previous experience with programming **Kick-start activation** strategy is recommended [20]. In this approach student starts with deep structure of programming before introducing the structure of programming language. The strategy is based on a real computer program and is easily introduced while students participate in solving tasks to eliminate the errors that were intentionally made by teachers. The concept of the algorithm is introduced through pseudo-code and flow charts at the same time allowing students to enter solving problem phase, programming phase and understanding the differences between human and computers way of thinking.

III. PROGRAMMING LANGUAGES AND TEACHING ENVIROMENTS FOR NOVICES

Understanding the learning process of the first programming language can create effective learning environments. Some systems accommodate programming in an accessible and entertaining context like storytelling, games and robots [21], others simplify programming languages by keeping a few simple commands, reducing the syntax elements or maintaining the highest possible similarities with general-purpose languages without changing the structure of commands (QBasic, SP/J, Turing, Blue, JJ). The main purpose of MacGnome and Gnome is the prevention of syntax errors. Systems like Play, Show and Tell, My Make Believe Castle, Logo Blocks Alice2; Karel J Robot and Kodu are examples of systems developed for using objects and graphical representations of actions and events, all in order to circumvent totally syntax errors. Programming languages like Pascal, SmallTalk, Playground LiveWorld, and Blue Environmentare examples of languages, which aim to boost the availability of programming. AlgoBlocks promotes collective learning. The best examples of programs that introduce programs through some content are programs that include micro-worlds, robots, gaming and media computing. Early examples of the use of micro-worlds in programming are designed in Logo. Micro-worlds are useful for teaching, but there is a risk that students will not be able to convey the importance of content in the real world. The use of robots in the initial programming has proven successful and motivating in many institutions [22]. Media computing, which involves manipulating the media such as images and sound files, encourages creative expression while dealing with programming features such as loops and data management. Applying the approach of media computing resulted in increasing memory, enthusiasm among students and encouragement of women to participate [23].

Among the various environments that attempt to facilitate the introduction of the special programming highlights Alice, Greenfoot and Scratch. Although designed in different times and contexts, all three environments are visual, encourage direct participation in attractive activities and introduce students to programming. These environments have strong support in user community, either individually or in face to face groups in the form of a gallery, a Website where students publish and share their materials. The absence of syntax errors in these environments has increased the security of novices, but these problems occur again at the turn to the textual programming languages [24] such as Java or C++. Graphical environment Alice 3 successfully solved the problem of transition to Java with methods that directly convert Alice 3 objects in Java code (Fig.1) [25]. The connection was made between problem solving strategies in Alice environment and supporting teaching techniques of indirect transfers known as bridging and hugging. With this technique, the teacher helps the student create a link from the content of which the concept taught to some other possible content in which the concept could be applied but also teacher creates learning situations that are very similar to situations in which the transfer is expected. A similar approach is used in BlueJ environment which is intended for initial teaching of object-oriented programming. BlueJ offers a graphical presentation of the class in the form of UML diagrams [26]. Good results in working with novices showed the Kodu programming language showing the increased involvement of students and students' projects containing even demanding programming concepts [27].

Figure 1. Transferring Alice3 project into Java code

The main goal of any introductory programming subject and learning the first programming language is learning basic programming concepts that can be applied equally well in any programming language. Also, first programming language must be intuitive enough for beginners so they do not give up at the very beginning [28]. More than 8,000 well-known programming languages are documented on the World Wide Web [29]. Which of these languages are the most suitable for beginners? Today, thinking about the programming languages focuses more on the educational aspect of learning. Among the programming languages like C, C++, Python, Java, Eiffel, Haskell, JavaScript, Logo, Pascal, VB most appropriate for teaching were evaluated as Python and Eiffel. Although Java fills most of the required criteria, its major drawback is that it is not designed for teaching.

Many novice programmers when writing the first computer program follow the feeling of failure because they have to deal with unexpected syntax errors, errors of program or some output value that is not expected. All of the above may be included in the forms of program feedback. Program feedback is essential in assisting students to understand the computer program and the way in which computer interprets the program. One approach in solving these problems involves the use of problem-oriented programming and testing POPT [9] supported by the TestBoot tool. It allows novice to define simple input-output table of cases without the need of learning a new environment or changing the structure of the program. The results

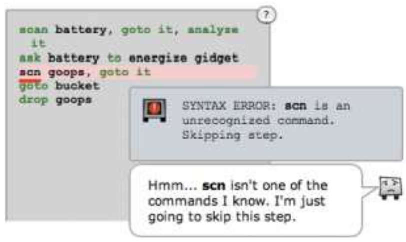

Figure 2. Gidget – performance error with and appropriate robot message

are better quality of generated code, smaller number of corrections of first program solutions and longer time to create the first solution. Another approach involving testing in introductory programming subject uses some personalized programming environment like Gidget. Gidget is a game where beginner helps the robot to repair his faulty code. They go through several levels of the game while learning basic design and analysis of algorithms in a simple imperative language (Fig. 2).

This approach has caused an increase in motivation and engagement of students in correcting faulty code [30].

Good results can also provide tools that help students in the form of teaching assistant. Tool Petcha is an example of such a tool that acts as an automated assistant in matters of programming [31]. It complements existing tools, it is easily removed at the time when is no longer needed and promotes the use of existing development environments such as Eclipse and Visual Studio.

IV. Predictors of novice programmers performance

Studies of factors that can significantly influence the performance of programming are very interesting subjects for teachers of introductory programming. These factors can point out what should be highlighted or should represent the foundation of teachers work but also can recommend what to avoid in working with novices. The best indicators of success in all disciplines are considered students' self-esteemed success, their attitude, enthusiasm and general academic motivation. These factors have a strong impact on the performance of students, but do not separate programming from other disciplines. Earlier extensive research emphasized as the strongest predictors the degree of comfort, mathematical knowledge and attribution of success dependent on luck. Several studies have confirmed the existence of a positive correlation of deep approach to learning with the initial programming grade, but also a negative correlation of surface approach to learning with the same grade. Significant positive correlation was also found between the assessment of programming and sketching the spatial maps. We can say that various navigation strategies can have a positive impact on the programming code [32]. A strong positive correlation was shown between success in the programming and problem solving in mathematics and the natural sciences. Research of students' comments and observations collected during programming tasks showed that the positive previous programming experience strengthened positive self-assessment of student work [33]. Using viable mental models of programming concepts positively affects the success in initial programming [34]. Among the negative predictors were highlighted the frequent frustration with the tendency of rapid with drawal, an aversion to programming, a sense of failure during programming, use of different programming models to solve the problem, believing that the best solution is to learn by heart, that real programmers immediately see the solution to the problem and that it takes a great knowledge of programming to achieve success [35]. Students who had a high percentage of successful continuous translation of programs achieved good success in programming, while students with lower achievement in programming had a high percentage of continuous errors in programming exercises and a greater number of hours spent on debugging the program. Previous programming experience showed to be useful for students, while gender, number of years of programming and programming languages that the student knows didn't significantly affect their performance [36]. There is a significant positive correlation between learning style abstract/random according to Gregorc, while learning styles according to Kolb does not demonstrate the power of predictors. Results related to learning styles vary through researches and it is possible that some meta-study could help produce valid conclusions about their impact. Teachers can hardly affect most of these factors significantly, but it is extremely important to know well their students in order to adjust teaching strategies and select the appropriate system for teaching as well as appropriate initial programming language.

V. Conclusion

In this debate about teaching novice programmers some teaching strategies that have shown the potential to facilitate students the adoption of demanding concepts of programming have been addressed. These strategies require more student engagement in the work and pay special attention to any form of mutual interaction and collaborative engagement between students and teachers. None of these strategies has proved to be successful in every learning situation which leads to the conclusion that it is necessary to adjust the chosen strategy with the context of learning, learning environment and the student himself. Learning environments and first programming language both, must introduce students into programming in a way that is interesting and engaging enough to keep them working while adopting demanding programming concepts. Knowing the factors that significantly influence the performance of programming teacher can improve students programming and avoid bad influences on their performance.

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EXPERIMENTAL EXAMINATION OF STRUCTURED-MODULAR INSTRUCTION

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Abstract - The experimental examination of the efficiency of constructivism based structured-modular approach was done on the example of Anemometer module at Electro-technical school. The starting hypotheses were confirmed, i.e. the level of factual knowledge does not depend on the treatment of the group but their size, namely, the ability of using the knowledge is significantly better with structured-modular teaching. The transfer of cognitive skills gained by this approach is expected, but did not happen. The students consider that the structured-modular teaching is better and more interesting. It enables them to problem solving independently and the knowledge is better related to the needs of practice. From the taxonomy of educational contents is easy to designate modules of the lowest hierarchical level. These modules become relevant to students by gradual grouping from the simplest to more complex intentional modules. They are constructed by experts and skilled teachers, based on student's interests and affinity. The development of abilities to apply knowledge, independent learning and employing sophisticated resources is more important than accumulation of factual knowledge. This demand sees a role of teacher as coordinator, teaching materials as guide through the modules and assessment as confrontation of student with problem situation.

I. INTRODUCTION

Despite all the criticisms, lecture followed by exercises that further explain the learned concepts is the predominant form of teaching. It provides well-structured knowledge, it is very time efficient and it provides an opportunity for students to get quickly an overview of some scientific discipline and gives a sense of control of the whole process to the teacher [1]. Transmission character of teaching suffers from serious deficiencies: it is mostly focused on factual knowledge, understanding and easierapplication; poor motivation and passivity of students do not stimulate creativity; it is unadjusted to real interests of students; excessive influence curriculum creator leaves teachers a little room for adaptation to local conditions. Possibleanswer tothis situation is modular teaching [2]. The idea of thematically rounded modules that starts from the real lifeand verification of the entireset of module sinstead of individualone have yielded significant results [3], [4], [5]. Structured-modular model of the teaching process is characterized by aspecific clustering module procedure and their hierarchical structure. Prevail teaching models that are grounded in aconstructivist paradigm are seminars, project teaching, learning through research, teaching questioning [6], [7], [8]. Of course, there is also room for variety of methods used in the ERR (evocation, understanding, reflection) framework for teaching [9], [10].

By its nature, structured - modular model is praxeological and covers the entire educational process, such as didactical theories. Experts in specific scientific areas conduct collecting, sorting and selecting of goals, defining educational content and its taxonomical schemes and modules of the lowest hierarchical level. Teams consisting of experts and teacher-practitionerwill make integration and placement of modules in real contexts, based on students' interests.Optimization module shall be set based on transparent criteria. Teachers are more familiar with their school environment and student abilities, theyhave a major role in defining the teaching methods and forms of work, in making the choice of the teaching social organization, teaching aids and equipment that will be used as well as method of evaluation results. They cease to be a transmitter and a primary source of knowledge. Teachers become guide to students - their co-workers in a team. In collaboration with other teachers,they also define common points with their courses and possibilities of teamwork. Verification of student achievement takes place through the entire process of carefully selected problem situations. Instead of measuring the accumulated factual knowledge, the test is more oriented towards recognizing the wealth of ideas, their argumentative purification, towards the quality of implementation, testing and documentation of solutions [11]. Test instruments and analysis of the results besides the revised Bloom's taxonomy [12] should be based on the SOLO taxonomy [13], which measures the perspective of knowledge on the local-holistic scale. Structured-modular teachingparticularly comes to the fore at higher levels of implementation and creation, i.e.a multiple and holistic perspective.Empirical research conducted among third grade students of Electro-technical school through the course of Digital electronics had an important role in the development of models for content programming, selection and design of the module and the organization and management of the teaching process with structured modular approach.

We set four hypotheses:

H_1: There is no significant difference in knowledge of the facts, which are the result of learning, between the standard and structured-modular way.

H_2: There is a significant difference in the ability to apply knowledge as learning outcomes between standard and structured-modular way.

H_3: There will be a transfer of cognitive skills acquired in the structured-modular teaching assignments in more complex applications and synthesis.

H_4: There is a greater studentaffinity toward modular-structured teaching than for classical.

II. EMPIRICAL RESEARCH

A. Research draft

The central empirical method in this paper is adidactical quasi-experiment from the group of operational and applied researches. It is supplemented by surveys, which tested students' attitudes in experimental group and qualitative snapshot of the teaching process. Experimental model that Campbell and Stanley called “right” and Kerlinger “good”, with streamlined parallel group [14] was applied. Working of groupstook place on the following scheme:

- C-2, control group consisted of 39 students, classical work, common lectures, exercises divided in three subgroups
- C-1, control group consisted of 14 students, classical work, separate exercises and lectures
- E,experimental group consisted of 24 students, modular-structured classes divided into two groups of 12 students

It is well known by GlassandSmiths’ extensive meta-analysis that smaller classes achieve significantly better results [14]. C-1 group was formed for that reason, in order to control the impact of group size, by which weavoided attributing the impact of other factors.

In order to retain the naturalness, each group was composed of students from the same classes and groups as it was before the research hand the same teacher performed the instruction. There was no equalizing by couples as it was already established that there were nosignificant differences between the groups according to the overall success, the general ability test, grades of group of courses in electrical engineering and initial test of knowledge. Including teaching materials and test instruments were the same for all groups.

B. Sample

In the study that lasted for six weeks, 77 students participated in two parallel classes of third grade Electro technical school with identical programs. A teacher with five-year experience as a designer in electronic industry and three-year experience in teaching taught digital electronics course. He was a leading teacher, teacher who was ready to change his role and status in the structured - modular teaching. He gained his authority with arather unconventional than rigor relationship with students. According to Bennett typology [14] teachers closest to him, belong to first and third categories: he prefers intrinsic motivation and integration of content, students choose what and how they will work, mostly in teams.

Module Anemometer/Rev counter gave the possibility of a direct connection with the subject of electronic assemblies and sub-modules via computing encoder and processing by computers. It was necessary to provide sufficient signal generator, oscilloscope, rectifier, test circuit boards electronic components and catalog with specifications of digital circuits.

C. Methods, procedures and measuring instruments

The study applied the Problem test capability, initial and final knowledge test and the questionnaire for a survey of students in the experimental group. Several students did not participate in all stages because of the inability.

Bujas’s Problem test of the ability for the profession of electrics/electronics/automationhad70tasks, and was handled for 45 minutes. The mean value was M =38.58 and standard deviation σ =10.39. Respondents achieved 46.22 points (equivalent to z-value is 0.735). The initial knowledge test consisted of two parts and it was addressed to all three groups for 60 minutes.

TABLE I. COMPARISON OF INITIAL CONDITIONS BY GROUPS

	E – group	C-1 group	C-2 group	ANOVA / Kruskal-Wallis
1. Bujas's Problem test (z-score)	0.78	0.55	0.77	F=0.492, sig.= 0.613
2. Overall success mark	3.24	3.19	3.28	F=0.032, sig.=0,969
3. Electronic courses mark	2.73	2.58	2.85	X^2 =0.36, DF=2, sig= 0.835
4. Pre-test – (known topics, prerequisites)	41.35	42.71	41.71	F=0.156, sig.=0.856
5. Pre- test – (new topic + use of catalog)	10.55	9.86	11.21	F=0.611, sig.=0.546
6. All previous elements (1-5) together (quick cluster - 3 group – percentage of students in best group)	36.8	33.3	33.3	

Tasks could be classified into six types: multiple choices, replenishment, comparing, multiple joining, analytical reasoning and synthesis. Winning points were all fully or partially correct answers. Negative points were included to discourage guessing, depending on the severity of the error. Scoring system was previously agreed for each task with all possible variations for correct and incorrect responses. The tests were corrected independently twice as in the final test. The first part of the initial test (14 tasks, 55 points) checked the knowledge of digital technique and electronics circuits, which was prerequisite for mastering of module. There were nosignificant differences between groups [Table I].

The second part (8 assignments, 31 points) explored the possible knowledge of the material that was about to be processed by the module. In addition, there were no significant differences between groups.

The constructive validity of the test, determined by factor analysis, emphasized the importance of three factors that explain over 50% of the variance: the knowledge of the signal, cascading circuits and knowledge of logic gates. Reliability of the tests according to the Spearman-Brown formula was a modest 0.69 because of the in homogeneous structure of the test, a small number of tasks and the effect of guessing. The discriminative value of most tasks, expressed by ϕ coefficient, was very high.The exceptions were two tasks in which no one knew the answer because it was about material yet to be processed as well as tasks of the knowledge of the EX-OR gate and periodic signals. Table (table) shows that there is no significant difference between groups by any criterion.

The final knowledge test included topics: flip-flop, the delay signal, register, shift register, counter, display, divider, decoder, driver, A/D and D/A converters. The first section (11 tasks, 47points) assessed the level of factual knowledge, understanding, application and analysis. Solving time was 30 minutes. Typical tasks included the situation of the various able of stabiles, differences of asynchronous and synchronous counters, definition and principle of shift register operation. There were nosignificant differences between groups. The second part (task 3, 44 points) related to the complex application and synthesis. Resolution time was 25 minutes. An example application was the tachometer. On the block-scheme, students should have marked the names of the assemblies, the number of lines, the type and position of the control signals. Synthesis was assessed with task that was supposed to explain the schematic work of echosounder (transmitting part, the receiving component, display and managing of time counting). Students of the experimental group achieved a significantly better result. The thirdpart of the test (3 tasks, 22 points) attempted to examine whether there was a transfer of cognitive kills in the field of A/D and D/A converters, which was not included in the modular-structured classes. Time was limited to 25 minutes. There were no significant differences between groups.

Likert scale of attitudes was used for students of experimental group to test interesting aspects, usability of knowledge in realistic problem situations, the necessary level of independence and demands of students, the role of teachers and their qualifications, possible applications through out the school year and in other courses and preferences in relation to the standard teaching. The views were presented in the form of astatement byt he Likertscale, ranging from 1to 7.

D. Preparation of the experiment

First step in the preparation of the experiment after defining the objectives, tasks and research hypothesis included a choice of schools, grades and classes in which was possible to conduct an experiment. The choice fell on the School of Electrical Engineering for the sake of several reasons: established curriculum, opportunities to connect on tent from a large number of cases with one teaching module, having lecturers with enough experience in design and teaching ready to accept an experimental mode that is full of uncertainty, good laboratory material equipment, existence of well-developed laboratory exercises in the are a covered by the module and existence of two parallel classes of thirdgrade in the same profession that were mature enough for realization of more complex modules.

It was necessary to find interesting relevant problem for students who were able to realize the anticipated 12 hours of instruction, compatible with the existing curriculum and the pace of their implementation. It was preferred that the components (sub modules) could be incorporated in the other main modules as a complete solution, that the knowledge of the related coursesthat were thought at the same time could be used but also that it could provide the preparation of individual assembly for the module in those courses.

We assumed that the acceptable module was anemometer, a device that measures wind speed. Anemometer is inevitable in the collection of data necessary for the design of wind turbines that are the leading source of renewable energy today. Regardless of the enormous importance of energy issues, an attempt to exploit energy background to animate students remained fruitless, because they did notsee immediate benefits or usability in their daily lives. For them it was others' problem– government's, companies' etc. However, the simple possibility of using the same device caused a great deal of interest. A few of them were sailors, and they knew the meaning of the unit in preparation tactics for the race. During the implementation of the modules students noticed that the main module, after changing encoder, couldbe used for device that was even more attractive - the car or motorcycle tachometer.

Synopsis that defined the key points and the time required to reach them was designed before therealization ofthe module. In everything else, the teacher hadfull freedom, but he was expected to achieve the highest possible quality and thoughtful students' engagement.

E. A recording of the teaching process for the experimental group

The focus of this recording is directed towards the aspect ofestablishing problem dialogue, with emphasis on the stage of decomposition of the main problems in several smaller ones. Therefore, despite the existence of a large number of teaching process recording protocols such as Flanders, there were used only some of their elements. With the help of their teacher, students were mostly able to follow the development of the project from concept to concrete specifications. Appointed tasks were in the zone of proximal development, still slightly above the current capabilities of students.

The teacher skillfully guided the process by constant creating of problem situations, at first verbally and later confronting students with unexpected and seemingly contradictory situations that led to cognitive dissonance. It was obvious from the footage that half of the students were active during the theoretical problem solving, and during the independent practical work almost all of the students were involved, much more than in the traditional teaching. It is reasonable to presume that other students tried to find a solution, but that was not recorded because of slower labor or smaller capacity or they did notmanage to make it on time.

The module offered the possibility of extending so the encoderpulses were shaped and driven to the I/O port of the PC, counted in time and directly presented as the speed of wind speed in the digital and analog form on a computer screen, along with the graphics display of speed change in time. Students really liked that option, and one of them, very suspicious of anything new, said that he had "the best two hours since going to school".

F. Realization of the teaching process with control groups

In conventional work, teaching is delivered in a form in which frontal lessons for the whole class followthe material from textbooks. Laboratory exercises follow the lectures and are held in groups up to five students with pre-prepared manuals for students. Manuals provide description of laboratory exercises, a scheme by which the assembly will be measured, a description of measurements and instruments, and often the appearance of the table in which to enter the results. A common mistake with this approach is the aspiration towards mechanical performance of a large number of exercises thatprecisely follow the manual. It typically serves as a source of prepared information and teachers and students both do not participate in its production. For student everything is served. He does not encounter even one real problem in the design and manufacture of assembly because someone else, usually a teacher, made it for him. The students were expected to carry out the scheme to connect circuits and devices, measurement, data processing and display. The interpretation of the results is usuallypaternal.

The effect of exercise is reflected in the fact that the student is "convinced" that the theoretical elaboration of certain circuits is correct and that the results obtained in individual measuring points were predicted by the teacher or textbook. No self-disclosure or greater intellectual effort of student was included. This result is useful in the beginning of professional student education when it is necessary to master the technique of measurement and data processing, but it is difficult to expect that the student, accustomed to such work, will be able to designin dependently a complex device. Laboratory work has the potential in developing methods that are similar to scientifically ones or in the process of provoking curiosity and motivation of students, but working with the constructed model, students do not recognize its benefits in their private and professional life, so their motivation is low.

Why has this way of teaching managed to maintain in technical courses of many technical schools and colleges? This approach certainly has a number of technical advantages: the timing of exercise realization can be accurately predicted, students can study them in advance, and the necessary theory for understanding is included in the exercise description. This approach is economical because large number of students can use small number of models. This approach allows teachers casualwork, without the possibility of unpleasant trip into the unknown, failure model is simply replaced by backup.

The main problem of this approach is the tendency to perform more and more exercise, even purely mechanically, without understanding. The problem is not that such teaching model exists, but that it is often dominant or the only one in professional schools.

III. ANALISYS OF THE RESULT OF THE EMPIRICAL RESEARCH

Reliability of the final test, expressed by Spearman-Brown coefficient of internal consistency was 0.78. The discriminative value of all tasks, except two, was very high. Percentage of correct answers was in the range of 3% to 86%. Constructive validity of the final test was determined by the factor analysis (Principal Component Analysis, Varimaxrotation). The most important factors were registers, then understanding of the device blockschemes, A/D converters, counters and their application and circuit delay. In the overall factual knowledge, there was no significant difference between the standard and structured-modular way, although the experimental group (E) was significantly better than the large classical groups (C-2) [Table II]. Group size had greater impact (η^2= 0.032) than treatment (η^2=0.002). This confirmed the hypothesis H_1**.**

In the synthes is and application of acquired knowledge in more complex tasks, the experimental group was significantly better than both control groups. Treatment (η^2 =0.065) had more significant contribution than the group size (η^2=0.044). In this way, the hypothesis H_2 was confirmed. In knowledge ofthe A/D and D /A converters, the best result achieved large group of classical C-2, which was significantly better than the group C-1. It is important to note that all groups started to adopt this material in the same conditions and in the same, standard way. Certain degree of transfer of cognitive skills was expected to be acquired in modular teaching in the experimental group, but it did not happen. Hypothesis H_3 was not confirmed. Another analysis confirmed the superiority of the experimental group. Quick cluster analysis showed that 66% of students in the experimental group and 29% of students in control group belonged to a best group. Multiple regression analysis showed that the score of electrical courses was influential predictive factor for all three components of the test. Contrary to expectations, problem test had three times weaker influence, even in the tasks of synthesis and complex applications. Attitudes about their experience with the modular classes were presented in the form of statements, and students of the experimental group expressed their agreement or disagreement with Likert scale ranging from 1 to 7 at the end of the realization of the module. Students strongly emphasized that the work had been interesting (average score 6.42), that acquired knowledge had beenassociated to real problems (6.0) and their greater ability to solving problems by themselves (5.92). In

TABLE II. TWO-WAY ANALYSIS OF VARIANCE AND QUICK-CLUSTER BY GROUP ON FINAL TEST

	E- group	C-1 group	C-2 group	F-test(sig.)	TREATMENT		GROUP SIZE	
					F-test (sig)	η^2	F-test(sig)	η^2
Facts	23.04*	21.93	18.27**	0.064	0.681	0.002	0.133	0.032
Application, synthesis	11.17*	6.93**	3.89**	0.000	0.031	0.065	0.078	0.044
Transfer to A/D &D/A	6.61	4.86**	8.14*	0.040	0.212	0.022	0.019	0.077
% students in best group	66%	29%	29%					

Comment: * - significantly better group (p<0.05), ** significantly worse group (p<0.05) addition, students slightly agree that such approach is possible in other courses (5.11) and that other teachers are trained for such work (5.11). They completely noticed teachers' changed role (6.53). They consider that students need to be more independent (5.74) and that this approach requires more of their work (4.32). This problem-based modular teaching students find better than the classic one (5.26), suggesting that it should be introduced gradually from the beginning of the school year (6.68). The survey analysis confirmed the hypothesis H_4 that students were more proneto modular-structured teaching than the classic one.

IV. Conclusion

Instead of a one-way flow of information typical for frontal teaching, constructivist-oriented teaching techniques are collaborative and two-way and turn teachers into "travel guide for info sphere." Successful dealingwith the challenges of the real world, typical for industrial training, becomes more represented in school education through emphasizing competencies rather than factual knowledge. For the sake of students preferences to learn in real context and easier integration of new concepts in students' concepts network it is justified to use initial introduction of thematic units. Especially suitable framework for such approach is modular-structured teaching. Empirical researchon the module Anemometer/Rev counterin the Digital Electronics course has confirmed the effectiveness of structured-modular approach. For the acquisition of factual knowledge size of the group showed significantly greater effect than adopted structured-modular treatment compared to standard lecture followed by laboratory exercises. Significant difference was shown in dealing with demanding situations such as applicationin new context or synthesis (creation) in favor of structured-modular approach that was applied to studentsofexperimental group. It showed significantly greater effect of treatment than the effect of group size. The transfer of complex cognitive skills in new material that was cultivatedin a standard way did not occur althoughit was expected. Students questionnaire of the experimental group showed that students in structured-modular approach strongly emphasized interesting work, expressed greater interest in the problems that emerged from real-life context and felt that they had raised their own level of proficiency in problem solving. They observed the changing role of teachers toward more advisory role, also they noticed that they werestriving to more independence and would like touse this approach in other courses. Students are careful in assessing how much it isfeasible. Isolated or overlapping materials are frequent consequences of teachers' closure in narrow boundaries of your profession. Structured-modular approach is interdisciplinary and itnaturally integrates content from various scientific disciplines. This requires adequate training of teachers and the tendency to work in a team. This needs to be nurtured during prospective teacher studies rather than focusing exclusively on autonomous action.

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WEB 2.0 TOOLS IN EDUCATION, THE GAP BETWEEN THE CURRICULUM AND SCHOOL PRACTICE

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Abstract – Modern pedagogical efforts, the information society and changed mental structure of new generations require the implementation of web 2.0 tools in education. Web 2.0 services and sites allow users to interact and collaborate with each other. Web 2.0 tools, such as online documents, social networks, wikis, blogs, social bookmarking and online presentations are interesting possibilities with interactive and multimedia support, which motivate students and fit their mentality and everyday lives (Namestovski & Arsovic, 2013). This research project investigates the level of web 2.0 tools application in Serbia, and also explores the barriers and offer possible solution. On the other hand the curriculum and the textbooks were also analyzed.

I. INTRODUCTION

Web 1.0 was characteristic to the Internet until the middle of the first decade of the new millennium, mostly meaning passive content servicing and one-way communication. The following Web 2.0 environment – beside "content consumption" – also means creating and sharing of contents, emergence of online applications, as well as of interactive and collaborative activities. On the other hands the communities in this environment are formed around the field of users' interests. The document editing and storing tools, e-mail sending/receiving softwares were also moved to the online space. These processes facilitated the mobility of users and the rapid and easily access to the documents.

The most popular Web 2.0 tools are social networking sites (Facebook), where all Web 2.0 features are appearing, first of all immediate and interactive communication.

Besides the social networking sites, there is the image and video hosting, sharing websites (YouTube, Flickr, Picasa), collaboratively edited free online encyclopaedia (Wikipedia), online auction websites (eBay), blogs and microblogging services (Twitter) and online document editing applications (Google Docs and SkyDrive)

II. EDUCATIONAL STRUCTURE OF REPUBLIC SERBIA

The educational structure of Republic Serbia is divided into elementary schools, high schools and higher education. Elementary schools consist of 4+4 classes. In first 4 classes (lower classes) class teaching is realized, in other 4 classes (higher classes) subject teaching is realized.

The high schools, ended with Matura (Graduation) are 4 years long, and besides these high schools, there are high schools with three years duration, in most of the cases with vocational type of education. All public educational institutions in Republic of Serbia are under direction of Ministry of Education, Science and Technological Development and the curriculums were created by this organisation.

The faculties of universities are independent, the curriculums of these institutes can be customizable and adaptable for programs and needs.

III. WEB 2.0 TOOLS IN LOWER CLASSES OF ELEMENTARY SCHOOL

In republic of Serbia the teaching of IT contents began in lower classes of elementary school within the framework of subject: From toys to computers. The subject is optional (1 lesson per week) from 1 to 4 classes. The curriculum was created in 2008. In the framework of this course, the students are meeting with concepts of materials and different toys, and after that with basics concepts, security risk and rules of conducts related to IT. The units of course are repeated and expanded in the form of concentric circles and usually lectured by teacher.

The aims of the course at first grade are the development of motor skills, logical thinking and creativity. Besides of these contents, the course includes the basic components of computer, the safe using of computer, basic text inputs and editing, drawing and printing in the first class.

Following the principle of concentric circles, in the second year the contents from the first class are extended. In the introduced software (Paint) the numerous possibilities and tools are extended. The text and picture editing is expanded with scanner and digital camera application.

At the third grade the teaching contents are also expanded. For creating picture and textual contents used Paint software. In the curriculum and in workbook appeared the calculator and the concepts of hardware and software was presented using practical examples. At the end of school year the operation of sending and receiving e-mail is appearing.

At the fourth grade for the topic of text and picture editing (Microsoft Word, Microsoft Publisher) and for the topic of presentation (Microsoft PowerPoint) new softwares appeared. Activities on the Internet were expanded with applying web camera and multimedia message.

In conclusion can be highlighted that Internet and activities related to Internet are underrepresented in curriculum and is workbooks. The services of Internet appeared only in topic of E-mail. Web 2.0 tools, are not represented in the curriculum of lower classes of elementary schools in Republic of Serbia, in the framework of the curses From toys to computers.

IV. WEB 2.0 TOOLS IN HIGHER CLASSES OF ELEMENTARY SCHOOL

At higher grades of elementary school, there is IT and computer technology (facultative subject - one lesson per week) and Technical education and IT (compulsory subject – two lessons per week) at seventh and eight grades. The curriculum of Technical education and IT contain 14 lessons (from total 72 lessons) related to IT contents in seventh grade and 18. At the seventh grade, the acquiring of using IT tools appeared as the goal of the year. Besides of programming, video and audio editing, the curriculum contains the Internet unit as separate part of curriculum with six lessons. This unit contains learning contents such as rules of communication using Internet or mobile devices. Although the curriculum places the emphasis on the process of sending and receiving e-mail and this unit is presented in workbooks in the form of dial up Internet and Outlook Express, and there is the requirement of registration online and free e-mail address, where again there are the possibilities of implementation of web 2.0 tools, such as Google Drive in Gmail environment. On the other hands the curriculum mentioned the blogs, comments and forums on Internet, where there are also possibilities for effective implementation of web 2.0 tools.

In the eighth grade one of the main aims of the school year is development of digital literacy and implementation IT tools. Besides of spreadsheet calculation and programming, there is also creating web sites. In the framework of web design, there are possibilities for implementation web 2.0 tools, even though the workbooks based on HTML encodes websites and Microsoft FrontPage as web editor, the curriculum refer for JOOMLA and Dreaweaver as optional solution. In addition, there is also a favourable fact that 14 lessons (from total 34) are freely chosen project. Here the modern web 2.0 tools can appear in framework of communication between students, during the realisation of project or even in presenting the project.

The greatest disadvantage of education and learning IT contest in elementary schools of Republic of Serbia is the facultative subject and the fact that contents cannot effectively build on each other’s during the process. On the other hand the teachers of Technical education and IT in most of the cases don’t have IT qualification, even though the pairing of technical education and IT specialisation on the universities of Serbia is becoming increasingly popular.

The curriculum of IT contents in elementary school is not inter-correlated or related to other subjects. Workbooks don’t have annexed CD and online support is also limited.

V. WEB 2.0 TOOLS IN SECONDARY SCHOOLS

The teaching of IT contents in secondary schools in Republic of Serbia depends on major of education institute. Secondary school with arts profile have IT subject in first year, with two lessons weekly. On the other hand, in the general grammar school there are two lessons per week, during four year or in few grammar schools, mainly with natural science or IT profile, where number can reach even 12 lessons per week related to IT. The one of significant disadvantage of curriculums in secondary schools is that contents and requirement are not unified and not compatible with ECDL curriculums. Just in a few secondary schools ECDL (European Computer Driving Licence) exam is realized, which guarantees unified level, using standardized theoretical and practical questions. ECDL certificate prove IT skills and it is acknowledged in whole world. We analyzed the general grammar school curriculum in this paper from diverse secondary schools, and we recognized the possibilities of implementation web 2.0 tools in entire educational process and especially in framework of IT subjects. The curriculum for grammar schools was written in 2011, so it is the latest document among the analyzed curriculums.

The subject of IT teaches two lessons per weeks in general grammar schools. The curriculum prescribes web 2.0 teaching materials in first and in second years. In the third year the curriculum prescribes programming and in fourth year activities related to date bases. Among the main aim of education, besides the development of linguistic, mathematical, scientific, artistic and cultural competencies, there is the formatting and development of technical and digital literacy. Although in framework of IT competencies the competent and critical usage of devices of information society is especially highlighted, in different situations there is focusing on the interest of person and community. Among the goals are still the understanding of principle of the Internet and local networks, exploitation of resources of network and using of services of internet for e-learning purposes. In this part the sharing of computing resources is emphatic, instead of interactive and collaborative communication and content sharing. Web design and preparing other online (web based) applications are also prescribed by curriculum. On the other hand the curriculum emphasize the appropriate activities on the social networks, first of all the sharing of useful information and the importance of assistance.

Although this educational aims are not up to date and is not adapted to the changed structure of educational system in informational society, with few addition and innovation it can effectively support the implementation of web 2.0 tools.

At the teaching of several softwares (such as operating systems, text editors, presentation editors and image editors) the curriculum and workbooks based on curriculum present the offline application (for example Microsoft Office: Word, PowerPoint) and there are no connection toward online contents or solutions. The existing educational structure doesn't have motivational effects for collaborative work forms and for sharing finished projects and artifacts. On the other hand, the applications are not named, so the application based on web 2.0 services is not excluded. In first year of grammar schools web 2.0 tools are appearing in the framework of the Internet unit. In this unit, learning contents such as searching on Internet, processing and using the information from Internet, online maps, the using of social networking sites, e-commerce and e-government, e-learning, rules on Internet (netiquette) and ethics are included. In second year of grammar schools appearing web 2.0 tools framework Multimedia unit, where curriculum prescribe the sharing (uploading) created video materials on the Internet. Besides this unit there is advanced using of Internet, where the web 2.0 tools are clearly prescribed, such as Online document editors (operations in “cloud”) – sharing documents on Internet, Blog, Wiki tools and Electronic portfolio. In accordance with those objectives the application of web 2.0 tools in grammar schools in Republic of Serbia is possible.

VI. EMPIRICAL RESEARCH ABOUT USING WEB 2.0 TOOLS IN EDUCATION IN REPUBLIC OF SERBIA

To investigate the real situation in schools of Republic of Serbia about using web 2.0 tools, we created a theoretical model and the schedule of scientific research.

The schedule of research:

Phase 1: Analysis of related literature
Phase 2: Organising research teams
Phase 3: Preparing online and offline questionnaires
Phase 4: Publishing and filling the questionnaires
Phase 5: Processing the received results
Phase 6: Comparison of results of Republic of Hungary and Republic of Serbia
Phase 7: Comparison of results with international results
Phase 8: Formulation of conclusions and recommendations

The theoretical model is based on the following scientific literature

International:

ITL Research (2011): Innovative Teaching and Learning Research, 2011 Findings and Implications, SRI International, Microsoft Partner in Learning.

EU:

European Resource Centre for Web 2.0 Education (2011): Analysis of Training Courses (Deliverable 23)

Hungary:

Fehér P. (2008): Internet és számítógéppel segített tanulás a kistelepülések iskoláiban (A pedagógusok módszertani kultúrája fejlesztésének és megújításának leheőségei IKT-eszközök alkalmazásával) - Internet and computer supported learning in rural schools (Improving teachers' classroom techniques with ICT technology integration)

Serbia:

Namestovski, Ž. (2013): Analiza efekata primene obrazovnih softvera na motivisanost nastavnika i učenika u nižim razredima osnovne škole - Analysis of the Effects of Applying Educational Software Tools on Pupils' and Teachers' Motivation Level in Primary Schools

The references and the scientific literature promote the comparison of results from different countries and with results of similar investigation from world and EU.

The research team formulated followed researchers: Dr. Buda András (Hungary), Fehér Péter PhD (Hungary), Dr. Námesztovszki Zsolt (Serbia), Bagány Ágnes (Serbia), Major Lenke (Serbia), Szálas Tímea (Serbia), Vinkó Attila (Serbia).

The questions are categorised in four groups, as follows: 1. Basic information (14 questions) 2. Attitudes (12 questions) 3. The implemention level of web 2.0 tools in education and in leisure (5 questions) 4. Barriers and possibilities of motivational factors for using web 2.0 tools (7 questions) 5. Other remarks and perception.

The research is currently in phase 4: Publishing and filling the questionnaires. The online questionnaire is available on following address: http://bit.ly/1dOKBww.

VII. Conclusions

Although the research is in progress, the preparatory section is finished, the base for successful research is established and the preliminary results of survey outlines the significant gap between curriculum and school practice.

Acknowledgment

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DIGITAL REVOLUTION: SCOPE AND INDUSTRIAL APPLICATION OF DATA WAREHOUSING AND DATA MINING

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Abstract - In every industry across the board, from retail chain stores to financial institutions, from manufacturing enterprises to government departments, and from airline companies to utility businesses, from research institute to higher institution of learning, in agriculture data warehousing is revolutionizing the way people perform business analysis and make strategic decisions. It is one of the emergence technologies that had changed sustainability of business by integrating a measure that helps in decision-making based on data stores in data warehouse, which is mined with data mining technique. This paper explores definition of data warehouse and data mining with their application in the business world. It also outlines importance of data mining & data warehousing to capacity development of metrological and health care sector. Its areas of application would also be given a boost. The question that need to be asked is this "Has this been fully utilized by developing countries like Sub Sahara Africa"?

I. INTRODUCTION

The future of global competition is data driven decision-making. As more and more organizations depend on analytics for competitive advantage, those using Teradata applications will find themselves at the top of their game.

Data warehouses and data warehouse applications are designed primarily to support executives, senior managers, and business analyst in making complex business decisions. Data warehouse applications provide the business community with access to accurate consolidated information from various internal and external sources. The goal of using data warehouse is to have an efficient way of managing information and analyzing data. Gigabytes of daily data are generated daily by corporate organizations and are stored in various database systems. The question that need to be asked is-how efficient do users earnest huge amount of data to control and monitor their business performance? Are users able to get timely result or information without errors with useful data analysis? What are the areas of application of data warehouse and data mining in the industries? However, we can divide IT systems into transaction (OLTP) and analytical (OLAP).We can assume that OLTP systems provide source data to data warehouses, whereas OLAP systems helps to analyze it. More so, data warehouse stands a chance to help in capacity development of business in totality.

II. OLTP & OLAPS

Transaction processing is a type of computer processing that takes place in the presence of a computer user. It provides for an immediate response to a user request. It is an online transaction processing systems to handle day-to-day business transactions. More so, the main emphasis for OLTP is put on very fast processing, maintaining data integrity in multi-access environments and an effectiveness measured by number of transactions per second. When large number of transactions are taken and stored to be dealt with later, the processing is known as batch processing. Good examples of this is automated teller machines (ATM), credit card authorizations, online bill payments, self-checkout stations at grocery stores, the trading of stocks over the internet, and various other forms of electronic commerce.

Online analytical processing (OLAP) is a category of software technology that enables analysts, manager and executives to gain insight into data through fast, consistent, interactive access in a wide variety of possible views of information that has been transformed from raw data to reflect the real dimensionality of the enterprise as understood by the user. Examples of OLAP's include ERP, CRM, SCM, and point-of-sale applications, call center.

OLAP systems are market oriented and used for data analysis by knowledge workers, including managers, executives, and analyst. It also helps to manage large amount of historical data, provides facilities for summarization and aggregation, and stores and manages information at different levels of granularity.

III. Definition of Data Warehouse System

Data warehouse is a relational database that is designed for query and analysis rather than for transaction processing. It usually contains historical data derived from transaction data, but can include data from other source. It separates analysis workload from transaction workload and enables an organization to consolidate data from several sources. In addition to relational database, a data warehouse environment includes an extraction, transportation and loading (ETL) solution, an online analytical processing (OLAP) engine, client analysis tools, and other applications that manage the process of gathering data and delivering it to business

A. Applications of Data Warehouse

Data exist to facilitate complex, data-intensive and frequent adhoc. Data warehouse must provide far greater and more efficient query support than is demanded of transactional databases. It also provides a common data model for data, regardless of the data source. The main purpose of data warehouse is to analyze the business to meet future prospects.

Although their primary use is not limited to the following:

Revenue Management, Customer-Relation Management, Fraud Detection, Crew Payroll-Management Applications, Sales Analysis for Business Organization.

B. How Data warehouse works

Data warehousing, like data mining, is a new term although the idea itself has been around for years. It represents an ideal vision of maintaining a central repository of all organizational data. Centralization of data is needed to maximize user access and analysis. Dramatic technological advances are making this vision a reality for many companies. In addition, equally dramatic advances in data analysis software are allowing users to access this data freely. The data analysis software is what supports data mining.

C. Data Warehouse Architecture

The structure that brings all components of data warehouse together is called architecture. Data architecture includes a number of factors. It includes the integrated data that is the centerpiece. This architecture includes everything that is needed to prepare the data and store it. It also includes all means for delivering information from data warehouse. It is composed of the rules, procedures, and functions that enable data warehouse to work and fulfill the business requirements. The architecture provides the overall framework for developing and deploying data warehouse: Architecture is a systematic arrangement of components.

D. Components of Data Warehouse Architecture

The main components of data Warehouse architecture are:

- Source Data has following divisions- Production data, Internal data, Archived data and External data
- Data Staging-also has following divisions- Data extraction, Data transformation and Data loading
- Data Storage component
- Informative deliver component
- Metadata component
- Management and control component

Diagram in Figure 1 shows the major components of Data Warehouse along with their interrelationship.

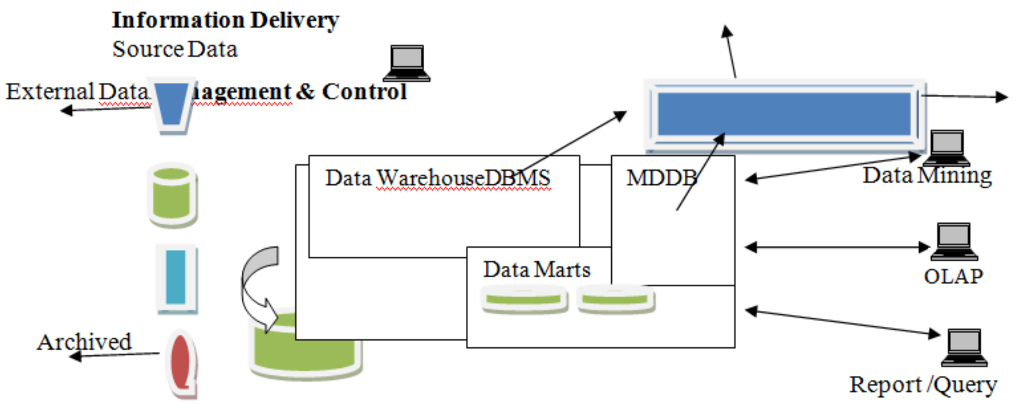

Figure 1. Data Warehouse Architecture

IV. DATA MINING

Data mining is concerned with the finding hidden relationships present in business data to allow businesses to make predictions for future use. It is the process of data-driven extraction of not so obvious, but useful information from large databases. Data mining is a way to gain market intelligence from this huge amount of data. The present day challenge is not lack of data but how to learn from the data itself. In data mining, the data gives details of its component; it is left to user to know how to use the information for effective decision-making.

A. *Data Mining and Knowledge Discovery Process*

Data mining is not specific to any industry-it requires intelligent technologies and willingness to explore the possibility of hidden knowledge that resides in the data. Data mining is also referred to as knowledge discovery in databases. Figure 2 gives detailed information on its graphically process.

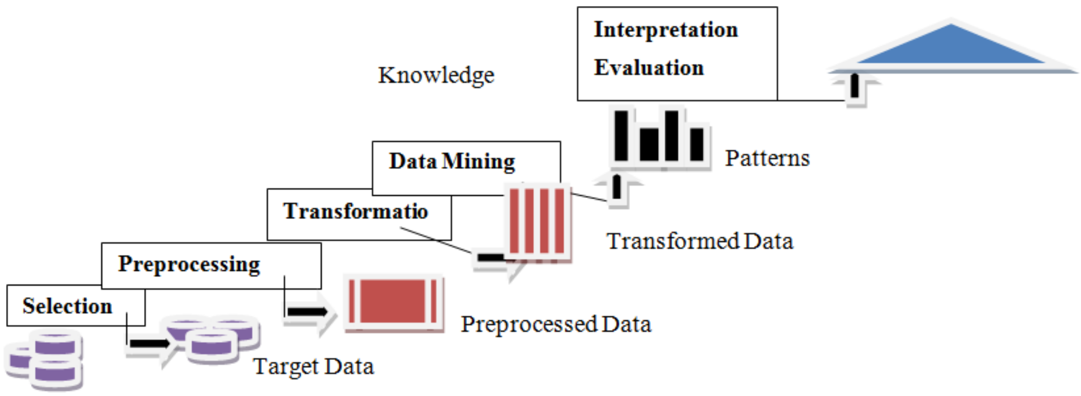

Figure 2. Steps in knowledge discovery process

B. *Data Mining Technique*

Data mining is not a method of attacking the data; on the contrary, it is a way of teaming from the data and then using that information. For that reason, we need a new mindset in data mining. We must be open to finding relationships and patterns that we never imagined existed. We let data tell us the story rather than impose a model on the data that we feel will replicate the actual patterns. Researchers have identified two fundamental goals of data mining and they are:

Prediction Tools**:** This technique involves traditional statistics such as regression analysis, multiple discriminant analysis, etc.

Description: This focuses on finding patterns describing the data and the subsequent presentation for user interpretation.

C. *Data Mining Software*

A number of data mining soft wares are available in the market, which are initiated by popular software vendors like IBM, Microsoft, and Oracle.

Mineset (Silicon Graphics Inc-SGI)-MineSet provides tools for searching, sorting, filtering and drilling down enabling previously complex data models to be viewed intuitively through real-time 3-D graphical representation

Intelligent Miner (IBM Corp)-IBM data mining capabilities help to detect fraud, segment customers, and simplify with the customers' existing systems to provide scalable, high performing predictive analysis without moving data into proprietary data mining platforms

Enterprise Miner(SAS Institute)-It provides the most powerful, complete data mining solutions in the market with unparalleled model development and deployment alternatives and extensive integration opportunities.

Clementine (SPSS Inc.)-It is an enterprise data-mining workbench that enables to develop predictive models quickly using business expertise and deploy them into business operations to improve decision-making.

DB Miner (DB Miner Technology Inc.)

DB miner insight solutions are world's first server applications providing powerful and highly scalable association, sequence and differential mining capabilities for Microsoft SQL server analysis services platform, and they provide market basket, sequence discovery and profit optimization for Microsoft Accelerator for Business intelligence.

V. APPLICATIONS OF DATA MINING

Data mining is still in its infancy, although it is favorably becoming a trend, it is lately being applied as reliable and scalable tools that outshine older classical statistical method. Companies with a strong consumer focus - retail, financial, communication, and marketing organizations, primarily use it today. It enables these companies to determine relationships among "internal" factors such as price, product positioning, or staff skills, and "external" factors such as economic indicators, competition, and customer demographics. In addition, it enables them to determine the impact on sales, customer satisfaction, and corporate profits. Data Mining is a step in KDD-Knowledge Discovery in Databases in delivering measurable benefits, including reduced cost of doing business and enhanced quality of service.

A. Biomedical Engineering

The explosive growth in data collection in business and scientific fields has literally forced upon us the need to analyze and min useful knowledge from it. Data mining is used to predict future patient behavior and to improve treatment programs. It is used to turn information into knowledge in health care organization by implementing data mining technique to control costs and improve the efficiency of patients.

B. Climate Data and Earth Ecosystems

The large amount of climate data acquired through NASA’s earth observation satellites, terrestrial observations, and ecosystem models offer an unprecedented opportunity for predicting and preventing future ecological problems by managing the ecology and health of the planet. Data mining plays role in the automatic extraction and analysis of interesting patterns, thereby complementing, and existing statistical techniques.

C. Scientific, Engineering, and Health Care Data

Scientific data and metadata tend to be more complex in structure than business data.In addition, scientist and engineers are making increasing use of simulation and systems with application domain knowledge.

D. Web Data

Data on the web is growing at an exponential rate and in complexity. Data not only include text and images but also streaming data and numerical data.

E. Electronic Commerce

Electronic commerce produces large datasets in which the analysis of marketing patterns and risk patterns is critical. Following are data generated: Genomic data, Sensor Data, Simulation Data and Healthcare Data.

VI. CONTEMPORARY APPLICATIONS OF DATA MINING AND DATA WAREHOUSE

This section contains will enumerate applicability of data mining in health, stock, banking, telecommunication and retail business. The aim of this chapter is to give users sectors where data mining is in use or can be used in later future.

I. Stock Forecasting-There are many applications or soft wares that use data-mining technique on the market for stock forecasting. One of such is given below which is used by Nigeria stock exchange

X-Gen is a new electronic trading platform that will allow stockbrokers and other stakeholders to access the stock exchange market anywhere, anytime. It was developed by Microsoft and was successfully launched in Nigeria in August 2013.

II. Banking-Data mining has been used in the financial sectors. In the banking industry, data mining is used to detect fraud in credit card, to perform trend analysis and to evaluate profitability. Neural network have been used in financial market to forecast price of stock, in commodity price forecasting, portfolio management and in mergers and acquisitions

III. Health care-Hospital currently uses a manual system for the management and maintenance of critical information. The current system requires numerous paper forms, with data stores throughout the hospital. Data mining has been used positively in the health sector to archive and retrieval of patients’ record.

IV. Retail business- Data mining and data warehousing has been particularly successful in the realm of customer relationship management. By utilizing a data warehouse, retailers can embark on customer-specific strategies like customer profiling, customer segmentation, and cross selling.

V. Online marketing: for product and service advertisements.

VI. Telecommunication-To identify fraudsters in telecommunication industry, scoring of response, marketing campaign management, profitability analysis, and customer segmentation.

VII. Data mining challenges

This section will shed light on some of the current research and application challenges for data mining. These challenges are not very common but they are given to familiarize us with problem facing data miners. If security and privacy is taken out of any application, it will be extremely difficult to benefits.

Although, its challenges are more than these but few will be given a lift.

Missing and Noisy Data-This is a very serious challenge especially in business databases. Some important attributes can be missing if the database is not designed with discovery in mind. Possible solutions include the use of more sophisticated statistical strategies to identity-hidden variables and dependencies.

Systems Integration-A stand-alone discovery system might not be very useful, a typical integration issues include integration with a database management systems for example, through a query interface, integration with spreadsheets and visualization tools, and accommodation of real-time sensor readings.

Complex Relationship between Fields-Hierarchically structured attributes or values, relations between attributes, and more sophisticated means for representing knowledge about the about of a database will require algorithms that can effectively use such information. Historically, data mining algorithms have been developed for simple attribute-value records, although new techniques for deriving relations between variables are being developed. (Usama 1996; Dzeroski 1996; Djoko, Cook, and Holder 1995

VIII. Conclusion

Data mining is concerned with finding hidden relationships present in business data to allow businesses to make predictions for future. Data mining is a multidisciplinary field that draws work from database, information theory, knowledge acquisition, data virtualization and statistic. From above stated points, data mining with its application in today's digital age stands out to be a technology, which could be used to earnest functionality of businesses, agriculture and education. Since its inception, it has recorded an incredible success. More so, it is clear cut that, data mining experts could achieved much due to the knowledge of data mining technique and its technological benevolence. As part of digital revolution Data Warehouse & Data Mining are tools that are used to transform raw data into useful data that can be used by companies in making business decision on market penetration strategies, anomalies and operational efficiency. Has it been fully utilized in Sub Sahara Africa? What are the challenges in proper implementation?

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E-LEARNING TRAINING IN THE SYSTEM OF CONTINUOUS PEDAGOGICAL EDUCATION

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Abstract. The article lays bare the means of the introduction of e-learning technologies in continuous pedagogical education. The material is based on the laboratory of problems of educational technologies personnel's, involving range of issues related to e-learning.

I. INTRODUCTION

Intensive process of information technologies inculcation into the educational system, the emergence and popularization of active e-learning need to define the use of e-learning technologies at various levels of the educational process.

Since 2011, the laboratory problems of educational technologies have been functioning in Taganrog State Teacher Training Institute named after A.P. Chekhov. Its scientific and practical activities are aimed at:

- carrying out research work in the field of e-learning;
- the development and implementation of innovative software products in the educational process of the disciplines and areas of training;
- development of e-learning courses, based on the use of remote sensing technologies;
- development, testing, adjustment and use of multimedia electronic text books in the disciplines, taught at the institute, forming the appropriate libraries;
- training teachers of vocational and higher educational establishments institutions, school teachers the possibilities of using e-learning technologies in educational process organizing and conducting;
- training students-bachelors of "Teacher education" program the opportunities to use information technologies in educational process;
- faculty and staff's consulting for on the implementation of e-learning technologies in educational process.

To that moment, there are two ways of e-learning of development having both common characteristics and using methods and the hallmarks due to the specificity of goals, objectives, needs, target audience, etc.:

1. Corporate training (for employees of various organizations, from small companies to large retailers, banks), which is realized through e-learning technologies: adaptation and training courses; courses aimed at the formation of corporate culture; training; master classes; webinars, etc. Their goals, objectives and forms of realization are determined by management and the company's internal routine.

2. Education in educational establishments (educational organizations, secondary and higher educational establishments, institutes / faculties of qualification improvement). In this case, the educational process is clearly based in accordance with applicable state federal educational standards, educational programs and curricula.

Taking into consideration the rapid pace of development of corporate training and demand for professionals (teachers, trainers and programmers owning the technologies of instructional design) for developing educational content and support the learning process, the goal of teacher training universities is to prepare professional educators who are able to work effectively in the educational system in any direction.

Combined educational process participants into three main groups, we consider the introduction of e-learning technologies in continuous pedagogical education (Fig. 1):

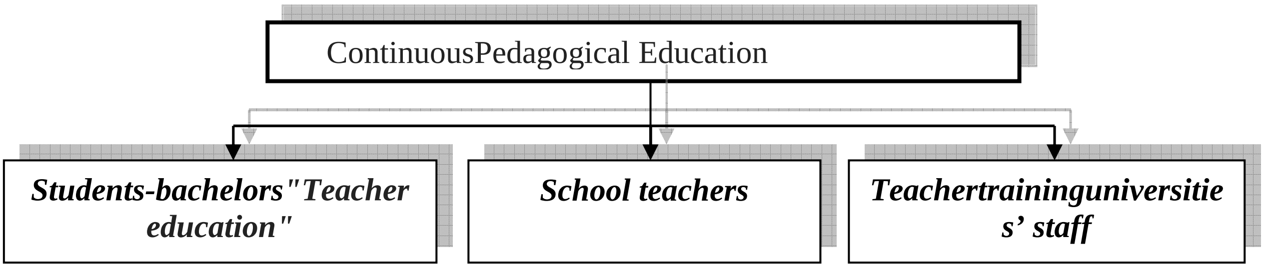

Figure 1. The system of continuous pedagogical education

II. Full-time and part-time students (bachelors of "Teacher Education")

Using tools and e-learning technologies is primarily aimed at improving the effectiveness of training and the formation of competency by:

- increasing the availability of educational materials through the development of e-learning courses for distance learning system and libraries of educational multimedia publications (for example, for students with individual learning paths or for part-time students when given academic hours are not enough for the presentation of educational material in full volume);
- opportunities of constant educational content updating based on the latest achievements of science and technology in the relevant subject areas;
- possibility of developing of fund assessment tools and implementation of electronic testing, which allows to evaluate the quality of the development of educational material at any stage of training (intermediate, final testing).
- increasing students' interest to the studied material owing to the ability to organize multimedia materials (presentations, video, audio, animation) in the structure of e-learning and multimedia electronic textbooks;
- giving students access to additional sources of information (resources available on the Internet at various educational portals, open educational resources, enlarging the contents of electronic textbooks with textbook and reference books materials).

III. School teachers

The current Law on Education in the Russian Federation gives the right to use modern ways of learning including distance learning technologies, e-learning resources and networking of various educational organizations in the educational process. It also expands some learning opportunities for students and enshrines the right to various forms of education, including family, using remote, electronic and network technologies [1].

New opportunities fixed in law, create the need for continuous improving of professional competence in the use of e-learning technologies and update existing skills required and sufficient for teachers' efficient and comfortable work in e-learning environment.

IV. Teacher training universities' staff

The most stringent requirements are imposed to the teachers of higher educational institutions, as they must possess:

- system competencies to work in the of e-learning environment, necessary for the educational process organizing and conducting;
- system competencies in their subject area;
- system competencies required for teaching students how to use e-learning technologies in their future professional activity [2].

Monitoring studies conducted by the laboratory of problems of educational technologies staff allow to get reliable information necessary for constructing an optimal trajectory of school teachers and teachers' of higher educational institutions skills for work e-learning environment, the preferred form of the courses that interest you and problematic topics, etc.

Analysis of available data suggests that teachers prefer to be trained by:

- mixed model, alternating classroom training with studies in distance learning system and webinars;
- electronic courses, implemented through a system of distance learning and video conferencing;
- series of thematic webinars.

Developed courses have a high degree of variability (modular structure) that allows combining modules depending on the initial level of competence and needs of the target audience.

Since 2013, the course "Teacher in e-learning environment", based on a mixed model of training (classroom training (lectures, practical) and work with e-courses in the distance learning system on the platform Moodle) has been holding for students-bachelors of "Teacher Education". Course goals are as following: to train future teachers to work in e-learning environment. Its main tasks are:

- to form an idea of e-learning;
- to introduce the legal framework applying e-learning technologies in the Russian education;
- to consider ways of using modern information-communication technologies in the educational process;
- to consider adding circuit and filling electronic course content;
- to introduce requirements for the development of test items;
- to show variants of tests submitted in Moodle;
- to consider the possibility of monitoring and knowledge evaluation in the Moodle environment;
- to consider modern technologies of developing electronic multimedia learning tools;
- to form an idea about the basics of instructional design.

Our approach to the formation of professional competence in the field of e-learning is a complex and systematic monitoring of all groups in the system of continuous professional education. This approach allows to:

- assess the initial level of competence in the field of e-learning in each group of the target audience (students, school teachers, teachers of pedagogical universities);
- identify the needs of developing of existing and acquiring new competencies required for the implementation of e-learning technologies at a higher level;
- organize training, based on modularity and multilevel course "Teacher in e-learning environment";
- use the principles of continuity and succession for the process of education and training the use of e-learning technologies for the educational process organization;
- systematically consider the characteristics and desires of the target audience in the organization of training (basic level of knowledge in the field of e-learning, age, and subject - professional orientation, employment, wishes in choosing training format (traditional, remote, mixed or on-line).

E-learning enables the use of various technologies at all levels of the educational process for the visualization of educational material, organization of distance learning, webinars, forums, on-line conferences, demonstrations of virtual laboratories, creation of educational portals, use of open educational resources, etc. With proper professional application e-learning technology, taking into account the principles of feasibility and optimality, modern teacher receives the tools with which the teaching and learning process becomes more efficient, interesting and of high quality.

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FORMATION OF INFORMATION CULTURE OF PUPILS OF ORGANIZATIONS OF GENERAL EDUCATION

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Abstract - In this article the concepts "society informatization", "information culture" are considered. The portrait of the modern pupil possessing information culture is given. Practical experience of formation of information culture of pupils of the general education organizations on the example of work of Sunday school "Young Information Scientist" is given.

Modern society is characterized by prompt process of informatization. There are new software products, inquiries of society change, technologies are improved – all this forms new knowledge which, in turn, generate new information technologies. Process is infinite, and a task of the person is skillful and reasonable to react to these changes and to correspond to requirements of modern society. According to the scientists, the XXI century becomes history as a century of information technologies, and they are to become a driving force of transformations in economy, business and education.

Knowledge is generated and transferred with a high speed. There is a problem: the knowledge actual today, can already be tomorrow absolutely useless. Scientists counted that since 2010 each 72 hours there will be information doubling. P. Druker (the influential American theorist of management, the author of the concept of "the information worker") spoke "Today the advanced knowledge is a tomorrow's ignorance" [1].

Informatization of society is understood as the global social process which dominating kind of activity in the sphere of a social production is collecting, accumulation, processing, storage, transfer, use, a producing information which are carried out on the basis of modern means of microprocessor and computer facilities and also various means of information interaction and exchange [5].

In this regard, preparation and education of pupils, future students, and ready to adapt for life in information society becomes one of the priority directions of development of system of school education.

One of the most important directions of modernization of school education at the present stage of its development is use of means of information and communication technologies.

Now in scientific knowledge the extensive material on substantial components and levels of information culture (knowledge and the abilities relating to his information competence, conditions of formation of information culture, property of identity of the expert, promoting successful formation of information culture and so forth) [2] is saved up.

The provision on substantial structure of category as most the general concept reflecting "the main points, knowledge steps the person of objective reality" [3], focuses us when determining the content of category of information culture to reveal such characteristics which would reflect sequence of knowledge of the information professional environment and the follow-up converting activity in it.

Information culture suggests possession of certain knowledge, abilities, belief helping to function in information society. Besides, there must be constantly high level of information requirement, be carried out information psycho hygiene (self-control of information processes in their correlation with an actual condition of an organism). Information culture of pupils is shown and in the valuable relation to information, in interest to information activities. Due to the introduction of standards of the second generation of the general education, pupils have to be able to formulate accurately the inquiries, competently to carry out a choice of any sources of information and to use them. Level of its information culture will be shown in free orientation in information streams, knowledge and active use of technology of information search in the educational activity. However, formation of information outlook at pupils is especially important. It is defined by development his own position, the valuable relation to objects and the phenomena of quickly changing information environment, outlook formation about global information space, information interaction in it, opportunities and problems of its knowledge and transformation by the person.

In Fig. 1 the portrait of the modern pupil, possessing information culture is presented.

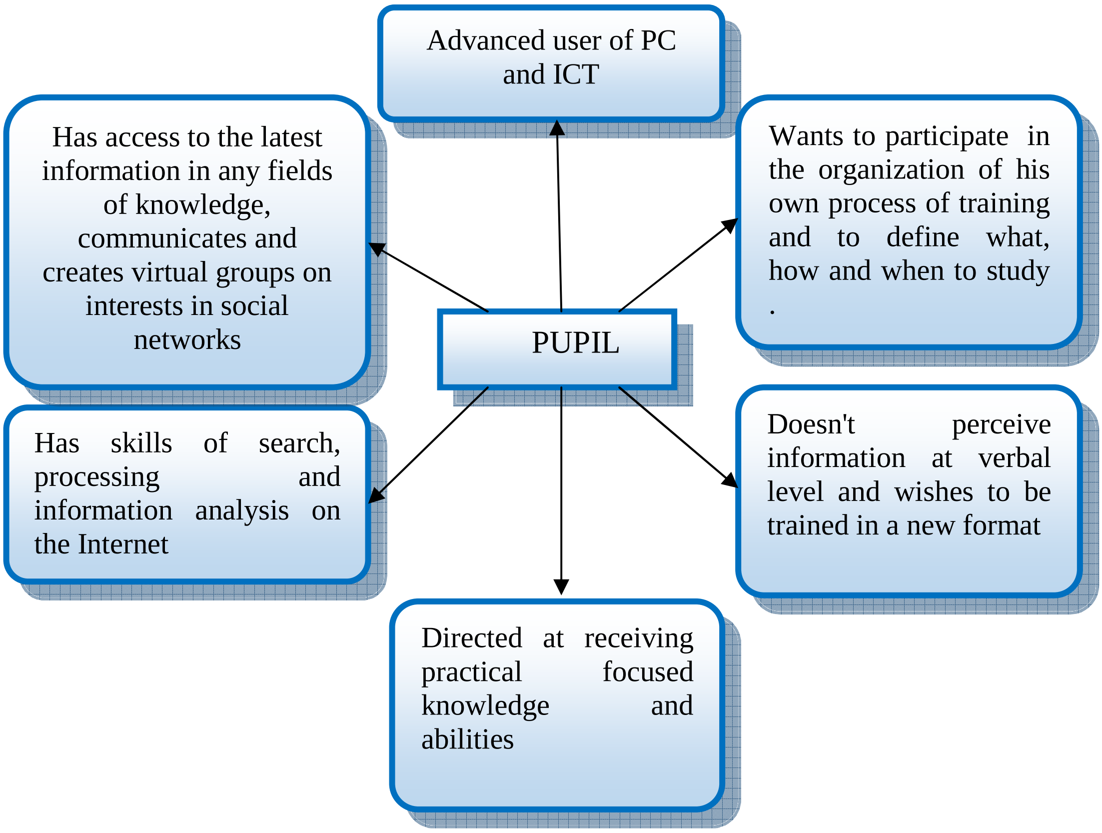

Figure 1. Information culture of the pupil

Thus, the presented principles give us the grounds to assume that the category "information culture" has to be described as set of integrated characteristics and their indicators (criteria) which structure decides by regularities of interaction of the person with the inconsistent environment and its transformations in interaction with other people [4]. The substantial aspect of the integrated characteristics of information culture is based on the subjective factors having probabilistic influence on structural and dynamic characteristics of educational process in the information environment.

Such information environment promoting development of information culture of pupils is activity of the school "Young Information Scientist" that is at the Taganrog state teacher training institute of A. P. Chekhov".

Classes in the school "Young Information Scientist" serve:

- to formation of a modern information picture of the world;
- to formation of information culture of listeners of the school;
- to formation of skills of information technologies use as the main component of educational activity in modern information society;
- to formation of the device knowledge and functioning of modern computers;
- to formation of the creative person, development in pupils of theoretical thinking, memory, imagination.

The main *objectives* of the school "Young Information Scientist":

- Providing conditions for personal development and professional self-determination of the school students.
- Expansion of an outlook of listeners, development of their creative and informative abilities.
- Acquisition by listeners of necessary knowledge and practical skills of work on the computer.
- Development of skills of educational and research work in listeners.
- Training of pupils on the basis of modern achievements of science, introduction of methods of cognitive activity, technical means and intensive technologies of training.
- Increase of information and cultural level of listeners.
- Organization of communication of listeners with the creative intellectuals, scientists.

The main *trends* of the school are:

- Consultations at a basic course of informatics.
- Guide of research activity of the school students to informatics.
- Pre-university preparation on the chosen questions of informatics.
- Preparation for the state certification for informatics in the Unified State Examination format.
- Carrying out competitions and quizzes.

Form of education: the internal.

The organization of main types of studies (lecture, practical classes, consultations, and testing, individual lessons) and independent work of listeners of the school is according to the schedule.

Pupils: pupils of Taganrog (school No. 33, 7, 23, 37, 24, 9) and rural schools of the Rostov region.

The program of the school is developed by professors of the chair of informatics and includes the following subject presented in Table 1.

Table I. THE PROGRAM OF THE SCHOOL "YOUNG INFORMATION SCIENTIST"

№	Unit	Contents
1	Numeral systems	Historical information about numeral systems. Not position numeral systems. Position numeral systems.
2	Main directions of informatics	Mathematical and algorithmic fundamentals of informatics. Social informatics. Logical bases of computer architecture.
3	Information and computer modeling of information processes	Concept of information. Theory and practice of information processing. Submission of numerical and non-numerical information, information coding. Computer modeling of information processes and processes of nanotechnologies. Supercomputers and parallel calculations.
4	Programming bases	Programming bases in Pascal. Basic designs of the Delphi programming.
5	Review of modern problems of informatics	Review of modern scientific and technical problems of informatics. Scientific aspects of problems of modeling and programming. Review of problems of development and operation of supercomputers.
6	Some practical aspects of informatics	Computer graphics. Creation of sites in the Internet network. HTML bases.
7	Mathematical logic	Mathematical logic as basis of architecture of modern computers. Modern directions of development of mathematical logic. Application of algebra and computer algebra in systems of modern computer mathematics (MathCAD, Maple).
8	Computer modeling	Types of modeling. Purposes and problems of computer modeling. Reliability of computer modeling. Program and numerical experiment. Program creation of a model.
9	The solution of problems of the high complexity of a school course of informatics	Special items of preparation for Unified State Examination on informatics. Competition tasks.

Within creation of a common information space, there were certain traditions in the program of its work. Tournaments on computer games, meetings with the pupils, the students who are training for the specialties "Informatics" are held.

One of work forms with listeners of the school "Young Information Scientist" is acquaintance to experience of scientific activity of the pupils of the schools of the city. Listeners were acquainted with reports of prize winners of the second City conference of Association of student's scientific organizations. Anton Boldyrev (lyceum N 4, the

1st place) told about "Development and VEAM creation (the self-contained automated robotic unit)of a robot". Such robots can independently work in places inaccessible to the person where a radio signal doesn`t pass at all. However, particular interest of the pupils was caused by the working model of the robot capable to perform various tasks depending on its logical scheme. Alexander Fomenko's development (lyceum No. 4, the 2nd place) is very actual for a modern education system since its program complex for interactive training based on Delphi 2009 completely excludes possibility of writing off (coping out). Evgenia Skutelnikova's report (school No. 31, the 3rd place) devoted to social networks contained not only interesting data of social survey conducted by it, but also a number of recommendations how to avoid Internet dependence.

Now materials are developed for carrying out monitoring research on definition of information culture level of listeners, which is planned to carry out based on the criteria allocated with us: orientation in information streams, knowledge and active use of technologies of information search, ability to apply information and communication technologies in educational activity, etc. The received results will form a basis for adjustment and addition of the program of the school "Young Information Scientist".

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THE GAMIFICATION OF EDUCATION

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Abstract - Programming is a major subject in Computer Science (CS) departments. However, students often face difficulties on the basic programming courses due to several factors that cause these difficulties. The most important reason may be the lack of problem solving abilities that many students show. Learning to code can be made more effective and sustainable if it is perceived as fun by the learner. Code Hunt uses puzzles that players have to explore by means of clues presented as test cases. Players iteratively modify their code to match the functional behavior of secret solutions.

I. INTRODUCTION

Programming is a complex mental activity that is defined as an abstract process. Understanding and visualizing abstract processes poses a considerable problem for students when learning programming, as well as other fields with similar characteristics.

Linn and Dalbey [1], [2], define an ideal chain of the learning process of learning programming and suggest it as a standard for comparing programming teaching methods. The three links of the chain are:

- characteristics of the programming language – in order to log the programming solution of the problem with the given language, the student needs to understand the syntax, semantics, and expressive possibilities of the language.
- the skill of forming the program is the knowledge to use a bundle of techniques which, applied and combined, are used to solve the given problem. The skill is based on the knowledge of stereotypical code samples which combine different characteristics of the language. The models implement complex functions, such as sorting, finding the lowest common denominator of two numbers, counting words in a given text, etc. Programmers design the language and model characteristics to be combined, problems to be decomposed into parts, solving every part independently, then linking the partial solutions into a unique unit – the program. At the end of the program writing process its correctness is checked by testing.
- the general problem solving skills come to light during learning new formal systems and this is set as the goal to be achieved by studying programming. The same models and procedural skills are common to many, or even all formal systems. Therefore, this approach is used to learn models of logging with one formal system and the rules of transfer to the new one, the subject of the learning process, so it results in mental learning and activation of pre–existing knowledge.

Lemut et al. [3] explain the difficulty of learning programming by the need for implementing complex activities that have to be mastered even by beginners simultaneously. For example, the program is tested by executing it, using carefully selected input marginal values that will result in checking all program paths. The choice of the marginal values requires the knowledge of semantic program instructions. Opposed to this, the beginner programmer learns instructions, so they find it very difficult to choose such inputs on their own. Du Boulay [4] finds that the sources of difficulties are the following:

- Orientation – the general idea of students about programming and the program.
- Abstract engine – understanding the computing model that defines the program language.
- Notation – syntax and semantics of the language.
- Structures – knowledge of programming constructions as a composition of instructions with which certain program requirement are met.
- Pragmatics – skills implemented in creating the correct program (planning, decomposition, coding, testing, detecting and fixing errors).

Learning to code can be made more effective and sustainable if it is perceived as fun by the learner. 28 million people harvest their crops on FarmVille every day, over 5 million people play an average of 45 hours a week of games. As a planet, 3 billion hours a week are spent playing video and computer games [15]. Gamification [5] is the use of game -play mechanics for non game applications.

The following arguments can be brought in support of gamifying education:

- Higher level of interactivity and rewards – The aim is not only to have the student read a given text, but to have them interacting with the contents
- Raising the level of awareness – Placing the student into situation that trigger actions and deeper comprehension which would not occur in regular computer based training
- Link challenging to reward systems – Make the students' efforts to hand in tasks on deadline or completing given tasks 'worthwhile' by offering rewards

The table below presents the points of divergence regarding an actual game and gamification [6]:

TABLE I. DIFFERENCE BETWEEN GAMES AND GAMIFICATION

Game	Gamification
Games have defined rules & objectives	May just be a collection of tasks with points or some form of reward
There is a possibility of losing	Losing may or may not be possible because the point is to motivate people to take some action and do something.
Sometimes just playing the game is intrinsically rewarding	Being intrinsically rewarding is optional.
Games are usually hard and expensive to build	Gamification is usually easier and cheaper
Content is usually morphed to fit the story and scenes of the game	Usually game like features are added without making too many changes to your content

Usually one finds four categories of players.

- Those who constantly face the urge of being at the top of the ranking – the Achievers
- Those who enjoy the process of discovering something new – the Explorers
- Those who feel the need for interaction with others – the Socializers
- Those who play with a strong desire to destroy or eliminate other characters – the Killers

In terms of education-based games, the main target groups are the players belonging to either the category of Achievers or Explorers. The mindset of the Achiever drives them to complete the course, it does not matter at what cost. The Explorer is most likely to discover all aspects of the game, which in turn leads them to covering the whole course. On the other hand, the Socializer is bound to apply the help of other plays, yet they are less likely to complete the course. An education-based game will hardly contain something challenging for the Killer type to complete it. Taken into consideration the above-described, as well as the research by Heeter et al. [7], it can be stated that only the categories of Achievers and Explorers are to be considered as target groups for educational games.

The player will play a social game given the following defined player lifecycle.

- Newbie – These players have just started the game. They need some time to acclimatize to the game, thus levels in the early stages of the game ought to be easy so that players can familiarize themselves with the game.
- Regular – This is the phase when players should become 'hooked' on the game The subsequent levels should present the players with satisfaction no matter what player type.
- Enthusiast – most of what can be learnt as to how to play the game - these players know it all, but now they require challenges to keep them 'hooked'
- The player lifecycle will differ somewhat with an educational game.
- Newbie – These players have just started the game. They need some time to acclimatize to the game, thus levels in the early stages of the game ought to be easy so that players can familiarize themselves with the game.
- Regular – This is the phase when players should become 'hooked' on the game and aim at completing the course.

II. BACKGROUND-PEX FOR FUN

Code Hunt uses puzzles that players have to explore by means of clues presented as test cases. Code Hunt is based on the test/clue generation of Pex, a white-box test generation tool that uses dynamic symbolic execution.

Pex [8] is an automatic white-box test generation tool for .NET, based on dynamic symbolic execution. This tool is integrated into Microsoft Visual Studio in the form of an add-in. It can generate test inputs which are combined with different unit testing frameworks [9]. They have implemented Pex in classroom teaching at various universities (for example North Carolina State University, University of Illinois at Urbana-Champaign, and University of Texas at Arlington), and also in a variety of tutorials both within Microsoft (such as internal training of Microsoft developers) and outside Microsoft (such as invited tutorials at .NET user groups). Further, they have created numerous open source research extensions upon Pex [10].

One of the most important methodologies that Pex supports is called parameterized unit testing, which broadens the scope of today's industry practice which prefers closed, traditional unit tests (i.e., unit test methods without input parameters) [9].

There are useful characteristics that Pex offers to support for testing. Primarily, there is the option of exploring code and suggesting the tests that should be done. Secondly, assuming that it is a parameterized test, Pex can determine the combination of parameters that has to be tested so as to provide all feasible versions. Lastly, once Code Contracts is being used, Pex uses that information to fine-tune the unit tests that are offered or generated for the user [11].

III. CODE HUNT, AN OVERVIEW

Code Hunt is an educational coding game. The play scenario is the following: the student will impersonate the code player, whose task is to detect the missing code fragments. Points are gained by completed level, while extra points are granted for elegant solutions. The game can be implemented for either C# or Java. During the game, the player will make their way to specific sectors and gain knowledge about arithmetic operators, conditional statements, loops, strings, search algorithms and more. The entire gaming experience has an underlying automated grading engine based on dynamic symbolic execution. The grading engine automatically analyzes the user code and the secret code so that the result table is generated. Most modern browsers including Internet Explorer 9, 10, 11 and recent versions of Chrome and Firefox are suitable for running Code Hunt [12].

Code Hunt resembles most games in the sense that there are sectors and levels. Code is written in an editor window by the player, they use either C# or Java as the programming language. The task is for the code to implement a given formula or algorithm – indicated by a top-level function, the "Puzzle". The function presents input parameters, then provides a result. The player needs to test if their task was successful, i.e. if the target algorithm was in fact appropriately implemented. This is done by hitting the enormous "CAPTURE CODE" button.

Figure 1. The start screen of Code Hunt

This button will trigger a chain of events [12]:

- The code is sent to a server in the cloud.
- The server compiles the code (including an optional Java-to-C# conversion, as described in Section 3)
- The server starts an in-depth analysis of the code, it is compared with the goal algorithm.
- The player will then be presented with the results (Figure 2).

Figure 2. The Code Hunt showing test results

The result will be either a compilation error, with information in the bottom pane, or some mismatches or agreements with the goal algorithm. The code is presented left in Figure 2, while on the right there are the mismatches (red crosses) and agreements (yellow checkmarks). The player has completed this level successfully if the code has compiled and no mismatches were found, only agreements with the goal algorithm. In the game this is described as the player having "CAPTURED!" the code, here seen in Figure 3.

Figure 3. After solving the puzzle, the player gets a score

As a follow-up, the each mismatch and agreement with the goal algorithm is returned in the form of a tuple (input, actual result, expected result). In the case when the player's code is in agreement with the goal algorithm, the actual and expected results are identical, while, if a mismatch has occurred, they are different. The player is given a chance to examine the mismatches and figure out how to modify and improve the code so a greater resemblance is achieved with the goal algorithm [12].

Upon the completion of a given level, the player will be prompted to choose a somewhat more difficult level, so as to keep up the flow. Also, all sectors bar the first one are locked as their default setup. Only when the player has completed a satisfactory number of levels in a certain sector does the next sector become unlocked (Figure 4).

Figure 4 The game's sector

IV. CONCLUSION

Games are an integral component of people's daily lives. Over $20.5 billion were spent on video games by Americans in 2013 [13]. While the games' primary aim is to present entertainment, given how universally applicable they are, games have long-since outgrown their entertainment role Games are implemented not only to provide entertainment, but also in the fields of defense, education, scientific exploration, health care, emergency management, city planning, engineering, religion, and politics. Apart from entertainment games there are also the so-called serious games whose primary goal is to train, investigate, or advertise.

The term gamification does not refer to the creation of a game from scratch. Instead, the term indicates the process of transforming education into a fun process, showing students it can be engaging, yet maintaining credibility. Gamification is an aide for increasing student motivation, leading them to increase their coding skills, ultimately they will be stimulated to learn. Gamification can act have a boosting effect leading them to study/read more [14].

Code Hunt is a highly effective educational gaming platform that internally leverages fitness values so as to guide the user to successful test/clue generation furthermore, it also externally provides its users with an entertaining learning experiences where search-based test generation is manually emulated. Code Hunt is a new attempt to create a game using serious search-based testing, make it available for a huge group of users, including coders, and especially learning coders [12]. The test cases are constantly changing, since they are built on the mined data, thus players will enjoy a new experience every time. Learning to code can become increasingly efficient and sustainable if the learner sees it as 'fun' as opposed to 'learning to code'.

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I LEARN WITH FUN – EDUCATION FOR THE FUTURE

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Abstract - Due to daily technology advancements, education evolves beyond classrooms, and libraries. Today, computers, and internet are affordable, and accessible to many. People learn through their mobile devices, and they want interactive, engaging content, and immediate feedback.

I Learn With Fun **is set of educational applications developed with focus on interactive learning. In this paper, I will discuss these educational applications, and features that make them stand out in the ocean of other educational software.**

I. INTRODUCTION

Economy in the world is changing, and many families have both working parents. Traditionally, children would stay home with one parent (or grandparents) until they get to school age, and only at school they would learn about mathematics, reading and writing, as well as other school courses. Today the times are changed; it is expected for kids to attend kindergarten, as a preparation for 1st grade. And also many children start attending preschool even before kindergarten due to expectations that they should know numbers, counting, letters and some basic reading and writing when they start kindergarten. Parents are under pressure to provide early education to children, and to give them a head start for school. This is a good environment for educational software to thrive, as the need for it is increasing. Educational software is a very helpful tool for parents, teachers and children.

I Learn With Fun is set of educational applications developed for Windows 8 Operating System, and Windows Phone 8 platforms, developed by Exandus, LLC.

These applications are designed having in mind preschoolers as primary users. Preschoolers are known for their short attention span, they need to be engaged, and consistently encouraged to learn, and they need an immediate gratification (feedback). Also, they want variety of content, which is visually, and audio appealing, and stimulating, as well as interactive.

I Learn With Fun applications provide instant feedback to users, and encourage independent learning. Independence is encouraged through easy and intuitive controls, as well as visual and audio cues. All *I Learn With Fun* applications support inputs such as touch, keyboard, and/or mouse (for Win 8 OS), and they all have characteristics of providing content that is colorful, engaging, animated, and highly interactive. Touching/clicking on objects shown on the screen will provide visual and audio feedback on the executed command.

Idea for *I Learn With Fun* applications is to provide a mix of learning, and practicing while playing various games, so that users don’t feel like they are learning, but more that they are playing a game.

I Learn With Fun applications have content divided in two distinctive categories: learning, and practice. In learning section users can learn content, and practice section provides set of interactive games that user can use to practice, learn new, and get immediate feedback on actions taken.

Currently published *I Learn With Fun* applications cover various topics, such as learning about: English words, mathematics, phonics in English, spelling in English, and Serbian words.

II. APPLICATION: I LEARN WITH FUN – 123

I Learn With Fun - 123 provides content to learn basics in mathematics, covering topics such as: numbers, addition, counting, shapes, and pattern recognizing. Learning content is divided in categories where users can learn about:

- Numbers (0 to 20): on screen you see the number, word – how to write that number with letters, objects to count, and hear audio content.

- Addition (up to 20): this simulates two-sided flash cards. On screen you see numbers to add, with addition and equal symbols, objects to count, addition line to help visualize operation, and you hear corresponding audio content. All these visual and audio cues help explain in different ways what addition is, and how it is done. There is “flip” control on which you tap to “flip” the card and see the solution. See *Figure 1* – showing addition: 2+3.

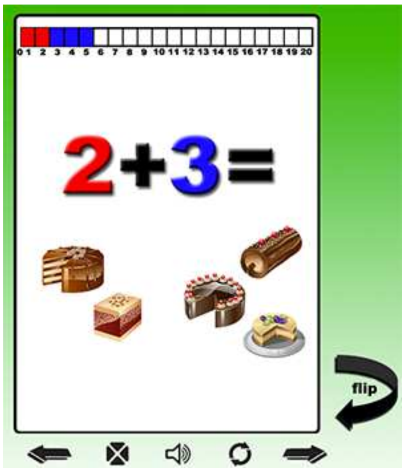

Figure 1: *I Learn With Fun – 123*
Learn: *Addition*

- Counting (by 1 and by 2 up to 20): on screen you see numbers, objects to count, and you hear audio content.

- Shapes: on screen you see objects and shapes, word – how to write name of object shown, and you hear audio content.

Each screen shows numbers/objects, objects to count, word how to write that number, and you hear audio content.

Practice section has flavors such as:

- Quiz: *How many do you see?* – You see number of objects shown, and three options to select correct number representing how many objects are on the screen. Clicking/taping image you will hear that number, and clicking/taping number will confirm your selection. You will get immediate feedback if your selection is correct or not. With this game you practice counting.
- Quiz: *What next?* - You see pattern shown, with last number missing, and three options to select correct number representing the missing one. Clicking/taping image you will hear that number and clicking/taping number out of options offered will confirm your selection. You will get immediate feedback if your selection is the correct one or not. With this game you practice counting and pattern recognition.
- Game: *Math pop* – On the screen you see balloons with numbers. Click/tap on the balloon will pop it, and you hear the sound how to pronounce that number. Whenever you pop the balloon, the value will be added to the current. Your goal is to reach given goal sum. With this game you practice number recognition, pronunciation, and addition. See *Figure 2* – showing math pop game with goal sum of 18.

Figure 2: *I Learn With Fun – 123*
Game: *Math Pop*

- Game: *Find it* – here users see list of objects that need to be found, and the objects are hidden in the screen shown. Hints are available, and immediate feedback is provided when user finds one of objects that need to be found. Game provides variety in a way that there are various combinations of objects to be found, and also objects can be shown in various locations – all this for hours of fun. With this game users practice shape recognition.

With application *I Learn With Fun - 123* users can learn and practice basics in mathematics. Content is presented in variety of ways, offering colorful and relatable images of objects for children. Variety of content in practice offers hours of educational entertainment, and it can satisfy users of different levels of knowledge.

III. Application: I Learn With Fun – Phonics

I Learn With Fun – Phonics offers content to learn how to read, write and pronounce words in English with focus on phonetics sounds. Phonics are an interesting topic for English language, as not every letter will make the same sound depending on its position in the word and surrounding letters. Also, there are different pronunciations of words in English, depending on the geographic area (e.g. English UK vs English US). This app offers more than 230 unique words to learn. Learning content is divided by length of words, and by categories. Each screen will have an image of the object; word how to write it, and the word will be animated, while audio output lets users hear how to pronounce words and letters.

Learning section has sections such as:

- Game: Abc shake – Users see letters on the screen. Tap or click the letter to hear sound.
- Game: Abc pop – On the screen users see balloons with letters on them. Tap or click the balloon to pop it and hear sound that letter makes.
- Game: Word it – On the screen users see image of the object, and letters. Arrange letters to write that word, and click image to hear sound. There is also a hint feature that will briefly show you the solution. Once word is completed, you will see animation and hear audio how to pronounce that word emphasizing phonetic pronunciation. See Figure 3 – showing task to write “eagle”.

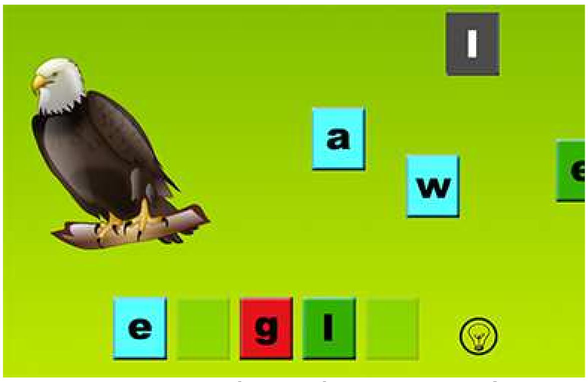

Figure 3: *I Learn With Fun – Phonics* Game: *Word it*

With *I Learn With Fun – Phonics* application users can learn and practice how to read and write in English. Colorful and realistic images are engaging for children. Easy navigation and instant feedback provides sense of accomplishment to children while promoting independent learning.

IV. Application: I Learn With Fun – Serbian

I Learn With Fun – Serbian has focus on individuals who want to learn Serbian, providing more than 270 unique words to learn in an interactive, engaging, and fun way. With this app you can learn how to pronounce words, and how to read and write them in both Cyrillic and Latin. You can also find out some basic facts about Serbia as a country. *I Learn With Fun – Serbian* has content divided in two categories: learning and practice. In learning, user can learn words which are presented as series of cards that contain image of the word, text how to write that word, and a sound how to pronounce it. The content is presented in several different groupings, such as:

Alphabets (Cyrillic and Latin): content is arranged by alphabet selected, and each screen represents one letter of the Serbian alphabet showing multiple objects that start on that letter. See *Figure 4* – showing letter Š.

Figure 4: *I Learn With Fun – Serbian*
Learn: *Alphabets (Latin)*

- *Colors*: here content is arranged by name of the color. Each screen represents a specific color, and shows several objects that are in that color.
- *Animals*: in this group content shows various animals with realistic images, and name of the animal shown in selected alphabet.

Practice category has several flavors, such as:

- *Čitamo/Читамо*: on the screen you see an image of an object, and animated word below how to write it. Animation follows sound which teaches you to read the word shown. You can select if you want to see font in Cyrillic or Latin.
- *Pišemo/Пишемо*: On the screen users see image of the object, and letters. You need to drag and drop letters in order to arrange

them and to write that word; click image to hear sound. There is also a hint feature that will briefly show you the solution. Once word is completed, you will see animation and hear audio how to pronounce that word. You can select if you want to see words (letters) in Cyrillic or Latin. See *Figure 5* – showing task to write “делфин”.

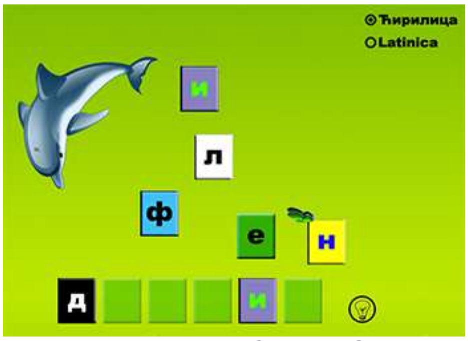

Figure 5: *I Learn With Fun – Serbian*
Learn: *Pišemo/Пишемо*

- *Abeceda* – users see letters of the alphabet (Latin). Tap or click the letter to hear the sound it makes.
- *Азбука* – users see letters of the alphabet (Cyrillic). Tap or click the letter to hear the sound it makes. See *Figure 6.*

Figure 6: *I Learn With Fun – Serbian*
Content: *Азбука*

I Learn With Fun – Serbian offers content to learn and practice how to speak, read and write in Serbian. Interactive content is engaging for children. Easy navigation and instant feedback provides sense of accomplishment to children while promoting independent learning.

V. Application: I Learn with Fun – Spelling

I Learn With Fun - Spelling has focus on individuals who wish to learn how to read, write, and spell words in English. The application provides more than 250 unique words to spell. Learning content is divided by length of words, and by categories. Each screen will have an image of the object; word how to write it, and the word will be animated, emphasizing each letter, while audio output lets users hear how to pronounce words and letters, and how to spell it. Spelling in English is a specifically interesting topic, since the same letter will not produce the same sound depending on its position in the word, and surrounding letters.

Learning section has flavors such as:

- *Shake spell* – On the screen users see letters of the alphabet. Tap or click the letter to hear sound it makes.
- *Abc pop* – On the screen users see balloons with letters on them. Tap or click the balloon to pop it, and hear the sound that letter makes.
- *Spell it* – On the screen users see image of the object, and letters. You need to drag and drop letters in order to arrange them to spell that word. Click image to hear sound. There is also a hint feature that will briefly show you the solution. Once word is completed, you will see animation and hear audio how to spell that word.
- *Starts with* – On the screen you see one letter of the alphabet and several objects. Your goal is to find all objects that start on that letter. See *Figure 7*. Clicking correct or incorrect object will provide immediate feedback.

Figure 7: *I Learn With Fun – Spelling*
Game: *Starts with*

I Learn With Fun – Spelling provides

Figure 9: *I Learn With Fun – Words*
Quiz: *Find words*

interactive content to learn and practice reading, writing and spelling. Learning and practice sections offer content presented in different ways, with goal to stay engaged while learning.

VI. APPLICATION: I LEARN WITH FUN – WORDS

I Learn With Fun – Words offers content to learn words in English, providing more than 450 unique words to learn in an interactive, engaging, and fun way. As in other *I Learn With Fun* applications, content is divided in two categories: learning and practice. In learning, user can learn words which are presented with an image of the object, text how to write name of that object, and a sound how to pronounce it. The content is presented in several different ways, such as:

- *By letter*: where you select a letter of the alphabet, and that will display on the screen the letter, and several images of objects that start on that letter. Clicking/tapping on any image will show how to write that word, and you will hear how to pronounce it. See *Figure 8* – selected letter A.

Figure 8: *I Learn With Fun – Words*
Learn: *By Letter*

- *Alphabets*: content is arranged by alphabet, and each screen represents one letter of the English alphabet showing multiple objects that start on that letter.
- *Colors*: here content is arranged by color name, where each screen represents a specific color, and shows several objects that are in that color.

Practice category has several categories, such as:

- *Find words*: image is shown, and three words below. One is correct – represents the object shown on the image. Clicking/tapping the image, you will hear how to pronounce that word, click/tap on one of the words shown will confirm your selection, and provide immediate feedback if your selection is the correct one. See *Figure 9.*
- *Connect*: you need to connect dots, by numbers, to form a letter. On the screen you will see several objects that start on that letter. Click/tap on any image will show how to write object you clicked on, and also you will hear how to pronounce it. Following numbers to connect dots teaches kids how to write letters. See *Figure 10* – connect letter M.

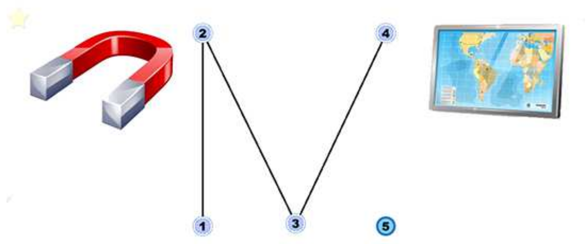

Figure 10: *I Learn With Fun – Words*
Game: *Connect dots*

I Learn With Fun – Words provides interactive content to learn and practice words in English. Content is presented in variety of ways with goal to keep kids engaged for hours in learning activities.

VII. CONCLUSION

Educational software has a center stage in education, in demographics that has computers and internet available. Users enjoy both visual and interactive components that software offers, which is not available in books or in a traditional classroom.

I Learn With Fun applications offer to users rich visual and audio interactive experiences while enforcing independent learning through easy navigation and immediate feedback.

It is my opinion that this is where future of education is: educational software that is specific to the topic, and presents content in variety of ways to satisfy different learning styles.

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FACEBOOK IN THE FUNCTION OF IMPROVEMENT OF TEACHING

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Abstract - The use of social media today has become one of the main ways of communication and exchanges various information via the Internet. Each network has its own good, but the bad side. This paper will give an overview of Facebook, as one of the most common networks, as well as the good and bad that it brings.

I. INTRODUCTION

The use of social networks today has become one of the main ways of communication and sharing different information over the Internet. Facebook is the largest and most extensive social network that allows people around the world to share certain information. Advantages and disadvantages of each network can be reflected in various ways. When we talk about education, this social network helps a lot in communication and sharing information, but gives possibilities to access some information that can violate the privacy of users. The main problem and bad side of Facebook is privacy of users. There is one question, how much is this social network safe when we talk about privacy and sharing some information? Facebook is one of the leading social networks, this network helps different people across the globe to access to information of some user. Facebook gives opportunity of making groups of users where they can share some information and this is very important for education purposes. Presenting of some education material via this social network is one of the advantages. Data security on this social network depends of a user which is responsible for all shared information.

II. SOCIAL NETWORKS

The impact of social networks on people today is very big. A large number of people from different sides across the globe use social networks to contact with different persons, cousins and friends. The idea of social networks is exactly this so user can share his different information, picture or attitude about something. Development of social networks is helped a lot when we talk about communication. Today, one of the basic methods of communication is social networks. Talk with friends has never been easier, the possibility of free calls over the Internet, and social networks using a specific hardware (camera, microphone, etc.) represents every day. Social networks can be also used for other purposes. Education via Internet, sharing educational material and organize some workshops on this networks are one of the purposes. Different people are using social networks and they can affect on creating different opinion of user for something. Shared information on social network can be approval or condemnation by large number of people. So we should wonder how much is good activity on social networks and how much influence on crating user personality. All people want to belong somewhere and to be accepted by the social. Using of social networks can increase confidence of users. On the other side, activity on social networks is become a trend so people think if they are using some of social networks they are on some modern place. Using of this network helps people to be spotted.

Today social networks are very popular and give opportunity to users to get some information. A bad side of using social networks can be if this becomes a way of living of users and they can cause specific type of dependency. Sharing information via social networks is not always good because different people can use them. They can use this information on many different ways, which are not good for user. Defects of social networks are emotions that other user cannot see when you communicate. This is because users usually send text messages. A great advantage of social networks is better way of representing some problems and call for users to affect. Sometimes we just can think that we are done something useful and that is not so good. Activity on social networks gives opportunity to users to say something in public and their dissatisfaction.Many people are active on social networks to get some new acquaintance and connect with people with same interests. Usually this communication via Internet and social networks is not the same as live communication between users. They usually can make passive communication with some people in circle of user friends. Social networks can be medium of a communication between people that user do not know live or even do not say hello to them. A bad side of social networks is that users can be a part of someone life from a safe distance. Usually users present them different that they are real. Because different people use social networks users, need to be more careful. Using good things of Internet there are usually and some bad things. Before user creates his profile on some of the social networks, he needs to think over. He needs to ask himself why he needs activity on this network; he needs to know to use Internet on the right way and not to share his personal information. As we said, social networks use a certain part in modern communication. People usually use social networks to have fun, spend their free time and get some interesting information now. On the other side, social networks are represented also in business communication.

It is very important to mention that the using of social network and activity of users is changed the way of spending our free time, communication and methods of learning and educational processes. Using social networks for educational purposes makes more interesting for students. Usually students create their own groups on social networks to connect and share information about school and their obligations.

This is cause teachers to start with using social networks and makes them accessible education material, makes some discussions between students and gives them some useful examples and video material. When teachers share some educational material on social networks they helps, students that are missed classes for some reasonso they can use it. With creating a groups of users on social networks teacher can be always in contactwith their students. It is very important to make difference between shared personal information and educational material.

A good side of using social networks is that a student always can ask his teacher about some educational problems and get answer immediately. Sharing education material on social networks is very important because this is the place where students spend a lot of their free time. On the way educational material imposes to students, even they are not in school. Using social networks provides place for cooperation and common learning. Activity on social networks can be bad for education purposes if students, users try to abuse some information. Teachers in addition of information for education share and other information. Teachers need to take care of which information share and who can access to them. Insulting and sabotage work in group can be a bad side of using social networks for educational purposes and teachers cannot do anything about that. Possible way to prevent this is ejection of students from the group, but this is not so good because this denied their possibility to get education information. Social networks allow users to share different kind of information and on indirect way; they can insult teachers, which teachers cannot prevent. This is also one of the bad sides of using social networks for educational purposes.

III. Good sides of Facebook

The founder of the popular social network “Facebook” was Mark Zuckerberg. He was born on the 14th of May in 1984. Facebook was established in 2004, while the Mark Zuckerberg was a student at Harvard universities. Dustin Moskovitz and Chris Judd was helped him for the establishment of this social network. Even before the founding of Facebook, Mark Zuckerberg at Harvard University, made the social network like Facebook to help students to find each other, more precisely, to consult about lectures etc.

This social network has been established in the February 2004. Facebook was made so that it is available on all operating systems such as Windows, Linux, Macintosh, and others. Social network Facebook has quickly experienced success. In just two week, most of Harvard students have already accounts on Facebook.After this, Mark Zuckerberg decided to expand their social network to the world. He wanted to use it in the best possible way, and so it is first spread to other American universities, and then the whole world.

Today, Facebook is available to anyone over the age of 13. All you need to do is enter your name, surname, your e-mail and password. In this way, you have made your Facebook account. Facebook is free for all users and available in all countries. Facebook offers the option of private and public messages. If you want to use private messages, you can do it the easy way by using the Inbox, and if you want to use public messages, you can use the application Wall. Application Wall is used to represent the public messages, so all your friends can see that message. There is also the option of writing the status, which informs your friends about your feelings, mood, about anything.

Facebook offers many different applications, but the most popular is Photos. With this application, you can show your pictures to your friends. Using this application, you can make an album where in one album you can put 199 pictures. In addition, in this application there is an option Tag. On this way, you can tag your friends in the precious photographs, which they can save on their computers, which is a very useful feature, because it makes it easy to transfer files from computer to computer. This application is also useful to the exchange of diagrams, formulas and many other educational items among students.

Similar to this application is an application that is used to set the video. With this application, you can upload many educational videos that help students during the school. For example, there are many educational sites that relate to a particular direction, such as IT (Information technology). On this page, you can find many interesting information about the world of IT. In addition, there are many motivational signs which incite students to improve their related to information technology.

One of the most interesting items of Facebook, are applications that can be added to the profile. During the fallowing years the emergence of Facebook, the number of applications has increased rapidly. “We’re Related” was the most popular application on Facebook in 2009. The main idea of this application is to connect family members. Users can build a family tree and connect to all family members, even those who live in another city or state. “Living Social” is an application that allows you to share interests with your friends. Titles like “Last 5 books I read” that we see on the profile, coming us from this application. With this application, you can share your opinions about books, articles, various documents, films and so on.

Many schools use social networks differently. Some schools use them to communicate with parents and students, while others are used to improve learning, because social networks allow students to engage in a form of a virtual community. Many experts say that in ten years 70 % of future generations will learn in virtual schools, where the teaching hours will attend on the Web. Teachers will use the well-known social networks, such as Facebook, to engage students in teaching.

Then, Facebook can become excellent e-learning platform. Teachers will then be able to publish their postal slides of teaching hours and a lot of different multimedia. One more option is, if students have basic programming skills to create application for Facebook, they can do that using the “State of the art” technology.

Edmodo is an example where using Facebook for education. This free social network was created with the aim of connecting and collaboration of students and teachers. There is since 2008, and it is used in some Croatian schools. Edmodo helps in solving problems of communication and cooperation that impede modern teaching. Classes do not last 45 minutes, but as long as students have an interest in the subject.

On the basic of previously said, it is obvious that the main purpose of education and the role of Facebook changes of the relationship of students to information and knowledge. Many learning theories emphasize human interaction as an important element in the learning process. Social networks are designed as service that maximum support interaction between its members. The possibility of interaction makes Facebook a suitable for education.

Groups have the best system of distance learning through the Facebook social network. In these groups, there is interaction between all members of the group, not only in relation to the mentor-student. There are two types of groups that can be formed on Facebook. The first type of group is public or open. In these groups, the information can be shared with users who are not members of the group. The second type of group is closed or secret. In these groups, information is exchanged only among members of the group.

The goal of using Facebook in education is to provide learning opportunities for all users of all ages, regardless of where they are. Facebook users can get to the educational information at any time, not just the usual way as schools and higher education.

IV. BAD SIDES OF FACEBOOK

A recent study in one school in Britain has shown that Facebook has very negative impact on the performance of students in school. The school has conducted research and testing to determine whether social networks, and Facebook as the most popular among them, affecting in any way the performance of students. The testing was done so that for a period of three months, the first two months access to Facebook was denied and the third month access to Facebook was allowed.

The results showed that a sample of three months was just enough to make a conclusion. In the third month, during the period of Facebook usage, it was noticed slight deterioration of grades, but what is even more important is lack of concentration and poor knowledge acceptance. In order to test the concentration level and the quality of teaching, at the last week, lesson was carried out to make summary of what was learned in every subject. In that, summary students have participated and it turned out that the results were much worse in the third month.

This test has shown that Facebook and other social networks have the most negative influence on quality of education.

Baroness Susan Greenfield, a top neuroscientist of the Oxford University warns about the lifelong effects of too much social networking:

- Facebook and other networking sites “are infantilizing the brain into the state of small children who are attracted by buzzing noises and bright lights, which have a short attention span and live for the moment”. There is hardly any concentration skills required in participating in these social networking sites, and these train the brain to have poor attention span.
- Kids are detracted from learning to communicate in the real world.There are reports from teachers that social networking is affecting kids’ comprehension levels. Also, if kids communicate primarily through the screen they do not learn the subtleties of real life communication - such as body language, tone of voice, and subconsciously sensing the molecules that other people release.
- Social networking sites make kids more self-centered. Since Facebookand other sites give kids their own page, which is about them, it leads some vulnerable kids to think that everything revolves around them, a precursor for emotional problems in their later life.This might also result in inability to empathize.
- These sites make kids prone to sensationalism.
- Pediatricians observe that some teens suffer from "Facebook depression". After spending a lot of time on Facebook and other popular social networking sites, some teens become anxious and moody. In addition, a vulnerable teen may suffer from depression when he reads great things happening to his friends, and his life is not so great in comparison. Teens that experience "Facebook depression" usually have trouble with social interactions in general.

For kids and teens in social networks, there are no spelling and grammar rules.In fact, it is cool to misspell and not make sense.Less sophisticated children will find it hard to differentiate between social networking communication and real world communication. In fact, many teachers are complaining that social networking communication with misspellings and lack of grammar are seeping through student’s school writings.

For kids who crave attention, Facebook and other social network becomes a venue for them to act out. These kids may make inappropriate statements, pictures and videos that could ultimately harm them. In addition, posts and materials that are published online tend to be permanent and may haunt them in the future. A study by Larry Rosen, a professor of psychology at California State University concludes that extended use of social networks like Facebook can result in a decrease in empathy among teens, and thus an increase in narcissism.

V. Conclusion

Young people who have a history of harming himself or herself or attempting suicide might be particularly vulnerable to negative messages posted online, new research shows. The new review, published Wednesday in the journal PLOS ONE, found that kids and young adults who have thoughts of self-harm or suicide actually spend more time on the Internet and are more often victims of cyberbullying than their peers who do not have such thoughts.

To put the icing on the not-so-great-tasting technology cake, another recent study shows that Facebook makes people much ruder. In that study, a whopping 80% people reported that they experience more rudeness on social media as compared to face-to-face interactions. It is no surprise, really, because interacting with screen instead of people also weakens our ability to be compassionate.

In fact, studies show that today is college students are 40% less empathetic than generations before them, and many psychologists and physicians say social media is to blame. Social media makes us dumb, depressed, rude and envious, but it also makes us more narcissistic, less productive and shallower.

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LEARNING MANAGEMENT SYSTEM USING COMPUTERS

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Abstract - In the teaching process, repeating the cycle step by step is used to control students' progression through a series of tests, in which the acquisition of knowledge is checked, and they are displayed in a strictly linear order in accordance with the guidelines of teaching courses. A further step that is taken in the implementation of some CML system is allowing the use (and subsequent use in making decisions about directing students) subjective assessment of students in relation to the learning style of the student at some point prefer, the choice of targets, which relates to future occupation, or Niva security (self) in understanding.

I. INTRODUCTION

The most perfect CML systems are able to build a very large and very detailed profile of students, containing all (or almost all) the details of information that designers consider teaching courses that are relevant to decision making in management courses. The recorded data on pupils' work contains a complex mixture of information that include data on the development of diagnostic tests in the course, which is ongoing, standard measurements, such as the level of reading and math skills, the profile of the student preferences in relation to the objectives of the course, learning style or choice tutors and coded the teachers' assessment regarding the level of motivation, the necessary degree of control, the level of cognitive ability or stage of cognitive development of students.

II. COMPUTERS IN THE CLASSROOM

The computers in the teaching process can be used and applied in different ways, such as:

- Computer as an object (subject) at classes,
- The computer as a tool,
- The computer schedules inventory and budget
- A computer-generated material,
- Computer- based design of instruction (teaching) [1].

It can be an object (object aim) of the classes, as in computer science and computer literacy, as well as a tool that can be used during classes to perform complex calculations, data processing and word processing.

In relation to the computer as an object of teaching students learn “about " computers that is they learn computer literacy, i.e. methods and forms of use and application of computers - learn to use them in their future career in data processing and analysis of the purposes (goals). In this role the computer being is tested like any other machine or device that the student learns to use that is used. The student learns to program or operate a computer. The computer can be used as a tool during the teaching time that is to be used in solving mathematical calculations, preparation of reports, budgets, and analyzes data. His task is to perform repetition of budget, collect and look for data when connected to laboratory equipment, perform word processing and their composition (matching lines), then, prepress, production of coursework to realize that. Is simulation of experiments, modeling of various processes as a lecturer teaching content (a kind of replacement teachers), or as a leader and manager in the learning process, which will evaluate students' achievement and progress in the learning process, to individualize the learning process and so on.

It may be used as follows:

- The subject and content of the classes, i.e. for teaching the subject “Informatics and Computing ", exercise programming in the classroom and other areas of computer science at the Faculty of future professionals about computers.
- As teaching aids i.e. Many functional instructional media in the teaching of all subjects for teaching by using computers in individual, group and frontal form.
- As a mean of rationalization of business educational institutions for classroom and

school statistics, etc. The records of students, teachers, curriculum, materials in the library, monitoring of health and psychophysical characteristics of students, guidance and selection, diagnostic and prognostic procedures, material and financial management, evaluation of teaching, planning, and control the execution of the work, the implementation of procurement, personnel, wages, and so on.

- As an instrument of following and evaluation of students that is testing students, controlling the correctness of written works, information about the success, failure diagnosis, counseling and so on.
- As a means for the realization of individual instruction.
- As didactic files.
- As an instrument for scientific research in teaching and learning [2] .

It can be used in and for:

- Adoption of the new materials (lectures and demonstrations)
- Determination (practice) teaching material,
- Repetition of the teaching material and
- Checking the learned material.

The forms of learning may include:

- Individual
- In pairs,
- In small groups, and
- Frontal (whole class) [3].

The main problems in the use of computers are a necessity to know the manner of its operation, use, application, usage scenarios and ways of action, all of which makes it difficult to use it at the appropriate time and appropriate. Therefore, many teachers do not accept them because they do not know a way to work with them. To work with them necessary are more and more complex preparations, but teachers are not very motivate for that. The human factor decides about the value of the use of computers, not by themselves [4].

The development of computer and information technologies and the expansion of their use in all aspects of human life. The rapid development of hardware, followed by a more rapid software development. Hardware allows for much, but the software allows teaching. Thus, in addition to the appropriate hardware, develop and implement software systems for accurate measurement, software systems deployment, educational computer software, information systems, expert systems, software systems for recording and reproduction of sound, as well as many others who serve people for easier, faster and more precise tasks. Today, music production and operation of a recording studio cannot be imagined without the use of computers [5].

III. THE USE OF COMPUTERS IN TEACHING

Computers are applied and used in the teaching process as: 1 means that “assists “(helps) teaching and learning, 2 as “administrative tool “for easier management of the school system, and a 3. aid that directly helps students to easily learn and understand the teaching material i.e. as “student tools.

The development of computers and their application in the recording studio, has led to major changes in the field of professional audio processing on a global level. Digital audio is the most important and revolutionary product development process audio on computers, provided that the devices that are used in recording studios become more compact and much more accessible.

The use of computers in the teaching process is manifested in various forms and strategies that are tagged acronym in English, like: CAI, CAL, CAT, and CMI. Today on the field of contemporary educational technology there are a number of domesticated and accepted the terms, guidelines, tags, concepts, that are used to denote a hem form of realization of the teaching and educational process, new resources, devices, techniques, " tools " that are used to support and enhance and processes, as well as new forms and methods of their realization and so on [6].

Understanding and precise definition still stands above that mark application and use of computers in the learning process, we point out that in the U.S. the term "teaching" is used in a global sense for any form of mutual exchange of information between teachers and students and that the term "instruction " means approximately our notion of " teaching". Because of that the expression of CAI can be translated as computer-aided “assisted” classes, and according to them “instructions “. In England this label, i.e. Name of CAI is equivalent to label CAL (Computer Aided

Learning), because the English considered the essence of the teaching learning process and that it should be supported in different ways, and that assistance only sometimes looks like classes. However, there are differences in the use of CAL, CML, and CAI. English authors believe that the CAI subset of CAL and the CMI variant of CAL. Other authors believe that the CML and CAI separate category and not part of the CAL. It is believed that teaching is only one aspect of education, which means that the CAI is only one of the aspects of the use and operation of computers in education [7].

For many computer experts and educators terms such as CML and CMI, computer-controlled learning and teaching and CAL and CAI computer- aided learning and teaching, and CAL, CBI, CBT computer based learning, education and training are the same, congruent and similar and have the same or about significance. However, many authors and experts distinguish them, and they have different specific meanings. The difference between CAL and CML is unclear because certain CAL programs can assist in the assessment, recording data and providing advice to students in relation to the path which will start in their learning. There is a difference between CAL (computer assisted learning) and CAT (computer assisted instruction), because the goals and methods of training are somewhat different from those that exist in education. However, one or the other form is related to learning, and between them, in practice there is a greater similarity than differences. Much of the knowledge and skills of CAL is equally applicable to training (CBT). All of these terms and acronyms used in education, as the term CBT are used in industry and business organizations and on equivalent terms for CAL and CAI, as he deals with the process of learning, teaching, training and education.

We usually translate these phrases as: teaching and learning with the help and support of computers, teaching and learning with computers or computer assisted teaching. For us, these terms indicate how they are used also acronyms. That means CAI NPK = Continue with the help of computers and CAL = UPK = learning by computer. It should be noted that the first method of labeling as international it is used more often [8].

IV. CONCLUSION

In its development, digital technology has met with a number of opponents, whose arguments are based on conservatism and traditionalism, trying to delay the application of information technology. In our country, it is especially characteristic. Even at the end of the twentieth century it is often heard the opinion that digital audio will never be able to compete with analog stating the numerous arguments. At the same time in, the international professional journals dealing with recording studios and studio equipment, analog devices, tape recorders with tapes and records no longer even mentioned. Today in our country, everyone knows that the recording studio went through information technology. Concrete results, i.e. music videos made with digital technology, their quality was far ahead of the clips that are recorded by analogue techniques, in which we once enjoyed by vinyl records.

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INFLUENCES OF SOCIAL NETWORKS ON LEARNING ENGLISH

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Abstract - The paper presents possible influences of social network on learning the English language. A short it also defines social networks together with their positive and negative features. The users of social networks beside their usage intention, they are inevitable exported to the English language. They learn new words, phrases, structures and they can improve their oral and written communication as well.

I. INTRODUCTION

Global social networks are for everybody, which the main purpose is communication and interaction. Therefore, it is not the networks that follow certain services where you can communicate and share with other Web resources, their main purpose is communication and interaction regardless of your background and interests. Most have a language choice, but most of them base on English language and that was very useful for everybody who wants to practice their English. Social networks are a theoretical construct and that is useful for application in the social sciences to study the relationships between individuals,

Groups, organizations, or complete societies (social units). They are in the world millions of people who used social networks much more then telephones. In addition, today the social networks used in a business context and marketing. With all the above meanings of social networks, which are of course their advantages, there are also their disadvantages such as privacy. Before we join a social (virtual) network, we must to meet in detail about their capabilities, the rules and ways to protect our privacy. That way we will be able to relax and socialize make new friends or business contacts. Social networking services are one of the most popular forms of "online" communication. They are allows sharing and viewing of large multimedia contents, and finding people with similar interests, and share knowledge and experiences. The most popular networks are Facebook, Twitter, Linkedin and Forsqare. A former executive president of PayPal, Reid Hoffman, founded newer types of network Linkedin used for sharing business contacts. Facebook offers Facebook Places, and at this point, the most widely used worldwide level (geolocation) services as Foursquare. There are also services Loopt, Buzzd and of course Google Latitude.

II. TYPES OF SOCIAL NETWORKS

Somewhere between 87% and 98% of companies now have a presence on social media sites. Whichever figure is more accurate, it is clear that if your company does not use at least one of Facebook, Twitter, Linkedin, Foursqare, it is in an ever-decreasing minority. Social media has changed the way businesses communicate with their customers, but it has done little to change the way people within the business communicate with each other. Yet this distinction is often lost amidst over-generalized definitions of “social business”. Consumer-focused social networks have a significant part to play in modern business communication, but it is essential that the strengths and weaknesses of each type of network is understood if we are to use them effectively. Facebook, Twitter, Linkedin, and Forsqare are primarily business-to-consumer and consumer-to-consumer networks. They offer immense customer reach – with 1 billion active users on Facebook and 300 million on Twitter, these networks are a great place to make contact with customers and prospects. However, they are not great places to have meaningful conversations with customers, so should usually be complemented by company-managed customer communities. [1]

The fact that there are so many ways to connect with like-minded individuals online can be very exciting and beneficial, but it is essential to proceed with caution. Keep in mind that not everyone who shows up on a social media website is who he or she claims to be. Exercise caution and closely guard your personal information any time you engage in social networking activities regardless of what kind of social utility you are using. There are online communities for virtually everything imaginable, and these sites can be broadly categorized into four possible areas:

- Dating/friendship;
- Alumni networks;
- Career/business related;
- Hobby/group networks;

These four basic categories can be further organized into the following areas:

- Book Communities
  Book-related join booklovers who want to share their interests in books and authors. Some of these communities allow members to exchange their books with one another
- Business Networking & Professionals
  Business networking communities are places for like-minded professionals to gather and connect with others. The fastest growing community for business professionals is LinkedIn.com.
- Family
  The family-based are places for families to stay connected to each other. These communities can be private so that only family members may access the sites.
- Friends
  The main reason why people join is to stay connected to "friends." Therefore, the majority of these online communities are built to support these "friendships." Sites in this category include Badoo.com; Facebook.com; MySpace.com; Orkut.com; Pownce.com; Vox.com; and Xanga.com. [1]
- Hobbies & Interests
  There are many online communities built around hobbies and interests. These types of include sites for people interested in arts, politics, movies, environment, cats, etc.
- Languages
  Language communities are developed to help people learn a foreign language online. Members network with each other to find a partner to practice language skills. Sites include Chaula; FriendsAbroad.com; iTalki.com, and KanTalk.com. [1]
- Video Sharing
  Online video sharing is one of the most popular trends. Members in these communities upload video, develop their own videos, share videos, and comment and/or rate videos
- Photo Sharing
  Photo sharing communities allows members to upload their own pictures, rate and comment on other people's pictures, and share pictures with others. Some of these sites incorporate photo-editing features and provide people with private libraries that they may share with only people they invite. Sites in this category include Clickfriends.com; Flickr.com; Fotki.com; Snappages.com; Picasa.com, and Zoomr.com. [1]
- Audio Sharing
  Music sharing communities are among the most popular. Depending on the community, members can develop their own music jukebox, and share their play lists with anyone. This allows people to discover music from friends, and find recommended artists and albums based on their particular music interests.
- Mobile Communities
  One of the latest movements in social network communities is mobile phone based networks.
- Shopping
  Shopping-themed allows members to share sales, discounts, comments on recent purchases, and research what others have said about products.
- Social BookMarking
  Social Bookmarking websites are for members to store their favorite links on the web. Links can often be tagged and viewed by anyone. The most popular linked websites can often be added to the most popular links pages on these sites.

The categories listed above are very broad, and cannot encompass the intricate details of each of the social networks found within them. This condensed categorization is merely a general overview of how these various communities might be grouped. Many of these could easily fit into multiple categories.

III. FACEBOOK

Facebook is a popular free social networking website that allows registered users to create profiles, upload photos and video, send messages and keep in touch with friends, family and colleagues.

The site, which is available in 37 different languages, includes public features such as:

- Marketplace - allows members to post, read and respond to classified ads.
- Groups - allows members who have common interests to find each other and interact.
- Events - allows members to publicize an event, invite guests and track who plans to attend.
- Pages - allows members to create and promote a public page built around a specific topic.
- Presence technology - allows members to see which contacts are online and chat.

Within each member's personal profile, there are several key networking components. The most popular is arguably the Wall, which is essentially a virtual bulletin board. Messages left on a member's Wall can be text, video or photos. Another popular component is the virtual Photo Album. Photos can be uploaded from the desktop or directly from a cell phone camera. There is no limitation on quantity, but Facebook staff will remove inappropriate or copyrighted images. An interactive album feature allows the member's contacts (who are called generically called "friends") to comment on each other's photos and identify (tag) people in the photos. Another popular profile component is Status Updates, a microblogging feature that allows members to broadcast short Twitter-like announcements to their friends. [2]

All interactions are published in a newsfeed, which is distributed in real-time to the member's friends. Facebook offers a range of privacy options to its members. A member can make all his communications visible to everyone, he can block specific connections or he can keep all his communications private. Members can choose whether to be searchable, decide which parts of their profile are public, decide what not to put in their newsfeed and determine exactly who can see their posts. For those members who wish to use Facebook to communicate privately, there is a message feature, which closely resembles email. Facebook

Members can join networks based on school affiliation, employers, and geographic regions.

Facebook can be used for keeping track of friends both old and new. It is free to join and

Requires only that you be over 13 years of age and have a valid email address.

IV. TWITTER

Twitter is a social network and real-time communication service launched in 2006, used by millions of people and organizations to quickly share, and discovers information.

The word Twitter comes from the frequent chirping sound made by birds, hence the bird used in the Twitter logo. Users can access the site via the web and mobile devices to exchange frequent bite-size updates of information called ‘tweets’ which are messages of up to 140 characters long that anyone can send or read. These messages or tweets are public by default and visible to all those who are following the tweeter. Twitter allows you to follow other users you are interested in so that you will see their updates on your home page, which is an aggregate feed of all the accounts you are following. Users share these tweets, which are micro-bits of information that can contain things like photos, videos, quotes, article links and more. Each tweet can also have replies from other people creating real-time conversations around hot topics, breaking news and interesting new content. [3]

Twitter was able to disrupt traditional point-to-point messaging systems like email by providing this one-to-many interface for rapid content delivery and search. However, Twitter has evolved from more than just a real-time communication tool into one of the world’s leading sources of social discovery and newsworthy events. This open networking environment has also led to an entire ecosystem built around the Twitter platform coined the ‘Twitterverse’ where creative people, designers, marketers and businesses can flourish together. A standard message on Twitter contains 140 characters or less. A tweet that has been reshared to all users’ followers. The # symbol is used to tag keywords or topics in a tweet to make it easily identifiable for search purposes. Twitter is the best way to discover new content and keep up with your favorite topics of interest and people. Twitter lets you exchange ideas and information instantaneously bringing folks together from all across the globe unlike ever before. Some of us use Twitter just to listen, others to keep in touch with friends.

V. FORSQARE

Foursquare is a free app that helps you and your friends make the most of where you are. When you are out, use Foursquare to share and save the places you visit. In addition, when you are looking for inspiration for what to do next, we will give you personalized recommendations and deals based on where you, your friends, and people with your tastes have been. Whether you are setting off on a trip around the world, coordinating a night out with friends, or trying to pick out the best dish at your local restaurant, Foursquare is the perfect companion. Foursquare founders are Dennis Crowley and Naveen Selvadurai met in 2007 while working in the same office space (at different companies) in New York City. Working from Dennis' kitchen table in New York's East Village, they began building the first version of Foursquare in fall 2008, and launched it at South by Southwest Interactive in Austin, Texas in March 2009. Foursquare is the second iteration of the same idea, that people can use mobile devices to interact with their environment. As of April 2012, the company reported it had 20 million registered users. The company was expected to pass 750 million check-ins before the end of June 2011, with an average of about 3 million check-ins per day. Male and female users are equally represented and 50 percent of users are outside the US. Support for French, Italian, German, Spanish, and Japanese was added in February 2011. Support for Indonesian, Korean, Portuguese, Russian, and Thai was added in September 2011. Support for Turkish was added in June 2012. [5]

VI. LINKEDIN

LinkedIn is a social networking site designed specifically for the business community. The goal of the site is to allow registered members to establish and document networks of people they know and trust professionally. A LinkedIn member's profile page, which emphasizes employment history and education, has professional network news feeds and a limited number of customizable modules. Basic membership for LinkedIn is free. Network members are called "connections." Unlike other free social networking sites like Facebook or Twitter, LinkedIn requires connections to have a pre-existing relationship. With basic membership, a member can only establish connections with someone he has worked with, knows professionally (online or offline) or has gone to school with. [4] Connections up to three degrees away (see six degrees of separation) are seen as part of the member's network, but the member is not allowed to contact them through LinkedIn without an introduction. Premium subscriptions can be purchased to provide members with better access to contacts in the LinkedIn database. LinkedIn was co-founded by Reid Hoffman, a former Executive Vice President in charge of business and corporate development for PayPal. The site, which was launched in May 2003, currently has over 40 million members from 200 countries, representing 170 industries. According to Reid Hoffman, 27% of LinkedIn subscribers are recruiters.

VII. POSITIVE AND NEGATIVE CHARACTERISTICS

Everyone, parents and teachers are seriously concerned about how children corrupt the language and spelling because of the social networks. True, in daily communication with each other, whether on a social networking or through text messages, usually abbreviated words, typed letters and even instead of our own, using the letters of the English alphabet ...[6] There's no denying that social media has transformed the way we interact with each other. From sharing our thoughts and photos to planning a night out, most people tend to organize their social lives, or at least have it significantly influence them, through some form of technology-based engagement. However, has this shift away from more physical interaction actually affected the way we speak and write English? What social media has done is enable us to communicate with a much larger number of people on a global scale in a way that we only really used to be able to do on a local level. This is great when it means we are keeping friendships alive over great distances, but it is also increasing the demands placed on an individual to keep a much larger number of relationships going simultaneously. For example, the average number of friends a person has on Facebook in the UK is around 300 – even if you are only actually really friends with, say, 10% of that number that is still 30 friendships to be maintaining. The result is an ever-increasing speed of communication. Facebook lets you communicate quickly, effectively and, most importantly, efficiently because written exchanges are concise and shared between all the friends you are connected with, meaning you only need to write them once. On Twitter, there is a 140 character limit, so even if you are not against the clock you are quite literally forced to make the statement brief. [7] Language is an evolving thing. It is naive to think that the language of social media is not having an effect on the way we use English in day-to-day life. It is more appropriate to consider just how much of an effect it is having on the way we communicate. A whole host of words originating from social media and the wider Internet has become so commonplace that they have now slipped into popular usage, and we do not even realize it. Just a few interesting words that have their origins in technology are blogosphere (the collective word for personal websites called blogs), troll (someone who creates conflict online by starting arguments or upsetting people) and buzzword (a word or phrase that is fashionable at a particular time or in a particular context). Even some acronyms have made the transition into everyday speech as words, ‘lol’ for example. Another curious phenomenon we have seen in recent years is the appropriation of existing words and words based on brands to refer primarily to their social media context. Appropriation is the cultural process by which a group claims words that were previously used in a certain way and gives them a new meaning. In this way, the people who engage with social media are quite literally creating new words and giving new meanings to existing words.

‘Friended’ and ‘unfriended’ are two examples of words that have been given a new meaning due to their usage online. The word ‘friend’ and ‘befriend’ is from Old English originating in the 13th Century, but it has been given an entirely new meaning thanks to Facebook (the process of adding or removing someone from your circle of friends). ‘Like’ and ‘viral’ are other popular examples of words that have had their meaning reappropriated by social media.

VIII. CONCLUSION

As we have learned from all the information presented to us in the communication world, there are many choices out there to relay tidbits of talk, video, emails, text, global connection via MySpace or Facebook, and face to face communication via webcam; it all just depends on how you (as a user) chooses to use the outlet.

All the communication we have investigated has to do with mostly snippets of information, like a text through Twitter; these are not communication or networking sites where you would post novels, but enough information to get the word out, the point across, or the video posted.

Businesses rely heavily on social and professional networking sites; as well as customers, individuals, and entrepreneurs. The uses of these networks differ from user to user, if businesses use social networking it may be to let consumers or competitions know of deals and offers, products, services, and comments and posts from users of products or services.

Whereas the public may use a social networking site to connect to an old friend, play a game, or post a comment on a product they just bought from a company. So many different types of companies use these sites that it has almost made the phone book obsolete, where you could turn a page to get a phone number, now you can go online and find out who works there, what they do, where they are located, and what others think about this company. Could you imagine how big the yellow pages would be if it gave you all the information you can get out there now just through networking sites? The uses are endless for social networking and I do not see an end to the expansion these networks could have.

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SAFETY AND SECURITY OF CHILDREN ON THE INTERNET

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Abstract- Protecting children on the Internet involves the physical, mental and moral safety of minors during their daily activities on the Internet (surfing, chatting, using social networks, and on-line games). The aim is to protect children from inappropriate content, the negative effects of using the Internet and raise the level of awareness and knowledge about how virtual reality affects Nadeco and long may not engage in the digital world, and that it is safe and without consequences. Teenagers and adolescents are very committed to digital services today, and spend much of their time on social networking sites, as well as communicating with friends and family via text message, far more than interacting with the same people by phone or face to face. No one can deny that Facebook has changed social relations, especially among young people, but the influence of social networks is not only positive. Teens that use Facebook more often show narcissistic tendencies and signs of psychological disorders, including antisocial behaviors, mania and aggression.

I. INTRODUCTION

Children and young people frequently surf the Internet by opening a variety of sites that are not adapted to their age. For all that is necessary to conduct adequate protection and enable them safe and carefree childhood [1]. Although the Internet provides great satisfaction we must be very careful, especially if it concerns children. It often occurs that information is very dangerous for them. Parents of younger children must be given helpful tips in everyday conversation with them. The Internet offers great possibilities of research, and connects with a large number of people. The risks are manifold depend on the age of the child and computer skills Email, messaging, chatting, constantly online communication today is something else too. But all of these technologies have brought some new danger [1]. The most important thing is to enable data security by placing appropriate filters. Primarily due to poor information parents are victims of violence on the Internet. Often they themselves stated that they feel safer if their children sit at home and use your computer. Previously, we could see and hear the children play in the streets with a message to be careful what I take from anyone with whom the barn. Today it is a little different surrounded by a large number of people that constantly communicate even to the extent that they are sending their photos and confidential data. Counted as abuse by strangers. Children have every problem we encounter on the Internet to inform and discuss with their parents. It is also necessary and interest parents their introduction to messaging and knowledge who are actually friends of their children on social networks. It is very important to make copies of significant documents. Downloaded content is always verified.

II. PROBLEMS ON THE INTERNET

The problems that we encounter are numerous:

- Child Pornography
- Cyber abuse
- Pedophilia
- Internet addiction

Child pornography is one of the most widely used types of crime on the Internet. Refers to the sexual exploitation of children and adolescents in pornography. Percentages shown over 80% indicate that children of all ages abused in child pornography. It's too bad the knowledge that is largely because of the minor children who have not reached puberty. Cyber or virtual abuse is more common in Serbia. Orders are open on Facebook. Peers in this way mutually dissatisfaction expressed by a certain professor or pupils. Open to groups that incite hate among children. Even to the extent that there is a ridicule of students with lower incomes Novacane. This falls into one of the biggest problems precisely because they leave long-lasting effects on children. Dissatisfaction with the government among them are absent do not want to go back school when poor students and even people. Just about all of this is the necessary support to parents teachers of local communities in solving this problem. Internet addiction is a bad habit and behavior which cannot be renounced. Negative impacts on our environment and even on ourselves. We become irritable nervous if you do not separate as long as we have planned for their own pleasure internet.

Studies have shown that the average man on the internet, spend between 3-4 hours on the internet. We are not dependent until any pleasure for us not to interfere with daily activities. The European Union has signed agreements where internet operators must ensure and enforce protection strictest internet profiles and contacts of all juvenile users. [2]

III. INTERNET CONTENT LIMIT

It is also necessary to restrict Internet content and adjusted to a certain age.

There are various programs that restrict access to certain sites. Also smart programs that remember where you were and that the user does not notice. The best is yet instruct children and inform them of the dangers that lurk and that they are not aware. Best to talk to them to find out what their real interests and desires. You should never criticize while critics have not been established. Yet for safer surfing the best to take such kind of packages that offer providers the protection that automatically rejects materials unreliable content. Therefore will be children and parents during the stay on the internet feel safer with certain see why. Children most often on the Internet opens the celebrities sportsman actually their idols but porno sex and other manipulative pages. Here is present but communication with the aim of abuse and manipulation of children. Actually, is not only the dark side of modern technology, but the key point is reflected in the fact that teenagers via the internet affects your own health. Many sites perform promoting diet stimulation means of energy drinks. All this can lead to various diseases and even death. Because of this, it is necessary to set a limit

IV. COMPUTER NETWORKING SETTING FILTERS

In many developed countries: Denmark Holland America has developed networking computer. This system enables continuous monitoring of parents on their children's activities on the computer. Pages can set passwords to block if it is needed. Report on activity. It is very worrying that in Serbia there is no means a single database on the culprits of these acts. Penalties are also very small with respect to the case of children as victims of violence. On average 2-5 years in prison, or if you just distribute porn material does not commit the response for their actions.

The most commonly used programs:

- Internet Filter Review
- Net Nanny
- CYBERsitter
- Max Protect
- Safe Eyes
- Network web proxy
- Anonymous servers to protect privacy

The addresses that were visited are placed in certain files with text that your child pounding on the chats can even be banned and their use.

V. THE ROLE OF SCHOOLS IN PROTECTING CHILDREN AND LEGISLATION

Talk about good habits on the Internet involve parents in workshops on safe Internet teach children about data protection talk to children about technology they use serve as a personal example. According to the law of the Republic of Serbia abuse and exploitation of children on the Internet is regulated by the Criminal Code. Prison sentence are varied and range from 6 months-5 years. With penalty!

VI. INTERNATIONAL FRAMEWORKS AND ACTION

All forms of violence, maltreatment, abuse and neglect, which endanger or impair the physical, mental and moral integrity of the person of a child, in violation of any of the fundamental rights of the child set out in the UN Convention on the Rights of the Child, which is the right to life, survival and development of physical and mental violence, abuse and neglect (Article 19); all forms of sexual abuse and exploitation (Article 34); abduction and trafficking of children. Action 'IDG', conducted by the Ministry of Telecommunications and Information Society entitled "Think before you start a" organized training for teachers, psycho-educational services and advice to parents, first in elementary schools. A major initiative this campaign, which was launched "Protect Children on the Internet", which aims to improve the safety of children on the Internet and is a step forward in the fight against the many threats that endanger all of us who use the Internet.

VII. SOCIAL NETWORKS FACEBOOK

Facebook is a website that serves as a social networking service. It started operations on 4 February 2004th This web page, which anyone can join, is owned by the eponymous company (Facebook, Inc.). And run by. Its users can join the networks that are organized by city, workplace, school, and region to connect and interact with other people. Also, people can add friends, send them messages, and can insert new information in their profiles to notify friends about themselves. It was created by Mark Zakerberg when he was a student at Harvard University. Initially, membership in this site was permitted only to students at Harvard, and later extended to students from all colleges who are members of the "Ivy League". After some time, membership is available to all students and high school students, and finally available to all persons who are 13 years or older. According to data from the site, Facebook has about 750 million active users worldwide.

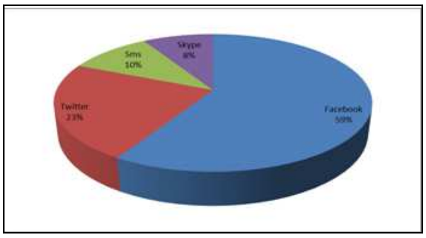

Figure 1. Popularity of social networks

VIII. SOCIAL NETWORKS TWITTER

Twitter is s a free online social networking and micro-blog service that enables its users to send and read other people's own micro text entries so tweets. In its basic meaning, tweets as text messages no longer than 140 characters. Messages are published on the user's profile, and delivered to other users who have signed up to receive them. Those who send tweets can restrict delivery to only those in your circle of friends; the service was initially set up to send all entries to be in their application. Since March 2009, Twitter has seen an increase in popularity in the world. Twitter is often described as 'Internet SMS' in the sense that the site provides users the ability to send and receive new entries by using various tools so that often is not necessary to use’s the original poster. This flexibility has allowed the site to gain more popularity than would be the case if users are forced to visit the original site to use this service.

IX. INSTANT MESSAGING AND CHAT

For children and teens, chat is perhaps the most popular activity after the use of social networks. The most common problem that children may encounter during the chat so-called chat-spam, which includes the offer of suspicious services, then services sexual nature, and even products that are related to sex. To protect users of advertising such services, many programs offer special chat options. Some of them have built-in tools and special features that are used to block spam. An example of such a Pidgin plug-in that prevents Sentry Bot Spammers bot network to add customer address. This extension also allows users to set any question to another participant in the chat in which they are asked to add a contact list. Those who do not answer the question will not be able to add users to your contact list, just. [3]

Figure 2. Bot Sentry

An example of such a Pidgin plug-in that prevents Sentry Bot Spammers bot network to add customer address. This extension also allows users to set any question to another participant in the chat in which they are asked to add a contact list. Those who do not answer the question will not be able to add users to your contact list, just a spam both networks are not able to anticipate the answers to the questions that people ask.[4]

X. CONCLUSION

Uncontrolled use of the computer by the child, which would not only stop the game even at the cost of skip homework, does not like his parents. They often forbid children to use the computer until you do the homework, but what good is it if parents today spend all day at work and the kids in the morning usually alone in the apartment. Then it is not controlled and can play to your heart's content (up to going to school), to surf the net, listen to music...Fortunately, there are software tools that will follow the instructions of their parents when they are in addition to children. These are called Parental Control software and tools that allow parents to define the parameters of the use of computers. Such programs, for example, allows you to define in what period and in what time of day a child can use the computer, and what all should (or should not) be working on it. We have to mention one more detail. About everything on the Internet and using computers talk to their children. Explain that the virtual world of detail.

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OPEN SEMANTIC ASSESSMENT: A MULTIPLIED CHOICE APPROACH TO E-ASSESSMENT

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Abstract - In this paper, a collaborative multiple-choice based assessment framework, with an answer multiplication possibility, is proposed. It is based on both textual learning material semantics and Web 2.0 approach. The aim of the framework is to stimulate students' involvement in building the test answer base as they learn and are assessed. This is achieved through enabling them to propose and evaluate new answers. The system subsequently decides, with respect to the students' evaluation, on the new combinations of multiple choice options presented in new assessment sessions. The previous research in this field as well as the expected results and possible pitfalls are discussed.

I. INTRODUCTION

This paper discusses a web-based e-learning assessment framework with semi-automated generation of questions based on community-generated content. This framework is aimed at providing an infrastructure that connects contributors with assessed learners using the learning material semantics as a bridge. The framework is expected to provide constant growth of assessment options (questions and answers) as the learning material is edited by the learners' community in a Web 2.0 fashion.

In the first chapter the foundation for this frameworks is given: the application of Semantic Web technologies in e-learning, particularly in the proposed system, the initial framework version and the second implemented version, upon which the proposed system is designed, are discussed. In the second chapter the proposed system is discussed in detail, while the conclusion summs up the paper and gives directions for further research.

A. Semantic E-learning

Modern concept of e-learning encompasses numerous aspects, including the personalization of learning material according to the student model or preferences, connecting experts with learners and development of learning communities, [1] the latter being the central idea of the proposed framework. Furthermore, e-learning should provide on-demand dynamically formed learning or assessment material based on value chains, [2] which is another aspect of the proposed framework: providing the means of user contribution to the learning material semantics, it enables dynamic creation of new questions and answers with each learners' semantic contribution.

The dynamic nature of e-learning requires the learning material to be fine-grained into small, reusable units (learning objects) that can be aggregated into larger structures (lessons, courses) on demand, using appropriate sequencing and personalization rules. Aggregation can only be possible if learning objects are labeled with metadata [3] and a certain level of semantics must be introduced into the process. This is where the technologies of Semantic Web proved suitable – with well developed semantic languages such as RDF [4] and OWL [5] to both express semantics and allow reasoning. The intersection of e-learning and Semantic Web yielded a spectrum of various approach, ranging from using ontologies to semantically label (and organize) learning resources [6] to the personalization of display [7] to the application of pedagogical agents for distributed approach. [8] Authors of this paper took the approach of layering the learning material into an outer (text/html) layer and an internal (RDF) semantic layer, both of which can be further granulated into learning object. The complete user experience comes from coupling of textual and semantic layers which adds an active component to the text. This will be described in more detail in the following section, starting from the initial approach up to the current system.

B. DSi

The system proposed in this paper is completely based on the feature set and architecture of the DSi (Drag and Drop Semantic Interface) e-learning framework, designed in 2007 and developed in 2009. at the Computer Science Department of the Faculty of Electronic Engineering Niš. [9] This framework first introduced the mechanism of querying the text (or, more precisely, the coupled semantic layer) by means of dragging and dropping the keywords one onto another. When a user loads a page, the lesson text is shown. Simultaneously, the underlying semantic (RDF) document is loaded too. The RDF document contains relations between certain words in the text. This document must be created separately – in any text or visual ontology editor, such as Protégé. [10] During the page load, all the words from the text that exist in the RDF (in form of subject or object) are given the drag-drop functionality and are highlighted for the user (eg.

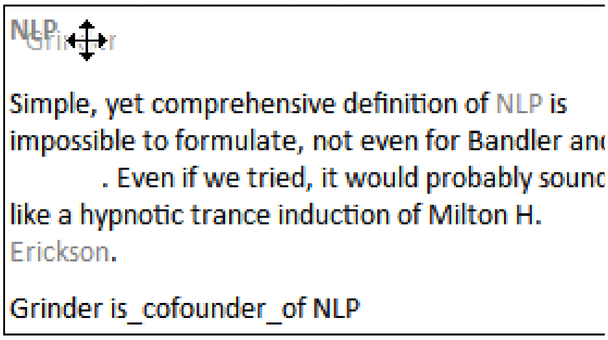

Figure 1. The DSi 1.0 front end on the drop event.

color coded). When one of such words is dragged and drupped onto another, the system queries the RDF for any relations (predicates) between these two words and displays them to the user. This is shown in Figure 1, where the word "Grinder" was dragged and dropped onto the word "NLP" and the "is cofounder of" relation is returned to the user.

The first version was a proof of concept but had weak spots in design. Primarily, complete RDF

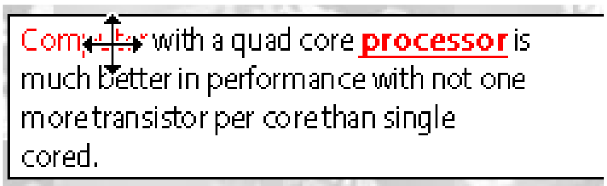

Figure 2. The DSi 1.5 front end on the drag event.

document was transferred to the client – and this document can be subject to copyright or be an organization's secret material. Moreover, not all the words in the RDF need to be interconnected. Two words in the text can be highlighted as draggable but still have no relations defined between them. This may lead to missed drops that can be annoying to the learner.

These shortcomings are addressed in the version 1.5. Instead of transfering all data to the client and processing it with JavaScript, as in first version, the 1.5 keeps the sensitive semantic data on the server and accesses it partially via AJAX calls. From the learner's perspective, when a word is dragged, only those droppable words that are related to the dragged word get additional highlighting. This situation is shown in Figure 2. Draggable words are highlighted with red color, but on the "computer" drag start, the word "processor" is additionally highlighted (underlined) to show that it is related to "computer". This DSi version is accepted as a Original Technical Solution by the Faculty of Electronic Engineering Niš. [11]

C. DSi 2.0

The next implemented version od DSi added a Web 2.0 element to the DSi approach. [12] This was done primarily in order to eliminate the need for manual ontology (RDF semantics) development, as this task requires a certain level of

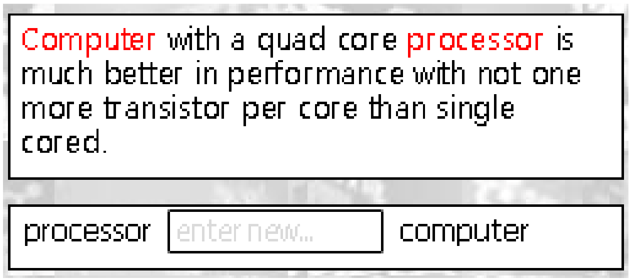

Figure 3. The DSi 1.5 front end on the drag event.

IT skills – which is not to be expected from non-IT domain experts who are to develop semantics. This was achieved by altering the page preparation code in a way that it makes all the words in the text draggable (and droppable) on page load. The words for which any relations are already defined are still highlighted; however the user (which can also be a teacher or a domain expert in this case) can drag any word and drop it onto any other. Both if relations between those exist in RDF (in which case they will be displayed) or not, the user will be offered to enter a new relation. This is shown in Figure 3, where the user is prompted to enter the new relation between "processor" and "computer".

On a new entered relation, the system checks for synonyms and (if none found) adds a new relation as a new predicate in the appropriate RDF statement.

II. MULTIPLIED-CHOICE ASSESSMENT

The "multiplied-choice assessment system" currently in developlment at the CIITLAB laboratory of the Computer Science Department, Faculty of Electronic Engineering Niš, is an automatic question generation system based on the community contributions. This system is an extension of the DSi 2.0, described earlier.

The underlying RDF document consists of statements in the subject-predicate-object form. Each statement asserts relations between the subject and object word (these are any two words from the text). An example relation "processor is-a-part-of computer" would look like this:

```
<rdf:Description rdf:ID="processor">
  <is_a_part_of    rdf:resource="computer"
/>
</rdf:Description>
```

If a user contributes another relation between these two words, such as "is-inside", this relation will be added to this statement as another predicate:

```
<rdf:Description rdf:ID="processor">
  <is_a_part_of    rdf:resource="computer"
/>
  <is_inside rdf:resource="computer" />
</rdf:Description>
```

With each new community-added relation one of the statements in the RDF will grow by one predicate tag. Simultaneously, the assessment module of the system forms a new multiple-choice question and adds it to the question base.

```
<dsi:Question dsi:QID="01">
  <dsi:qs="processor" />
  <dsi:qp="is_a_part_of" />
  <dsi:qo="computer" />
</dsi:Question>
```

```
<dsi:Question dsi:QID="02">
  <dsi:qs="processor" />
  <dsi:qp="is_inside" />
  <dsi:qo="computer" />
</dsi:Question>
```

Initially, the question base will contain only those relations that are initially present in the course semantics (defined by the instructional designers). As the community generates new relations, the question base grows. These questions are used for testing the student's achievements in the form of multiple choice. In order to generate multiple possible answers, the system generates a pool of predicates, for example:

```
<dsi:Predicate>
   is_a_part_of
   is_inside
   drives
   is_generated_by
</dsi:Predicate>
```

Each question is formed by taking one RDF statement and a number of additional random predicates. The actual form of the question may vary and can be parametrized; one possible example of a question formed this way could be the following:

```
Question 1
Processor:
   1. is a part of computer.
   2. consists of computer.
   3. is generated by computer.
```

The correct answer is derived from the question base and is added to the question HTML tag as an attribute. Instead of numbering radio buttons or any GUI controls can be used. At this stage of development no attention is given to the English syntax, in terms of accurately placed articles and the like. This requires sophisticated algorithms that are offtopic for this research and may be introduced when the system evolves to the commercial level. The central topic of this system is the usage of user generated content for automated question generation, instead of, for example, lexical analysis and meaning extraction from the front-end text. This way the community of learners is "applied" instead of machine learning procedures, adding the human component to the development of the question base.

III. CONCLUSION

In this paper an e-learning assessment framework that generates new questions as a result of users' contribution to the instruction material underlying semantics is described. The framework builds upon the existing versions of the DSi e-learning framework, developed at the Faculty of Electronics Niš, and is aimed at constant community-driven growth of the assessment question-answer base. The underlying concepts of the framework, implemented in the earlier versions, are discussed and the proposed system design is given. The directions for further research include the student assessment of false answers for excluding obvious falses (by introducing a new parameter, the relevance of false answers from the predicate base to particular questions from the question base). Another possible direction for further development may include the peer-assessment component in terms of students' mutual grading of contributed relations, which would lead to higher quality questions – based on relations' average ratings.

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HOW TO PROTECT ELEMENTARY SCHOOL CHILDREN ON THE INTERNET

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Abstract - This paper presents the main ideas about how society can protect elementary school children from dangerous on the Internet. A research has been carried out on 100 teachers of elementary schools. The aim of the research was to find out the scope how to protect and educate children about the dangerous on the Internet.

I. INTRODUCTION

In previous researching we saw how much elementary school children know about dangerous on the Internet. Result of that research was very bad. This research will help us to find how teacher with society can protect elementary school children about dangerous on the Internet. This research present extension of previous research with main idea to create good way for educate children about dangerous on the Internet and how to protect them.

The most of the Internet dangerous are on social networks, because we don't have idea who is on the other side. Children are one of the most endangered and because of that we as society have to do something. Dangerous on the Internet where children may suffer are:

- Peer bullying
- Pedophilia
- Theft of identity
- Cyberbullying

Those are only some of dangerous, bat we don't talk here about mental action of social networks and the Internet on children, that is some other subject.

The subject of this paper is how we like teachers and society can protect or children of the dangerous on the Internet. The goal of this paper is to find with help of 100 teacher form rural elementary school how to protect children from Internet dangerous.

II. PROTECTIONS OF CHILDREN ON THE INTERNET-REFERENCE

We can see that how every biggest internet provider or software house has references how parents can protect their children of dangerous on the Internet. Those references present to us some kind of rules for children and parents, also. Some of those references are present:

- Require of your child to show you sites which they visiting.
- Require of your child to take their internet profiles private.
- Ask your child about their online friends.
- Advice your children to take care which pictures upload to the Internet.
- Advice your children to be candid with you and talk to you about problems if they have.
- Hold your computer on visibly place.
- Rarely someone read or use these references for parents, although these references are from big IT companies.

There are, also some steps that parents can follow and that steps present other version of references above.

- Education: The most important step you can take is education. No single technology or computer program is going to solve all the dangers your children face online. Make sure you are always talking to them about their online activities, and stay current with what they are doing. In addition, create an environment where your children feel comfortable coming to you with questions or problems they may have online.
- Dedicated Computer: Have a separate computer just for your children. This ensures that if they do accidentally infect their computer, your online accounts, such as online banking, are not affected or

compromised. In addition, keep the children's dedicated computer in a public, high-traffic area so that you can monitor their online activities. Finally, make sure each child has and uses his own non-administrative account on the computer. This will allow you to more easily track what each child is doing on the computer.

- Monitoring: Children are by nature trusting and curious. Unfortunately, as parents we know that this can sometimes lead to dangerous or painful situations. So monitor your children's activities; they simply do not realize how dangerous the world can be. Help them to identify issues and discuss these issues together so that they can build a safe online presence. You may not realize it, but your computer has parental controls that help you to monitor their activities, or you can purchase programs that give you greater monitoring capabilities.
- Filtering: In addition, you may want to filter your children's online activities, such as restricting which websites they can visit. This is especially important for younger children, as it protects them from accidentally accessing dangerous or unwanted content. Just like monitoring, your computer has parental controls that enable you to filter their activities, or you can purchase programs that give you greater capabilities. However, as children grow older filtering becomes less effective. Not only do children need greater access, such as for school or work, but they will be also accessing the Internet with devices you do not control, such as computers in libraries, at a friend's house, or at school.

III. European studies about how protect children on the Internet

There we will present some results of international studies how parents protect their children. This study will help us in our research where we want to find out what teachers think how to protect children on the Internet. There is some result of European research.

Most parents talk to their children about what they do on the internet (70%) and stay nearby when the child is online (58%). But one in eight parents (13%) do none of the forms of mediation asked about, according to their children. Half of parents take positive steps such as suggesting how to behave towards others online (56%), talking about things that might bother the child (52%), or helping their child when something arose in the past (36%).

The use of technical safety tools is relatively low: just over a quarter of parents block or filters websites (28%) and/or track the websites visited by their child (24%).

Both children and parents consider parental mediation helpful, especially 9-12 year olds. Most parents (85%) are confident about their role, feeling they can help their child if the latter encounters something that bothers them online.

One in two children think their teachers have engaged with their internet use in most of the ways asked about, and 73% of children say their teachers have done at least one of the forms of active mediation asked about. But teachers' engagement with children's internet use is least among 9-10 year olds, and there is much national variation in teachers' role.

Three quarters (73%) of children say their peers have helped or supported their internet use in at least one of the five ways asked about, and other relatives are also important.

Only around 9% of parents say that they do not want further information on internet safety.

Many parents want far more information on internet safety than they actually get from the child's school, from government or local authorities, from welfare organizations and charities but also, though to a lesser extent, from manufacturers and retailers.

There are we have what parents and society in Europe do to protect their child. Below, we find out what teacher think about protection on the Internet for children.

IV. Research

In this part we find out what teacher in elementary school think is good for protection on the Internet. Elementary school whom is research in this paper is the same school like in the previous paper about how much elementary school children know about dangerous on the Internet. Reason why we carried out teacher but not parents is that we want to find good references for that how society can protect and educate elementary school children. The offered answers in poll was based on references of big IT companies and on European research results. Question for answer is: How we as environment can protect children of the Internet dangerous and offered answers are next:

- Keep computer in living room
- Education children
- Control the Internet sites what child visited
- Block or/and filter some websites
- Talk with children about dangerous on the Internet
- Less use the Internet

In this research participated 100 teachers. The goal of this question and research is to find good reference which will help us to create good way in education of children on protection of the Internet dangerous.

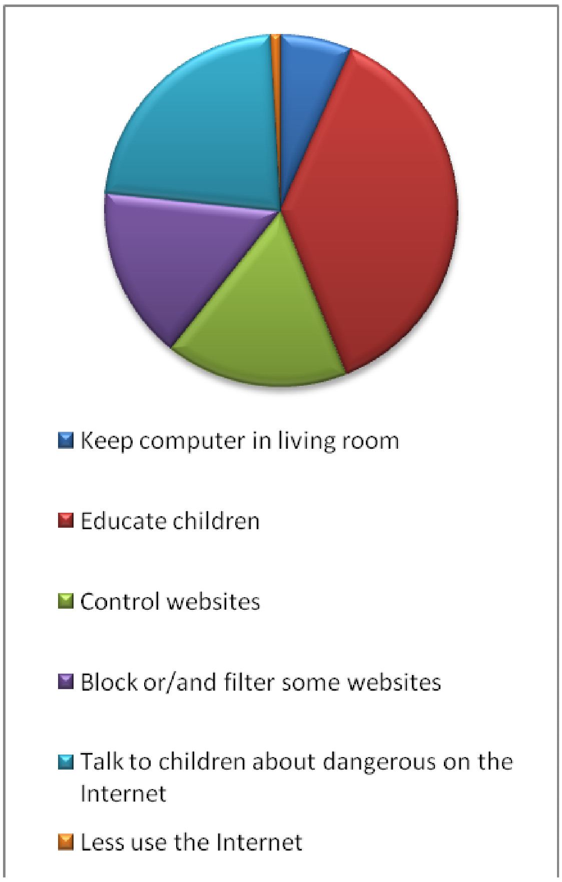

Figure 1. Results of research

As can be seen in Figure 1, 12.8 % of teacher answer with first offered- keep computer in living room. 70.7% answer with to educate children about dangerous on the Internet. 31.6% of teachers answer with control websites what child visited. 29.8 % of teachers reference to block or/and filter some websites. 42.1% of teachers reference to talk with children about dangerous on the Internet and 1.75% of teachers reference to use the Internet less.Analyzing the result and taking into account the Figure we can conclude that references from our teachers don't have so much different from European research and references from big IT companies. Also, we can see that the best way to protect children is to educate them of dangerous on the Internet and block or/and filter some web sites, of course all of this references can help us to protect our children and educate them.

V. CONCLUSION

In this paper we can see similarity with our research and international research. After these two researches we can create first phase of education about dangerous on the Internet and with help of informational technology we can design determinate software for children using. That software can be operational system, some kind of internet browser… First of all will be how to educate children and in same time we can slowly work on software.

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WEB APPLICATION FOR DOCUMENT MANAGEMENT SUPPORT IN HIGHER EDUCATION INSTITUTION

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Abstract - Educational institutions must enable public access to legislation and other documents that represent the rules and forms needed for all processes within that institution. The best way to do it is to place them at the official site of the educational institution. This paper describes document management system developed at Technical faculty “Mihajlo Pupin” in Zrenjanin.

I. Introduction

In this age of information, the process of input, delivery, storage, receipt, and categorization of data is very important. Business processes at any type of organization (public, government or private) are based on rules and documents with particular forms. The information age brings solutions that enable keeping data and documents safe and ready for access and use.

Document management could be defined as a computer based system which is designed and used to store, manage and track electronic documents. Document Management system controls the life cycle of documents in any organization. It implies how they are created, reviewed, published, and consumed, and how they are ultimately disposed of or retained, in the control of information [1].

Document Management promotes finding and sharing information easily, it also promotes knowledge management and information mining [2]. It helps an organization meet its legal responsibilities and reflects the culture of the organization. Document management tools should be flexible, allowing the users to control documents' life cycles tightly and also fits enterprise's culture and goals [3].

In this paper the web based document management system, developed at University of Novi Sad, Technical faculty “Mihajlo Pupin”, Zrenjanin, Republic of Serbia, is presented.

II. Document Management at Higher Education Institutions in Serbia

Based on conducted research that shows how different higher education institutions in Serbia organize documents on their web sites. Most educational institutions shows some of their documents and some of them are available, regardless validity date. Such display of documents is problematic for visitors, since they can not find the required document easily. Many of the websites document lists do not have the information about the date of document acceptance and starting date of validity. The date when the document was posted on the website can be found at most sites of higher education institutions.

Most of the high educational institutions have their sites written in two languages, English and Serbian. Translating the site in multiple languages contributes to greater attendance, attracts foreign students to read the offer of study, and perhaps convinces them to choose to study at one of the higher educational institutions in Serbia. Very few of these institutions translate documents in both languages which makes viewing the contents unclear.

III. Requirements Specification

A. The problem of posting

Educational institutions often have a responsible person who is in charge of managing the web site (web administrator). The web administrator could be full time employed at that position, part-time employed or may be engaged in teaching process as well. If web site is designed as static, changes of content require permanent activities of web administrator, which could be time-consuming. If the changes are minimal, the web administrator will most likely delay this change until the number of tasks increases.

This editing of static web sites produce problem of accuracy of data at website and appropriate documents. Visitors of such website do not always have available access to all valid documents. To avoid these problems, the institution needs to have a document management system within web site that would enable administrative workers (lawyers) who work at the educational institution to, once they write or edit a document and after the approval of the institution management, set the document on the web site without the need of engagement of the web administrator.

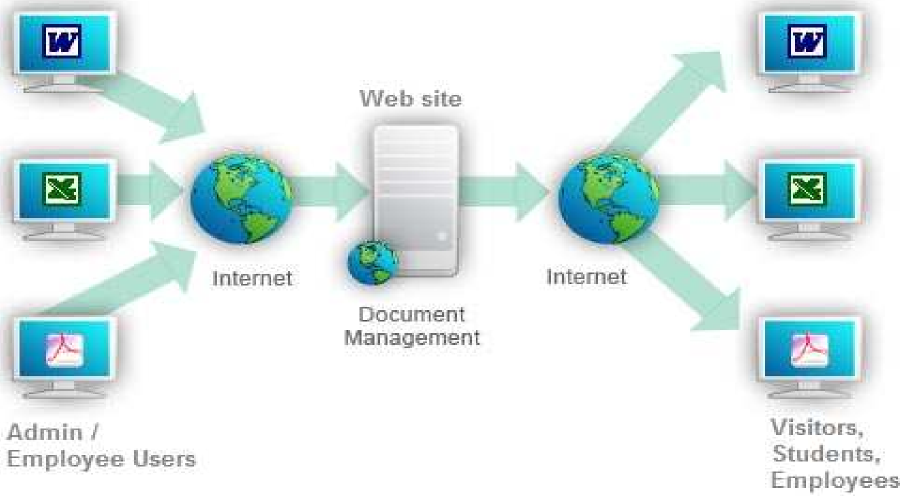

Figure 1. Forwarding of documents to the web site and users
(modified from http://freezonestore.com/mart/wp-content/uploads/2013/12/DMS.jpg)

B. Types of documents

At each educational institution there should be mandatory legislation documents about rules that regulate the functioning of the institution. Each institution must have legal regulations and standards, which should be available to everyone who wants to read them.

Legal documents of institutions can be grouped into three categories.

- *Statute* - The body of law consisting of written laws adopted by a legislative body. Statute law is often contrasted with case law, which originates from decisions of the appellate courts; and with constitutional law, based on a country's written constitution [4].
- *Rulebook* - a set of rules by which the members of a self-regulatory organization must operate [5].
- *Forms* - a standardized document forms to be used by employees or students of the institution for a particular type of situation.

IV. WEB APPLICATION - LEGAL DOCS

Based on previous research, the initiative is started for the enhancement of information system of Technical Faculty “Mihajlo Pupin”, Zrenjanin within improvement of current web site. Within this initiative, a new web application is developed as a module of current web site. This web application is named *LEGAL DOCS* and it is designed for document management support. The aim of the development is to enable everyone to use it as an easy and fast way to find the needed documents from the website of the faculty. The application is available to public, students and all employees.

The web application is bilingual, which means that it is possible to view the entire contents in two languages - Serbian or English. The choice of language simple - by clicking on an icon with the flag that symbolizes each country, i.,e. language.

A. Users of the web application

All users of the web application “Legal Docs” can be divided into several groups. Users can be:

- *Visitor* - someone who visits a web site and is not logged on the web site.
- *Student* - person who studies some education direction in the educational institution.
- *Worker* - a person who is employed at the educational institution.
- *Admin* – an employed person from the education institution who has the highest rights in using web application. The person’s task is to grant access to registered users and to set up and remove documents from the web site.

All those users can visit the site and view documents at their access rights scope.

Figure 2 shows the use case model with software functions of the whole web application. This figure shows the hierarchy of access for each user type. It also shows all the options that the web application offers to the user. The lowest rights in access and options on the web site have an

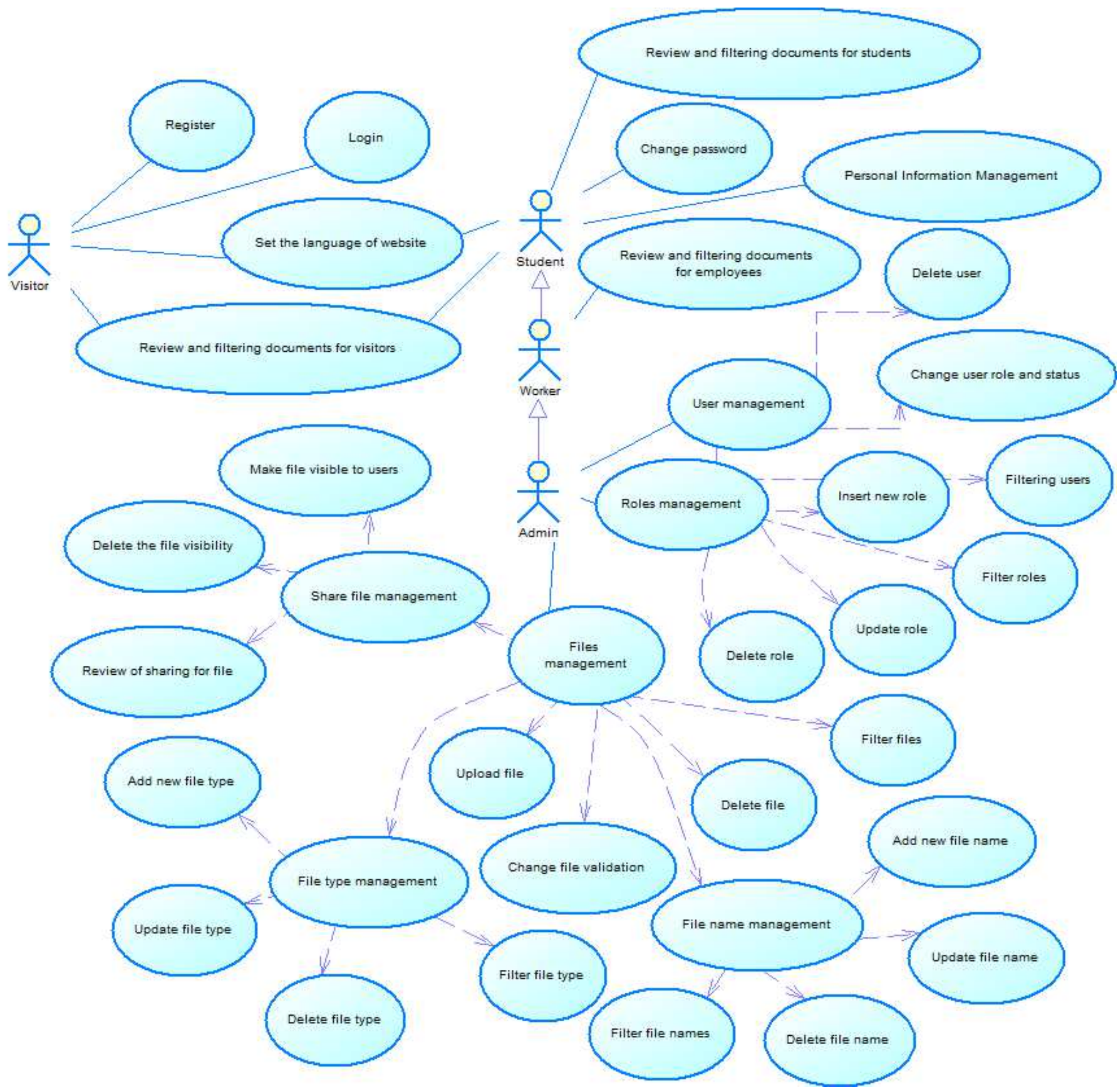

Figure 2. Use case model of Legal Docs web application

unregistered web site visitor, while the highest rights have admin, who manages data about all other users and all documents.

B. Registration

Every user, except for the visitors, in order to gain access to the higher parts of the web site must be registered. Registration can be made the first time when a person does not have a user account. Registration begins after click on the *Register* icon, which is used to call the page for creating new user accounts.

The user has to enter all his personal data and choose his status (Student or Worker). All information that was entered at the registration form will be checked by the admin, based on information entered the admin will grant access to the registered user of the web application.

Figure 3 shows the form for registration in the state of input of personal data (the first page of the

Figure 3. Form for registration

registration form). After filling the fields on the first page it is necessary to click on “Next Step”.

On the second page the user defines a nick name, and enters his/her email and password, to be used in authentication at the web application.

C. Granting access

The admin, after a successful user registration cycle, must grant the user’s access to special parts of the site. Admin checks the entered user information for registration, and if there is such an employee or a student in the educational institution, then it grants access to the user.

Figure 4 shows the page where the admin controls all users. From this page, users are granted access to parts of the web application. At the top of the page there is a filter with parameters: *user name, first name, last name, role, access.*

Figure 4. User management page

The central part of the web page is loaded from a database table, which contains all registered users with all their data. Each row of the table contains data for one user. Last three cells of the data grid at the presented page (Figure 4) are used for managing the user. By clicking on the radio button “Role”, a list opens with all the roles and a checked option in the list is the role in which the user is located. If admin wants to change user’s role, he needs to select a different role from the list. Granting access is done by clicking on a check button “Access” that is in the row user. By clicking delete button the user will be permanently deleted from the database.

D. Document management

Layout of the web page for document management in the web application Legal Docs is shown in Figure 5. From this page the admin does the management of all documents that should be presented to user groups.

Figure 5. Page for document managent

In order to display a document on the page it is necessary to send the document to the server and define who haves access.

In order to open the panel for sending the document to the server it is necessary to click on the Upload file button. The panel for sending appears in the right corner. The layout of this panel is shown in Figure 6. The admin defines the name of the document, the date when the document was approved, and the mapping document from his computer. Admin defines that the document is valid or invalid by clicking on a checkbox.

In order to send a document the “send” button should be clicked, after which the document is forwarded to the server. The latest document that is posted on server will appear as the first document in the row in the table that displays all the documents.

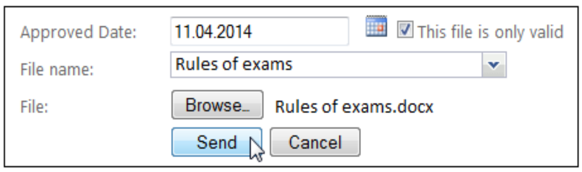

Figure 6. Panel for sending file to server

The admin must define the visibility of the document for users to see it. For creating document sharing is necessary to select target user group and categorize it within type of documents (rulebook, statutes or forms) and to save sharing to make the document visible to selected users.

If it becomes necessary to eliminate the visibility of certain document, the document should be found in the grid with all documents and click the button “View” to display sharing for the chosen document, after opening the list of sharing in a new table below then the “Delete” button needs to be clicked and the document will not be visible to the particular users.

To delete a document from the server it is necessary to check the checkbox field to select a document that is located on the left side of the table – first cell and click on the delete button, after that chosen documents will be deleted.

E. Displaying documents to users

From the user side, the page with display of documents is presented at Figure 7. List of visible documents depends on the user's role. The page for display of documents contains the filter. Documents could be filtered based on document name and validity. Users could find the documents much easier if they use the filter. Grouping based on the document type contributes to better hierarchy and easier identification of documents.

Figure 5. Page for displaying documents to users

V. CONCLUSION

Using efficient document management systems within an organization ensures that documents are safe, accurate, and accessible. With that comfort, users are encouraged to reduce the use of paper. It is one important step to becoming a paperless office.

By using the document management application, documents become available just a few clicks away from user. Filtering and searching any document allows the reader a quick and easy way to find and search for documents. This way, business processes are also improved.

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MODELLING SOFTWARE APPLICATION FOR MONITORING ENERGY EFFICIENCY OF PUBLIC BUILDINGS

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Abstract - Rapid energy consumption growth, increase of energy prices, dissatisfaction of customers with bills and problems associated with global warming are factors that influence the human society and environment. Management of information related to energy requires development of sophisticated software solutions that will enable tracking of all relevant data related to energy efficiency and consumption. This paper presents an approach in modeling a web based software solution for monitoring energy efficiency and consumption of public buildings. Model includes object-oriented model of software application and physical model of database. The use of modern, integrated modeling tools enable generating application code and SQL script for generating database. The model is used for development of web based software solution for monitoring energy efficiency of public buildings.

I. INTRODUCTION

The main goal of the application of energy efficiency measures in construction is reduction of energy needs during the projecting phase of buildings, as well as during the maintenance phase of existing buildings. Pavlović and Barbarić argued that the application of energy efficiency principles in construction enables more rational consumption of energy and energy loss reduction [1]. The problem with energy efficiency is evident in Serbia because Serbia spends 2 to 3 times more energy per square meter of housing or office space than countries in European Union [2]. The global contribution to the energy consumption in developed countries, for commercial and residential buildings is between 20% and 40% [3]. This is due to the fact that these countries do not pay enough attention to the problem of energy efficiency.

The calculation of the energy efficiency of buildings is usually based on measuring external and internal building temperature, emissivity of the outer and inner surfaces of the wall, and the appropriate construction parameters [1]. Several studies reported the use of variety of methods for measuring energy efficiency of the building, majority of them based on using infra-red equipment [3][4][5][6][7]. Measurements provide the basis for identification of problems and proposing the most appropriate solution for the specific situation. Lehmann et al. pointed out the importance of a multitude of climatic parameters that should be included in the investigation of energy efficiency of buildings [8].

Human society faces with rapid energy consumption growth, increase of energy prices, dissatisfaction of customers with bills and problems associated with global warming [9]. Efficient information management is vital for successful energy management. This requires development of sophisticated software solutions that will enable tracking of all relevant data related to energy efficiency and consumption. The most critical, and therefore, the most important step in developing software application for monitoring energy efficiency is to determine the information that will be tracked based on proposed goals, and designing software solution that is suitable for all potential user groups. Having in mind the current trends to migrate the most of software application to web environment, the following criteria should be followed in software solution design [10]: (1) web based system available to different groups of users, (2) interoperability with other utility systems such as accounting systems, customer relationships management systems, and billing systems, (3) automated validation of data, and (4) automated reporting functions. The comprehensive list of software solutions for managing various aspects of energy consumption and efficiency, renewable energy and sustainability in buildings is available at the web site of Office of Energy Efficiency & Renewable Energy, within U.S. Department of Energy [11]. Several types of software tools are listed in the directory [11], such as databases, spreadsheets, component and system analysis, and simulation programs for energy performance of buildings.

This paper presents an approach in modeling a web based software solution for monitoring energy efficiency and consumption of public buildings. The model is developed with conventional tools for software applications' modeling that are used for producing object oriented model based on Unified Modeling Language (UML). Conceptual and physical data models for database are generated from UML model. Models are used for generating code for web application and script for generating database.

The rest of the paper is structured as follows. The second section outlines some issues and directions for modeling software applications. The third section presents the model of software for energy efficiency management for public buildings the last section of the paper contains conclusions and further work directions.

II. SOFTWARE MODELING

Models created during software development phase form blueprint of the software solution to be implemented [12] [13]. The objective of modeled (developed) software system is to represent desired behavior and to meet its purpose [14]. Several notations and languages have been developed to represent software artifacts during development – some mainly used for describing structural organization, and others for representing behaviour. Some of these notations and languages are graphical and some are textual. Regardless of the used notations and languages, the following strategies may be used in software design [13]: general strategies, function-oriented (structured) design, object-oriented design, data-structure-centered design and component-based design. Different model can be used to describe a system, whereby different models describe different aspects of the system [12].

The dominant approach in software development is object-oriented. Object-oriented paradigm encompasses a complete view of software engineering [15]. Object-oriented model should clearly present both data and procedural abstractions that will provide the basis for modular design. The main elements of an object-oriented model are: classes and objects, attributes, operations and messages. Objects manifest themselves in one of the following ways [15]: external entities, things, occurrences or events, roles, organizational units, places and structures. The best features of object-oriented analysis and design methods were combined into unified method, Unified Modeling Language (UML), which has become industrial standard. UML allows modeling of a system by using a set of syntactic, semantic and pragmatic rules. The following views of a system can be modeled with UML: user model view, structural model view, behavioral model view, implementation model view, and environment model view. Different models are used to implement different views of a system in order to comprehend a system in its entirety. Kruchten [16] proposed five interlocking views for describing architecture of software intensive systems (see Fig. 1). These views include both functional and nonfunctional requirements (reliability, scalability, portability, availability) of a software system. Software development based on UML is use case driven, architecture-centric, and iterative and incremental.

Stages of modeling with UML are conceptual modeling, logic modeling, and physical modeling, as it is presented in Fig 2. However, the real process of modeling is iterative and assumes going backward and forward between stages in order to fulfill all requirements in software product.

Modeling of a software system starts with modeling business functions and the actors that use them. For that purpose, UML provide use case diagrams. Ratcliffe and Budgen [17] presented the review of the application of use cases in the analysis and design phases of software development. Use cases are particularly important because of their ability to document a set of user interactions with the software system that will provide the basis for implementation of the system behavior.

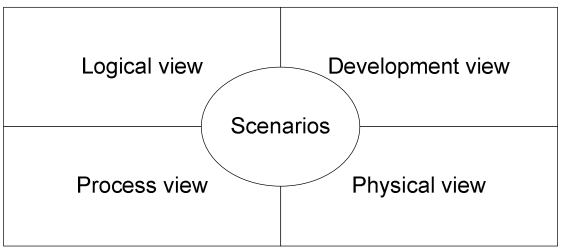

Figure 1. 4+1 view model of a software system [16]

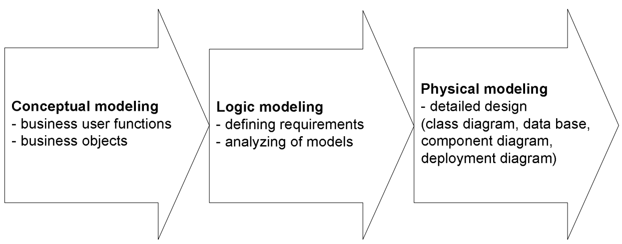

Figure 2. Stages in modeling software systems with UML [18]

Data base modeling is generally focused on logical (conceptual) and physical models of data [18]. The data model elements are [15]: the data objects (entities), the attributes that describe objects, and the relationships between the data objects. According to Pressman, these three elements of data model provide the basis for understanding the information domain of the problem. However, additional information are necessary, such as

cardinality (specification of the number of occurrences of one object related to the number of occurrences of another object) and modality (description whether the relationships is optional). Logical model of database contains entities, their attributes, and relationships between them. Physical model of database contains implementation elements (tables, keys, indexes) specific for selected database management system. In practice, two notations are mostly used for modeling databases – ER diagrams and UML class diagrams. Results of three sets of controlled experiments with students, presented by De Lucia et al. [19], revealed that UML class diagrams are more comprehensible than ER diagrams, especially during verification and maintenance activities.

III. CASE STUDY

As a case study, here is presented the model of software application for tracking relevant details about energy efficiency of public buildings. UML diagrams are used for modeling several aspects of software application. The most important aspects are modeling of application users and database.

A. Modeling users

The most convenient way for presenting users of software application is by using UML use case diagrams. The first diagram, presented at Figure 3. presents user roles available to users of the software application.

The following user roles are available:

- **Administrator**. The person assigned to administer application, and user accounts.
- **Operator.** The user assigned to operate data within the application. The activities of operator include adding new data, changing or deleting existing. The persons with this role work with data about energy, public buildings and energy consumption on the monthly basis.
- **Visitor.** The users with this role can only see the content of the application, but cannot change data. Potential user is occasional visitors, and workers in public institutions.

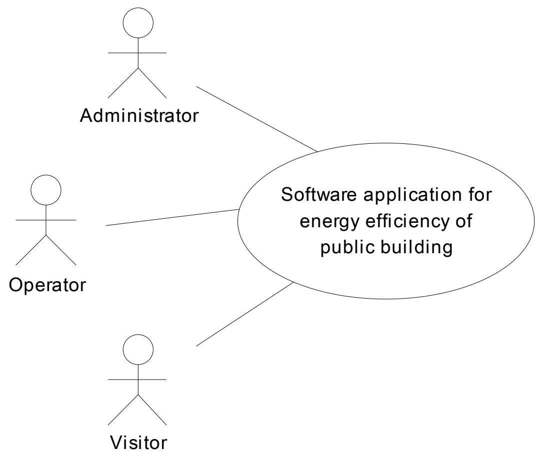

Figure 3. Users of a software application

B. Modeling database

Database is modeled with UML class diagrams because they provide several options for getting rich description of the observed domain of the problem. Model is developed in Serbian language because the application is intended for users in public institutions in municipalities in Serbia. In addition, the model provides the basis for generating the code for the software application, and therefore, all terms are in Serbian. Model of database is presented in Figure 4. The following entities exist in database:

- ***Building*** (`GradjevinskiObjekat`). This entity is used to describe public buildings with the information such as *name* (`naziv`), *address* (`ulicaBroj`), *area in square meters* (`povrsinaM2`), and *notes* (`napomena`).
- ***Town*** (`NaseljenoMesto`). This entity is described with the following fields: *name* (`naziv`), and *zip code* (`postanskiBroj`).
- ***Legal entity*** (`PravniSubjekat`). This entity is described with the following fields: *name* (`naziv`).
- ***Monthly consumption*** (`MesecnaPotrosnja`). This entity does not contain own fields, but, by using established associations, includes data from the following entities: consumption of energy, month, and building.
- ***Consumption of energy*** (`PotrosnjaEnergenta`). This entity describes the consumption of a particular

energy. It includes the following fields: *the area of using energy source* (`povrsinaUpotrebeEnergenta`), *the energy consumption in calculation units* (`potrosnjaEnergentaUObracunskojJedinici`), *consumption price in the currency* (`cenaPotrosnjeUValuti`), *and date and time of entering consumption* (`datumVremeUnosa`).

- ***Energy source*** (`Energent`). This entity describes the particular energy source (for example electricity, gas, coal, etc.). It is described with the following fields: *name* (`naziv`), and *calculation unit* (`obracunskaJedinica`).
- ***Operator*** (`Operater`**).** The person in charge for working with operating data about the energy consumption for public buildings in the observed region (municipality). It is described with the typical fields, such as *name* (`ime`), *user name* (`korisnickoIme`), and *password* (`lozinka`).

Class diagram presented in Figure 4. Also describes the relationships between entities. The relationships are presented with associations between entities. The following associations exist:

- The association between *building* and *legal entity* (building is associated to only one legal entity, but legal entity can possess one or more buildings). For example, a pre-school institution can have more kindergartens at different locations.
- The association between *building* and *town* (building is in only one town, but a town can possess one or more buildings).
- The association between *building* and *monthly consumption* (to each building may be associated several monthly consumptions, but each monthly consumption is specific to only one building).
- The association between *consumption of energy* and *monthly consumption* (monthly consumption may include consumption for one or more energy sources, depending of the building, while each energy consumption is associated to only one monthly consumption).
- The association between *consumption of energy* and *energy source* (consumption of energy is strictly associated to only one energy source, while one energy source may exist in several consumptions of energy).
- The association between *consumption of energy* and *operator* (energy consumption is edited by one operator, but one operator may edit one or more consumptions of energy).
- The association between *monthly consumption* and *month* (each consumption is associated to exactly one month).

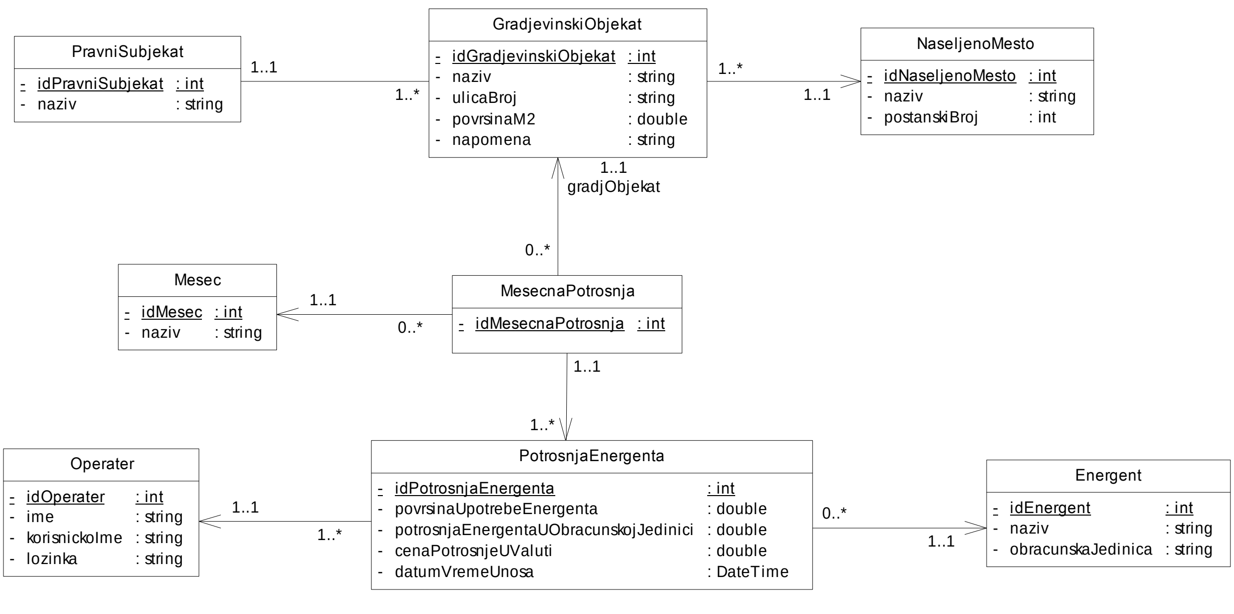

Figure 4. UML class diagram of data base

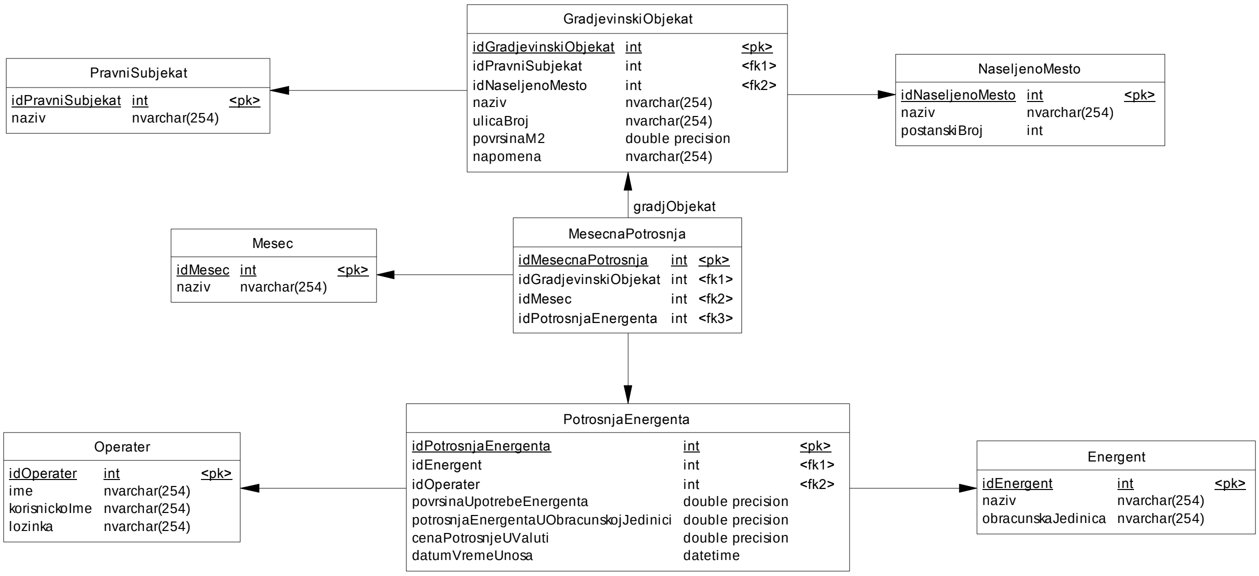

Figure 5. Data base physical model

Physical model contains tables in database, and relationships between tables (see Figure 5.). Physical model is generated from UML model.

IV. Conclusions

Successful energy management of public buildings requires efficient information management. Development of sophisticated software solutions enables tracking of all relevant data related to energy efficiency and consumption, which provide the basis for decision making related to reconstruction and maintenance of buildings. This paper presents an approach to modeling a software solution that will be used for managing data about energy efficiency and consumption in public buildings. Data are related to structural parameters of the buildings (area in square meters by energy), and the consumption of specific energy. The focus is on modeling data. UML class diagrams are used for initial modeling of data because of their comprehensibility. Model is later converted in physical data model, which is used for generating the script for constructing the real database.

Further research will include modeling data related to critical zones of a building by using thermography images, which will provide the basis for detecting the problematic areas of the building related to the waste of energy.

Acknowledgement

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EFFECTS OF EDUCATIONAL COMPUTER SOFTWARE ON MOTIVATION AND PERFORMANCE OF STUDENTS IN BIOLOGY

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Abstract - The paper analyzes the effect of educational computer software on the development of motivational processes in biology on grammar school students. This experimental study was conducted in a grammar school in Zrenjanin, Serbia. A stratified random sample consisted of 60 students 4th grade of grammar school, which was randomly distributed into control and experimental groups. The students in the experimental group learned biology content by educational computer software, while the students in the control group learned the same content by the traditional teaching. After elaborating on the teaching material, a survey was conducted for students of the experimental group. The survey results show a great interest by students and reported high motivation for adopting biological content using such a didactic model.

I. INTRODUCTION

The Biology syllabus for the IV form of grammar school of science-mathematical vocation in the Republic of Serbia comprises the realization of contents in a few very important biological disciplines: molecular biology, biology of animal development, genetics, ecology and environmental protection and evolution. In order to make it easier for the pupils to acquire knowledge in these fields of Biology, which are demanding and complex, it is necessary to use the most efficient ways of their utilization. Teaching Biology and other sciences in Schools in the Republic of Serbia is still dominantly organized and done in a classical way, so that pupils' activities during classes are only realized as passive listening, receptive learning and studying by heart. By such way of teaching pupils' opinions are neglected, especially creative thinking and looking for new ideas. On the contrary, the priority of modern education is the increase of quality and efficiency of educational-pedagogical work and the discovering more efficient models of learning.

With the introduction of technology into everyday life, it is becoming essential that the use of this technology forms part of the school curriculum. The utilization of informational technology fundamentally changes traditional forms and methods of work in the educational-pedagogical process, and demands a suitable didactic-technical environment in which teaching is being realized. This is confirmed by a great deal of research. Thus, the use of computer in the process of teaching develops the abstract thinking and individual improvement of pupils in acquiring knowledge [18]. By using computers in teaching, pupils acquire the ability of conducting their cognitive functions and develop their metacognitive skills [24]. In comparison with traditional methods of teaching, the use of computers in teaching offers numerable advantages, because it enables pupils to see their own improvement and makes conditions for the development of self-criticism [18], but also develops divergent thinking [21].

There are many assumptions that students are interested in using computer; they found it more pleasant, more appealing, and more motivating to study with computers than with traditional means. Teaching and learning of biology could be made more interesting if the lesson presentation using Power Point or multimedia education software to motivate students to learning and to make more interesting, to attract more students. Software can be provided to the students to allow them to engross the biology as subject, thus making learning more meaningful. The use of educational computer software will bring new, exciting, actual and rewarding educational experiences for both students and teachers [13]. Educational computer software (ECS) must be projected so that it satisfies the needs of all participants in the educational process. The simplicity in using the software must be provided for pupils, as well as a high degree of obviousness of teaching material, which is being presented in this way. Besides, software should be interesting and stimulating to motivate pupils for studying [16]. Adequately created teaching software should become an integral part of teaching and learning [10].

Numerous works of research have confirmed the efficiency of the utilization of the computer and teaching software in the realization of teaching material in Biology. The use of teaching software as tutorials contribute to better understanding of notions in genetics, while the use of software as teaching games develops positive attitude among pupils towards Biology [26].

The use of educational software with animation and illustrations contributes the better understanding of teaching contents in presenting the teaching theme "Genetics" [17]. Multimedia software have contribution in better understanding of biological notions and processes [4]; [5]; [6]; [25].

Research works in the efficiency of the use of educational computer software in teaching Biology in the Republic of Serbia are very few. The reason for this is the lack of issued educational software, then the lack of computers in schools as well as inadequate training of teachers for the use of modern educational technology [23]. Several authors did some research in the field of the efficiency in using the multimedia software in teaching Biology comparing it with traditional ways of teaching: in the realization of the teaching theme "Hidden seeds" in the 5th form of primary school [12]; in realization of the theme "Biology of Animal Development" in the 3rd form of Grammar school [8]; [9] and in the realization of the teaching theme "Cell splitting" in the 1st form of Grammar school [22]. The results of their research have showed that such a model of learning in Biology teaching is much more efficient than traditional one, considering the aspects of quality, duration and implementation of pupils' knowledge, motivation and performance.

Many researches argued in their investigations that use of educational computer software (ECS) on the achievements of pupils are increased, the speed of learning is greater, the understanding of abstract phenomena and processes is enabled and the motivation for learning is growing [14]; [26]; [2]; [7]. Due to presented advantages and positive effects of the ECS on their implementation in teaching improvements worldwide, it is necessary to work in an organized way on as soon as possible introduction of computers and computer software in teaching Biology and other natural sciences in the Republic of Serbia.

II. PURPOSE OF THE STUDY

The aim of this paper was to investigate the effects of educational computer software on motivation and performance of students in Evolution biology. Specifically, the study examined the effects of the ECS at the development of student motivation. Students are expected to be active, and independently develop their own creative possibilities.

III. RESEARCH METHODOLOGY

According to the Teaching programme of Biology in Grammar school at natural science-mathematical vocation considering the teaching theme "Evolution biology" during 9 classes (Official Gazette of the Republic of Serbia, no. 8/2008).

Due to the importance of correct understanding of contents in evolution which are the very essence of life and Biology as a science the aim of this research has been the methodological work towards the contents of the teaching theme "Evolution biology" in the IV form of Grammar school by using the ECS, and then the analysis of the efficiency of adopted knowledge of the students (quantity and quality) in comparison with the same teaching materials and contents taught in a traditional way.

In the pedagogical research, two classes with the total of 60 pupils of the IV form in Zrenjanin Grammar School took part. The experimental (E) group consisted of three classes with 30 pupils, and the control (C) group had three classes with 30 pupils. At the beginning of the research, before the introduction of the experimental factor in the E - group both groups were made equal on the basis of general success of the pupils, their success in Biology at the end of the III form of Grammar school and the initial test of knowledge in Biology. After making the groups equal the pedagogical experiment was done.

In the experimental model of teaching, while doing the teaching theme "Evolution biology", the teaching process was performed in the computer science specialized classroom where pupils used ECS individually. The teaching software was prepared for the pupils of the IV form of Grammar school as a substitution of the textbook during the presentation of the contents in Biology. When the programme is started there are links for the parts contained in the software: The Introductory Lecture, Teaching Material, Interesting Facts, A Gallery and The Final Test. “The Final Test“ there are questions for checking knowledge about the material of the whole teaching theme at the end of its presentation. The test consists of different types of questions and problem tasks. After giving the answer to a question, a pupils gets information about the correctness of answer, a pupil gets some additional pieces of information, which can help him/her to get the right answer. A special conformity in tests is the possibility of automatic change of the order of the given answers, because the programme offers every time a new variety of answers. In this way mechanical studying and copying is prevented, because each student has on his/her computer a different combination of answers. Every question, depending on its complexity, has a certain number of points.

At the same time in the controlled model of teaching, the teaching was performed in the Biology laboratory through a traditional way of teaching (verbal-textual and demonstrative-illustrational teaching methods and frontal form of work).

In order to compare the differences between the C and E groups on the initial test, final test and retest results, the independent t-test was applied. Statistical data processing obtained from these tests was done by using SPSS 19.0 software package.

Upon completion of the experimental research, a survey was conducted for the students in the experimental group who participated in this educational research (30 students) in order to assess their attitudes and opinions on the implementation of the educational computer software of teaching with respect to biological curriculum.

In this study, there was used questionnaire consisted of 9 open ended questions of authors' own construction. The questionnaire was anonymous

IV. RESULTS AND DISCUSSION

After the survey, the results of the pupils' responses to the questionnaire were obtained and presented in Table I.

Based on the questionnaire for students, the following conclusions can be presented:

More than 96% of students like working with computer;

83% of students enjoyed the lessons with computer, 13.33% thought it was all right and only 3.33% did not enjoy during the lessons.

Table I. The results of the survey

Questions	Variants of students responses	Number of students	%
1. Do you like working with computer?	Yes	29	96.67
	Maybe	1	3.33
	No	0	0.00
2. Did you enjoy the lesson with the computer?	Very much	25	83.33
	It was alright	4	13.33
	Not at all	1	3.33
3. The way in which we have covered teaching area Evolution biology was:	Very interesting	26	86.67
	Average	2	6.67
	Boring	2	6.67
4. This approach to teaching evolution enabled me to learn:	Much more	26	86.67
	Average	4	13.33
	Slightly	0	0.00
5. This way of learning biology was very useful for me.	Yes	25	83.33
	Maybe	5	16.67
	No	0	0.00
6. The use of ECS contributes the better understanding of evolution contents	Yes	27	90.00
	Maybe	3	10.00
	No	0	0.00
7. The speed of learning with ECS is greater, than on traditional way	Yes	29	96.67
	Maybe	1	3.33
	No	0	0.00
8. Would you like to realize other content from biology this way?	Yes	30	100.00
	Maybe	0	0.00
	No	0	0.00
9. What did you like / not like when processing the contents of the teaching areas Evolution biology			

For most students (86.67%) the way they deal with educational content of Evolution biology was very interesting;

86.67% of students reported that through processing of teaching areas using educational computer software they have learned much more, 13.33% stated that this approach allowed them to learn the average and while there were not students who said they learned a bit in this way;

More than 83% of students stated that learning biology with ECS was very useful, while 16.67% of students are not sure.

90% of students believe that this way of teaching facilitates the understanding of biological teaching content, while 10% of students found that this method of teaching and learning does not contribute to their understanding of content;

96.67% of students believe that the speed of learning with ECS is greater, than on traditional way;

The question "Would you like to realize other content from biology this way?" 100.00% of the students expressed a positive attitude, and no one had a negative attitude.

In considering individual responses to question, "What did you like / not like when processing the contents of the teaching areas Evolution biology?", we can point out a number of similar positions that best describe the general attitude of students on the application of educational computer software:

- "Using the computer helped me more for biology because it was interactive."
- "I like that it is on the computer and you were able to type the answers."
- "I liked the interacting problems."
- "Better than paper or lecture."
- "I liked it because I enjoy using computers, and I learn better on them."
- "I loved the way the material is prepared, its visibility. It was very interesting for me."
- "I liked that the work is interesting and I think that this system is successful because students participate in the process of learning"
- "I like to learn all contents in Biology by application of software"
- There were also conflicting opinions:
- "I prefer the classical method of teaching."
- "It was too hard for me."

Based on the survey results and students' views on the application of educational computer software in biology it can be concluded that most of the students accepted this manner of work. Students realized that such an approach in teaching facilitates understanding and mastering biological program contents. They were motivated to acquire the contents, and thus they gained quantitatively and qualitatively better knowledge of the teaching areas.

Negative responses of students indicate a particular role of classical teaching at the Grammar School, and each new form of teaching is strange for students and they approach it with a certain amount of uncertainty and caution especially towards what is new and different in the classroom.

Therefore, from this results are followed that ECS making the lessons more interesting, easier, more fun, more diverse, more motivating for the students and more enjoyable. According to the results of numerous authors [1]; [3]; [15]; [20] it can be concluded that the applications of ECS shows the important advantages and greater possibilities in teaching over traditional methods, as well as success motivation for the subject and cooperation abilities of the students are all improved.

V. Conclusion

Teaching and learning of biology could be made more interesting if the lesson presentation using educational computer software is supplemented with other activities to motivate students to learning and to make more interesting, to attract more students. Because students' interest in biology as a subject decreases. There is much software (CD ROMs) available, which can be provided to the students to allow them to engross the biology as subject, thus making learning more meaningful.

The application of ECS significantly to students' motivation to acquire the physiological teaching content, encourages the development of thinking, initiative students, develop independence in the exercise of intellectual activity. It achieved a high level of efficiency in the realization of program content in the biology, as well as increased the quality and quantity of knowledge acquired by students.

The impact of ICT on students' learning outcomes will ultimately depend on the biology teachers. They are the ones who will decide how best to influence the knowledge. The use of EDS will bring new, exciting, actual and rewarding educational experiences for both students and teachers.

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THE SOFTWARE COMPONENTS IN THE BUSINESS APLICATIONS DEVELOPING

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Abstract - The Software is nowadays a part of industrial production, because it is produced for multiplied purposes. The reusability of software components contains the completed functions and it is used multiplied in the software system development as the same part or as a tool for generative software development which shows around the generative software component and it is a part of practical research.

I. INTRODUCTION

The industrial technology nowadays has made that the software is a generally accepted concept, and demanding for the computer accessories has become bigger. The software becomes a very important industry at the end of 20th century and it is produced as goods as other industrial goods. If the industrial production of software could have organized, it is necessary to assure all the components which are part of the certain software product, and these components are in accordance with others and standardized too… For as much as the software development is a very dynamical process, it is accessible by permanent changes; the official standards aren't so accessible by permanent changes, and thereby the standards of big corporation (for example Microsoft® [1]), due to the lack of others, it became the generally accepted standards. The like industrial standards give the base for standardization from international or national organizations (International Standard Organization- ISO, American National Standard Institute - ANSI or National Standard Institute).

The software is goods which isnn't being amortized. The growth and development of the software significantly takes over the primacy in the industry of 21st century, and it is only constrained by human ambitions. The new methodology of software developing is based on the object. Accordingly the object oriented programming (OO) holds primacy in the industrial production of software solutions, whereby the object is a part of external world, an independent program complex, accordingly organized and systemized logical and structured solutions, which are adjustable to potential changes and specific needing, whereby these solutions support the system analysis on each levels. Reengineering of business' processes', OO information systems development (IS), indispensably go through four phases:

- information demands defining of prospective system
- OO analyses,
- OO design and
- implementation

Object oriented design can cause the stabilization of software markets and quality promotion, productivity, efficiency, credible, time savings, experience transfers and integral expertise in the new software product. This type of design is supported by next postulates:

- everything is an object. We regard an object as an improved variable; it saves data, but we can ''set up demands'' which it can fulfill performing operations on these data.
- program is a set of objects, which imparts each other what to do by the aid of messages. The message is in fact a function calling of certain object.
- every object has own memory which is made of another objects. The program is multiplying whereby is hidden behind the simple objects.
- every object has own type of data. Professionally said, every object is a class instance, whereby are ''class'' and ''type'' synonyms. The most important feature of the class is determined by the answer to next question: ''which messages can we send''?
- every object of certain type can receive same messages. Forasmuch as is the object of type ''circle'' at the same time it is the object of type ''shape'', the circle will certainly receive messages for circle.

It is widely accepted the term- asset-work product or component, it represents the product in the process of software development. The word ‘’asset’’ means: (The Basic Source for Software Engineering Technology-ASSET). It includes so palpable (code, design, algorithm, test plan and documentation) as impalpable (knowledge and methods) elements. Reusable assets (R assets) are assets which are achieved by building up and using of software assets in different software systems.

II. ARCHITECTURE, PROCESS AND ORAGANIZATION OF ITERANT SOFTWARE USING CONCEPT

R- Architecture includes the structure of system und data basis, architecture of user’s interface, operating environment projecting- the application schemes and blank forms, using and implementing methods of R software. The instruments and construction techniques of R components prove in defined methodological activities, which make: production methods, managing R infrastructure, intercession and using of R values, R processes, and planning of future development efforts in that area, they are represented in the advanced technology: ‘’managing of R infrastructure’’ (Managing the Reuse Infrastructure- MRI[2]) which include the standard identification, authorized development of components, coordination of activities, using of sources, stimulation and implementation of metrics and economic models.

The components or independent formed software solutions are the objects which can be downloaded and manipulated by visual elements: properties, methods and events which lead us in visual programming and the component is showed in public interface. This concept of programming nowadays represents significantly the program languages C and Java. The components have its own elements or properties which take control the functionality of components. The methods in components are the function which tells to component to do some events. The actions are events which are implemented in certain moment (so called events triggers). The time and place of its activating is precisely defined and it is being activated during the software performing. The definition ‘’ Nome nest omen’’ the name is everything tells what is and what the software component or all software solution should have:

- The component is non-trivial, almost independent and changeable part of the system which fulfills demands; it does dynamic set of measures to managing programs.
- The component provides a new block and goes to work through documented interface in the run time, and it has all abilities and instruments indispensable for faster development.

III. DEFINITION OF BLANK FORMS AND PATTERNS

The ‘’R’’ tools or placated lacing boards are instruments which, make work easier with ‘’R’’ values by standardized procedures and professional technical solutions and it include libraries, applicable lacing boards and generators. According to the Mc Parland explanation, the advantages of placated lacing boards glass itself in control and flexible implementation of development activities, which becomes a fundamental technological basis for making a new application. The workspace of software components development is called ‘’Component Models-CM) or ‘’Component Frameworks’’. These models support the different levels of application development, but in fact, they basically work out together with TCP/IP and other net communication protocols. The components are according to their dimensions much less, with regard to classic ‘’EXE’’ files, they are installed easily on the computers; they support the access control, working out and protection, easier error controls, and critical events. Nowadays it is being used successfully three main models of components: COM, Java Beans and CORBA.

Component Object Model (COM[3]) is a model which is distributed by Microsoft Company in order to components designing with multiplied developing environment and dynamic allocation possibilities of working environment final solutions. COM is a runtime environment, standardized formatting solution, with possible implementation on different levels. COM connection locates and connects the clients who have the access to server’s object, by implementation of the tracker service. The clients and objects can communicate directly without passing through the central part of API code. It is shown on the graphic how the client used COM to locate the server components and then to forward the demand using queries over the database (Query Interface).

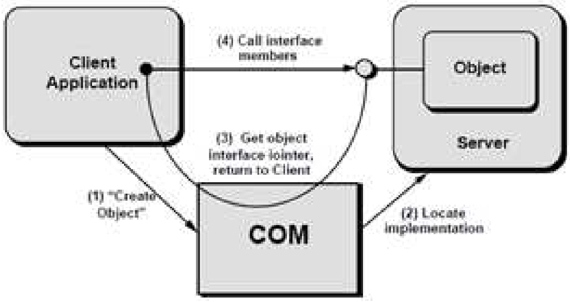

Figure 1: COM is making the connection between a client and a server, and the client communicates directly with server [4]

The development based on components focuses on building up of components with indispensable presence of important details, which fulfills the flexibility and rigidity of the component at the same time. We have to have a vision during building up of component solutions which are made for forward using, and a software component should be applied for integration with other components of the domain. The developing phase of system based on components, differs from development of traditional systems, and those are models: of waterfalls, falling, repeating, spiral and prototype models.

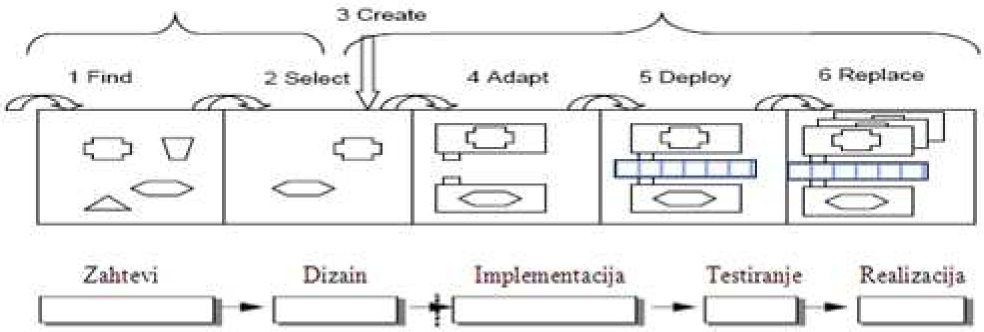

Figure 2: The example of developing phase with components and its comparison with a waterfall model [5]

The graphic is showing the developmental steps of the software solutions:

- identification of components which could be useful in the future R software development,
- choosing components which are compactable and in according to demands of aimed product,
- making private (proper) components which will be used in the new software product.
- adjustment of selected components from component basis, to be adequate according to present component model and specification demands, functionality.

IV. GENERAL COMPONENTS CREATING IN THE DEVELOPMENT IS ON THE CLIENT/SERVER PLATFORM

We have noticed by studios analyze of information demands, that many of them repeats continuously which shows that different software systems make similar or even shows the same functionalities. This information shows for a need to building up the software generative component, which is able to generate its functionality and gives answers to information demands. The decision about development is the result of very studios analyze, which takes into consideration the information too: does it exist the same information in the NET framework components library? The software component has the complete software-logistic support during design time support. It is opened an update and adjusting possibilities of its features and characteristics, and adjusting of parameters is being made in the frame of ‘’properties’’ with „custom UITypeEditor[6]“ which enable a visual graphic functionality adjustment. The graphical user interface - GUI[7]) enables free development of the software components, in order to be used flexible in the frame of different program languages, in different client/server or Web architectures. That kind of interface contains out of number controls, for application development purpose: buttons, textboxes, icons and many other tools which are indicators during operations, menu for making the hierarchical activity structure of applicable software which we automatically move using radio buttons, checkboxes, combo boxes, list boxes, list views, and many other controls. The users working environment Visual Studio is very complex and it has many possibilities, in order to raise a project, generally regarding, it has two obliged and one not obligatory component:

- The net framework class library. It is a library of already prepared objects for faster application development. All of these objects: forms, text frames, labels, buttons, drop-down lists and many other make the significant building up of project.
- Common Language Runtime (CLR) is a component which drives the performing of project.
- Microsoft Developer Network (MSDN) is a help working with Visual Studio.

Isolation of generative software components constructed class hierarchy, we provide a generic mechanism for mapping classes and database tables, regardless of which particular database or table to provide the functionality of basic operations on the data. How to work with database tables looks at the multiple levels of abstraction, reveals standardized procedures, given that all the basic operations on the data, the same. Since the database tables modeled on the basis of a given system entities and relationships among them, in this case, defined information requirements, we are able to determine examples of the following entities: business partners, banks, commodity, unit of measure, warehouses, types of goods, price list of synthetic and analytical accounts, document receipt, document delivery / receipt, document ledger, document types, and others. Each such entity could be defined as a single logical unit, which itself performs a function (which is uniformly recurrent, or are specific to the entity).

Separating the generative software components are made on classes' hierarchy, we ensure the generic mechanism by mapping classes and data basis table, regardless on that on which basis or table should ensure functionality of basic data operation. Because the work on data basis table is regarded from the abstract point, it is easy to notice the standard procedures, regarding the all basic data operations are the same. Whereas the data basis tables models on the entity of certain system and on relation between them, in this case under the defined informatics demands, we are able to determine next examples of entities: business partners, banks, goods, measure units, magazines, types of product, price list, places, synthetic and analytic accounts, good received note, dispatch note/invoice, main book, types of documents etc. Every entity could be defined as a logical complex which can conduct some functionality (which appears continually or are specific only for that entity). Abstracting the real world entities for a certain area, the software component, client/server of working environment, maps all tables in the data set, for the system class, which is a memory warehouse for tables and data from data basis. With the help of the binding source, all data are being connected from data set with the working environment interface. Binding source reads in data from the data set while new form it is reading, which is in this case defined as one or more entities, accordingly by interface, it shows data from data basis table. The tables in data set, seeing that their relations are showed as:

- *Master* or headers table
- *Details* or table items.

The data base is being read by binding source, respecting the relation in the master binding source class, and it is connected for data set, and it regards the table type master or detail binding source, which is also connected with data set it regards the tables type detail, and in the same time it is connected with master binding source, regarding the relations in the master/detail table.

The automation of new applicable software system development was showed in: We generate the future applications by components from business system tables which are present in data basis. For each table there are parameters. Each column has generated attributes which are remembered as list in *DataTable*, in our control classes in the process of generating. Later these attributes are being read in the *MasterDetailControl* class, in the form of tables and collections, after that they are being used in starting of controlling, their visual adjustment and functional implementation. Starting of generative component applies reading in parameters and basis on the work platform where is implemented. On this way, it is being reading in for each base data of:

- columns,
- types of data,
- primary keys,
- foreign keys and
- relations between tables.

During the software component implementation, the application is being dynamically generated based on parameters.

During the projecting, the generated classes are being compiled. The input fields are being generated dynamically based on the projected table. SQL commands for new fonts input, modification and erasing are also generated automatically.

V. THE PRACTICAL EXAMPLE OF GENERATIVE COMPONENT FOR THE APPLICATION DEVELOPMENT

The software so called *MasterDetailControl* is developed in working environment Visual Studio 2012, in the program language C#. The component is being integrated by its DLL file in new menu tool box, and as every other tool or control, serves to its purpose in the new project which is being evolved. On the next graphic we can see transferring of components on working surface of development environment. After that is being opened *MasterDetailControl Task* where is offered the *button Edit menu* which enables menu generating of new software application.

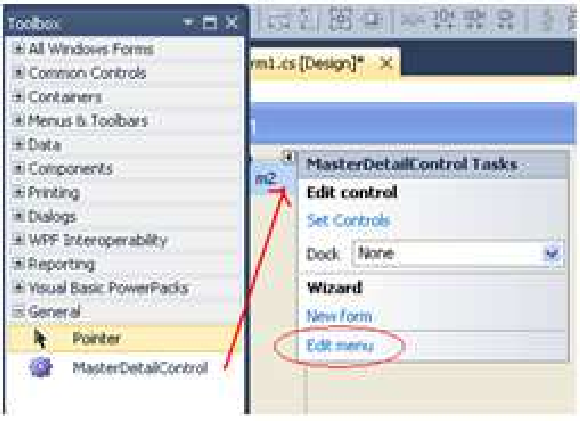

Figure 3: Component transferring on working environment surface, Visual Studio 2012

After menu generating, we use other functions of components to automate forward development of application. We open a new form on option new form, whereat is being opened a new window Enter Database Information, where we define the server data basis, we give name to data basis which we use, we write the name of users form, according the table where the form will work, in look up field we find the offered options of menu and we connect the form with defined menu.

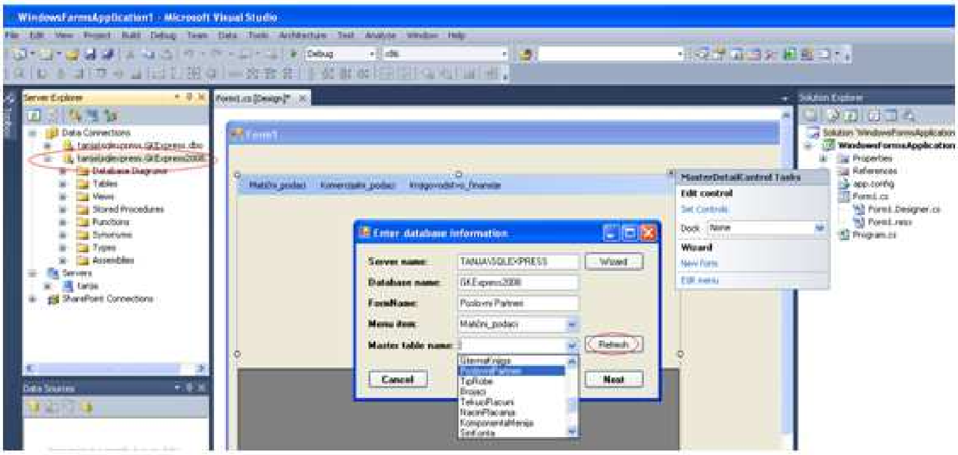

Figure 4: Choosing the table data basis which will implement the form. We are transferring the component on the form of working environment of Visual Studio 2012

As far as implementation, everything is in the class *MasterDetailControl*. The Class *DataSet* exists as an attribute in *MasterDetail* class and it is reading in all tables, attributes and data. Everything what user does influences on data which are in fact kept in DataSet. As soon as is the button pressed, it is being saved; the data set synchronizes the basis which keeps in it. The field forms, master and detail tables, everything is connected with certain columns in DataSet und by editing it is inscribed in DataSet automatically.

MasterDetailControl - is a component which generates the identification numbers and documents the file header/items: illustration of the MasterDetail diagram.

VI. CONCLUSION

In the field of OO procedure applied researching, procedures and principles of software solutions development; they are significantly farther and more perspective, and according to software components performance, generated and development classes and methods, they are incomparable above modern techniques which have been applied in the development of software. The results and measurable sizes can be got by metrics for measuring of the software quality, they have influence on a mark or decision if any software product represents perspective, reliable, qualitative leastways economically payable solution. The decision of development software performance is based on the politic of high quality software components, as during projecting, so and in maintenance and development. The objective-oriented projecting and software development, relations between software objects, and also many other principles on which is based modern objected technique and component programming give possibility to:

- Component generates the qualitative users interface, visual appearance forms for data entry, flexibility, reliability and quality of development tools,
- Robustness or adaptability of components during development of software applications performance all sizes and possibilities, software dimensions and memory hardware resources, on any relative data basis, for different domain operating.
- Flexibility, performances and scalability of software solutions with R component development,
- Quick executing of requests on basis – generative component in the new application development has integrated a system of quick search in data basis, and also printing of obtained result on screen or printer, and
- Over and above: the component is developed as dl file application, which can be integrated and multiplied used in many software systems, in different data basis, in the objects, in display, elaboration and manipulation of mass data.

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APPLICATION OF THE DSI FRAMEWORK IN TEACHING GRAPH SEARCH ALGORITHMS

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Abstract – The ways of graph search algorithms presentation varies a little throughout different universities. In this area, assessment is usually based on tests, problem solving, quizzes and the like. In advanced courses, there are projects in which it is needed to introduce certain modifications of the algorithm and implement specific software that utilizes the modified algorithm. In this paper, a way of individual graph search learning using the DSi system. Unlike reading the textual material, examples and solved problems, DSi based learning deals with individual creation of relations between known and unknown notions. It is shown how these relations can be defined within specific graph search algorithms, namely: breadth first search, depth first search and A* algorithms. The chosen criteria of relations creation enable noticing the fundamental characteristics of the algorithm, as well as comparison of search algorithms. Within the learning process obtaining of direct answers about the similarity of text and similarity of the graph-presented algorithm.

I. INTRODUCTION

At numerous universities, the domain of Graph Search Algorithms is taught as a part of the Artificial Intelligence course, and within this domain topics are, for the most part, uniform. The fundamental prepositions for working with these algorithms are fundamental knowledge about graphs and the ability to represent knowledge and solve problems. Based on [Hotomski] any problem solving process includes two components: problem representation and solution strategy. Various knowledge representation ways are possible. Both complexity of the problem description and efficiency of its solution depend on the choice of problem representation.

Historically, the development of this domain has origins in the seven Königsberg bridges problem:

In Königsberg, the Pregel River is formed from the old and new Pregel that forms an island at the confluence. Banks are connected with the total of seven bridges, so that the island is connected with two bridges on old, two on new Pregel and one across the part between the affluents. On both of the affluents, before the island, there is one bridge. The problem: is there a way to cross all seven bridges, but cross each bridge only once? [1]

This problem was solved in 1736. by Leonhard Euler, by abstracting the problem and showing that it is insolvable on a graph. This solution is considered the first graph theory theorem that made possible all the further development both in knowledge representation and search algorithms [2]. In the Figure 1 the drawing of the real problem is shown, and in the Figure 2 the graph representation is shown (pictures taken from [2]). Solving problems on a graph level is a presupposition for any further learning in the domain.

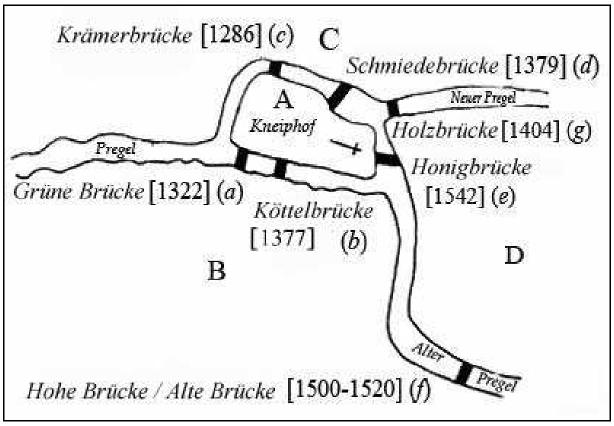

Figure 1. The Bridges of Königsberg, 1736.

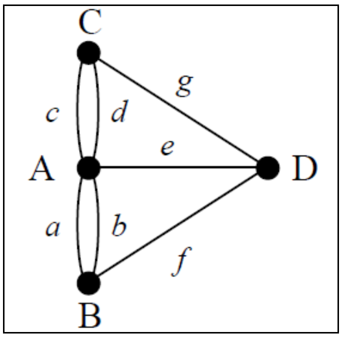

Figure 2. The corresponding graph (W. W. Rouse Ball, 1892)

Thus, it is needed that the students are trained for abstract (graph) representation of problems before any actual learning about search algorithms. Only when this is achieved, any graph search knowledge can be absorbed. It is common that first uninformed (blind) searches are done, and then informed searches. At the majority of universities, this approach is used.

In this paper, an attempt has been made to use DSi system in teaching Graph Search algorithms, namely its relation definition feature.

II. DSI E-LEARNING SYSTEM

The DSi e-learning system was designed as a tool for rapid learning from textual material. The first version enabled learners to query the text material for relations between notions without need for referring back to the definitions (usually at the beginning of the course/lesson). This version was first presented in [3] and required domain experts to edit manually the relations – which reside in a separate semantic document coupled with the text. In the next version, DSi enabled any user (including learners) to add new relations to the semantic document directly from the text, using a simple drag-and-drop operation, which makes way for user-generated content. [4]

For the application of the DSi system in the field of search algorithms, the following relations are significant:

- The basic application of the DSi system in sense of interrelating the known notions at the single word level. It is important to get both positive and negative answers about how notions are connected or not.
- The use of DSi for interconnecting entire sentences and passages. It is important to get answers where connections exist. This DSi feature is in the developmental phase.
- The use of DSi for interconnecting images. This DSi feature is in the developmental phase.
- Defining the relation rate: compulsory relation or optional relation. In addition, a compulsory absence of relation can be defined.

Defining the levels of material interconnectedness is a presupposition for the use of the DSi system. In order to make a map of interconnections for a specific lesson, it is necessary to examine which notions are connected on which of the aforementioned ways.

For the DSi-based search algorithm learning the following fundamental lessons are analyzed:

- state space search
- breadth first search
- depth first search
- A* algorithm

The maps of interconnections, that could be applied to other search algorithms, are defined.

III. DEFINING INTERCONNECTIONS MAP WITH SPACE STATE SEARCH

The state space search represents a graphical display of the abstracted problem. According to [1] representing the problem in the knowledge space is based on the set of states and the set of operators that transform one state into the other. Solution of the problem means finding a sequence of operators that convert one of the initial states into one of the final states.

Algorithms that solve the problem of reaching the goal state need to be connected with the state space notion the one word level: the name of the algorithm as well as the problem solution description should be mappable to space state search.

Graph display of a certain problem within the search algorithm would be connected to the state space at the level of optional connectedness (the case when it is important to emphasize that the graph display of a certain problem is possible to display with the state space). It is important to say that in DSi system the notions that are in relation(s) with some other notion(s) can be marked with a different color, to inform the learner that they can try to connect them in order to obtain answer(s). In case of graph display, color emphasis would be redundant, because to be presented in a graph form it needs to be connected with other notions or sentences.

Algorithms where the goal state is not known would be mappable to space state search only in case when it is necessary to apostrophe that they do not have the goal state.

In Figure 3 it is shown how in the DSi system a graph that displays distance between cities can be connected with the information about the state space.

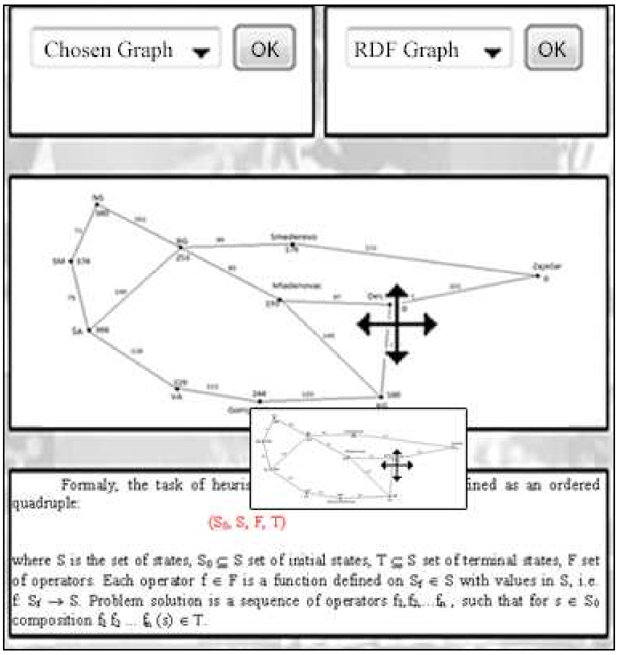

Figure 3. Connecting the graph and the state space in the DSi system

Figure 4 shows the response obtained from DSi system. These connections are in the developmental phase.

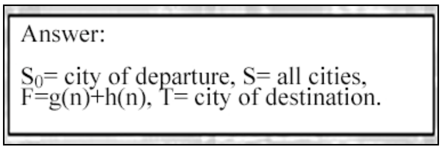

Figure 4. Answers obtained by connecting the graph and the words

These connections would enable students to retain not only the text but also the relations that can be made. In this way, a comparation of topics could be done in a better way, and the student could easier return to any previous lection in search for answers. The obtained answer, shown in Figure 4, is a result of not only connecting shown in Figure 3, but also connecting that the student has performed before connecting shown in Figure 3. The obtained answer is thus a result of a complex connection.

IV. Defining relations within BFS, DFS and A* algorithms

A. *Relation between BFS and DFS algorithm*

Depending on the sequence of opening the nodes, whose ancestors are explicitly generated on the state space tree, there are two ways of uninformed (blind) searches:

- breadth first search and
- depth first search.

Their mutual interconnection should yield answers about their similarities, but also about their fundamental differences.

For example, a sentence from the BFS algorithm:

Depth first search will take $\Theta=(V^2)$ time on a graph $G=(V;E)$ represented as an adjacency matrix.

can be connectable only with notions from the DFS algorithm with which it can be comparable. Time complexity of the algorithm is directly comparable but it is connected with the way of representing the graph. BFS uses adjacency matrix, while DFS mostly uses adjacency lists. In cases when a DFS algorithm is based on adjacency matrix, it has a different time complexity. To enable students to learn basic search algorithms presentations, we propose that only basic cases are included: BFS – adjacency matrix, DFS – adjacency lists. It is possible that these cases are highlighted with a different color or some other emphasis such as an asterisk (*), to suggest to the student that other options are available.

Based on the important characteristics of these algorithms mandatory relations between them are the following:

- know target state – target node,
- belonging to the blind search,
- time complexity.

B. *Relations between functions of evaluation*

The meaning of introducing the function of evaluation into a certain search algorithm is to utilize it to sort the node set and determine the sequence of their opening. The choice of a function can vary and upon it depends the efficiency of the search.

The A* algorithm, along with certain presuppositions, provides opening of the least number of nodes, with finding the minimal-price resolving path [1]. It is based on the function of evaluation in the following form:

$$f(n)=g(n)+h(n)$$

where the function g(n) represents the value of the path price from the initial node up to the node n, and the function h(n) represents domain-oriented heuristic estimation of the minimal price of the path from the node n up to one of the terminal nodes. To determine it some heuristic information is used, thus the h(n) is called the heuristic function.

It has been proved (Dechter, 1985) that if heuristic estimation h(n) is chosen in a way that it doesn't, in any node, does not surpass the real path price from that node to some terminal node, then the A* algorithm finds an optimal path to the target node.

Based on that, it is important to have connections that enable close observation of the estimation of the function h(n). In case of misjudgment, the search can go astray.

All connections between functions f should be compared with both belonging heuristics h and the entire path price. Setting appropriate gradation in the DSi system, with the evaluation function, is in development.

C. Connections between graph displays

Graph displays are necessary especially in the initial phases of learning and usually exist within examples. In the literature most frequently, at least one specific example is shown and treated with several search algorithms. Connecting a graph to a graph within the same example with different algorithms would be very efficient for obtaining information about understanding similarities and differences between algorithms.

In Figure 5 the well-known puzzle problem is shown, within the A* algorithm without stating the values of the heuristics h next to the graph nodes (figure taken from [5]). Immediately before the graph in [5] it is stated that for heuristics h the Manhattan distance is used. In case of moving the graph onto another graph of the same example but different heuristics, it would be very useful to obtain answers about heuristics that do not need to be written next to the graph nodes.

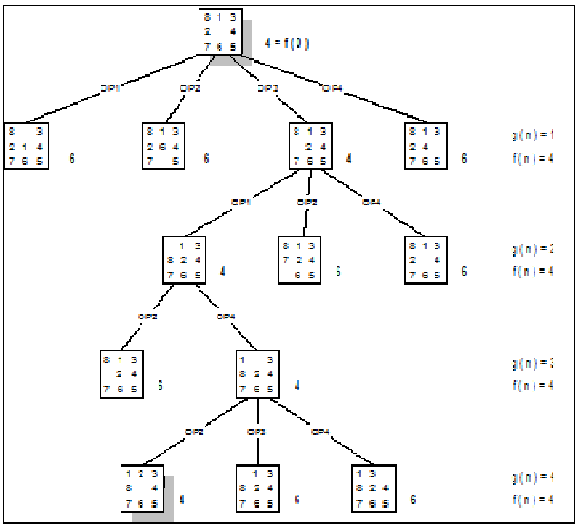

Figure 5. The puzzle problem solved with the A* algorithm

These DSi features are in the developmental phase. In parallel with the system feature set upgrade it is necessary to develop a corresponding learning model that would benefit from these features.

V. CONCLUSION

Based on the discussed topics, one possible DSi system usage scenario within the graph search algorithms is that the following information is given for any of the two search algorithms:

- relation between the algorithm and the space state
- information about blind or informed search
- number and type of lists in which open or visited nodes are kept
- time complexity of the algorithm
- in case existing heuristics, display of its function
- connectivity of graph displays of algorithms

Learning of graph-searched algorithms designed this way opens up further possibilities for students' independent work.

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EDUCATIONAL SOFTWARE FOR TRAFFIC

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Abstract - The use of different types of models (computer physical) and software simulation is increasingly present in the process of teaching and learning. Today the computer is increasingly applied to the educational process and for individual learning outside the education system. Increasingly appears larger number of traffic offenses and in cases where it is dangerous, especially when children are concerned, why should devote more attention to the traffic of children's literacy. This is something that will be useful throughout life. Just exploring traffic regulations and signs, they may be of great benefit because they themselves participate daily in city streets. All will one day take the driving test. There is software that will be used by the children, with the introduction of the basic road rules.

I. INTRODUCTION

The development of information technologies has enabled the realization of teaching using educational software in all areas and in teaching technical and IT education. Teaching computer-aided significantly contribute to the modernization of education. Visual, multimedia and interactivity are elements that significantly affect the increase motivation the work of students in the class. Acquisition of content from multiple senses at the same time affects the larger and longer maintenance level of attention, faster and better memorizing the material so treated.

II. EDUCATIONAL SOFTWARE

Complete computer programs used in teaching are called educational computer software. Today, the majority of textbooks and supplies educational software, which is correlated with the textbook and workbook, and so students, can review the content covered and multimedia presentations. Also on the internet, we can find a variety of free educational animations and simulations that can be used in teaching to facilitate explained the material to students.

The objectives of the educational software that cover the appropriate area of the curriculum, and thus increase the quality of teaching, increase student motivation, contribute to better implementation of the case and better individual progress of individuals in accordance with their intellectual abilities and allow students to master certain syllabus.

By using ORS and achieves a multiplier effect in teaching and learning. Some of these are:

- Increased independent activity of students;
- Increasing students' motivation;
- Learning is tailored to individual skills and abilities of students, advanced students to be faster to cross teaching materials, students who aspire to learn the pace of work adapted to their abilities;
- The student chooses his own path of learning and work;
- Ability to retain, return, repeat the essential elements of the adoption of concepts;
- A high percentage of the time saving learning and work.

III. PROGRAMMED INSTRUCTION USING A COMPUTER

Using the computer program set up a dialogue between the students and the “electronic teacher". The students answer the questions and provide feedback on the success of the operation. Subject matter is divided into steps of a certain size, each step provides new information and sets the task in relation to them, the decision depends on the student's next step ; steps are related to the program.

Learning software-programmed sequence using a computer has the following characteristics:

- Precisely defined task program
- Systematically elaborated the material that is exposed to the natural, small " portions "
- Activity provides students the task with each new piece of material,
- Immediately gives feedback on the accuracy of the solution,

- The progress of students through the program depends on the adoption of the previous material
- made possible by individualized speeds, the way of adoption of content material.

Learning contents programmed in this way are shown a number of advantages:

- Work independently,
- Increased activity,
- Feedback on the success of learning,
- Students who did complete the job receive additional material...

There are also funding that was reflected in the following:

- The student is strictly managed; because programs are inflexible, linear algorithm computer is used only as an aid.

IV. EDUCATIONAL SOFTWARE FROM TRAFFIC

The elementary school is devoted to a relatively small number of hours familiarizing students with the traffic rules, traffic regulations and traffic signs. Teaching themes traffic is processed with the most hours in the fifth grade. The use of educational software in this field enables the teacher to teach the material in a more interesting way, and can be used for Individual way of working with students so that each student can progress at the pace that best suits him.

The initial appearance of the screen any educational software from traffic would look like in picture 1.

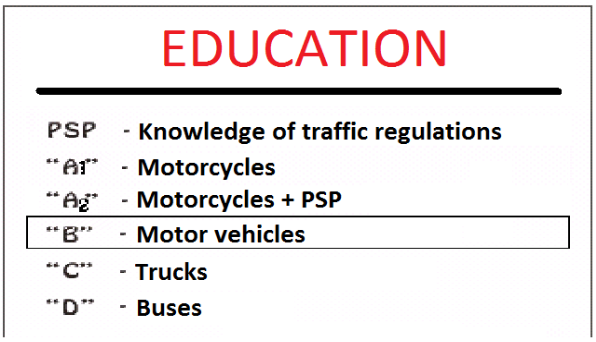

Figure 1. The appearance of any educational software

When you start with the introduction of traffic, the first children to be displayed road signs, regulations and intersections.

Other options could possibly be shown and their children can deal with when they reach a sufficient number of years, depending on the category.

We will start with the right models and simulations related to the first category, knowledge of traffic signs, intersections and regulations.

When you choose the first option (traffic signs) window opens with the question, "What is this a sign" and a picture of a traffic sign, as shown in Picture 2, students should consider and independently to answer questions. To check your answer you need to click on the text that says "Answer" and gives him the right answer, Figure 3

Figure 2. Traffic signs - pictures and question mark.

Figure 3. Traffic signs - answer

We have then the option to choose what we want to practice and learn. The following options are virtually simulation problem situations and intersection, and the addition of these simulations we have a theoretical question.

When you choose the second option related to the problem situation - the intersection get the look of the screen as shown in Picture 4.

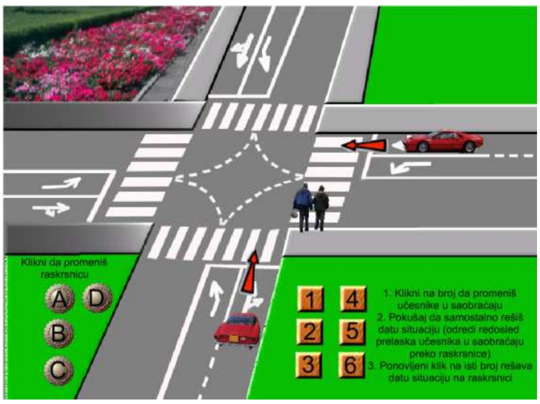

Figure 4. Intersection

The picture given intersection, where we can change the appearance of intersections and road users. By clicking, the appropriate box located under a, b, c and changing the look of the intersection, on the field under 1, 2, 3, 4, 5, and 6 are amended road users. When a student selects an intersection under a, b, c, and d on the other side of the 1, 2, 3, 4, 5 or 6 select participants in the traffic assignment of students to observe well the whole situation and then try to resolve automatically the situation intersection. By repeatedly clicking the same number program, resolve the situation at the intersection and the student can verify that it is correctly solved the intersection. The order of passing through the intersection must be set in accordance with traffic regulations, signs and public right of ways. Example, when a program resolves an intersection might look like this (Picture 5, 6 and 7):

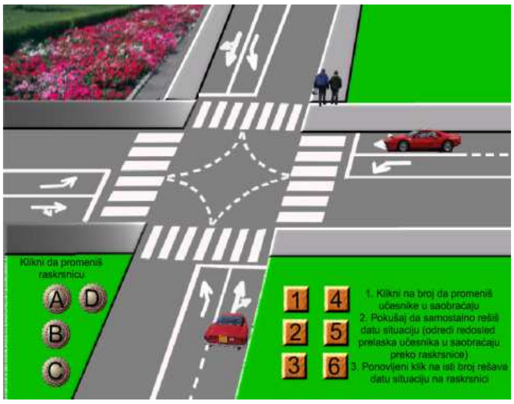

Figure 5. Intersection

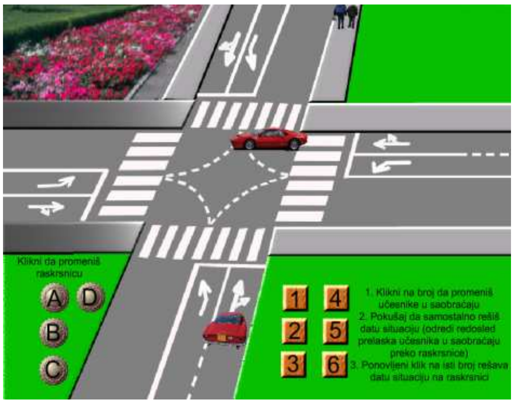

Figure 6. Intersection

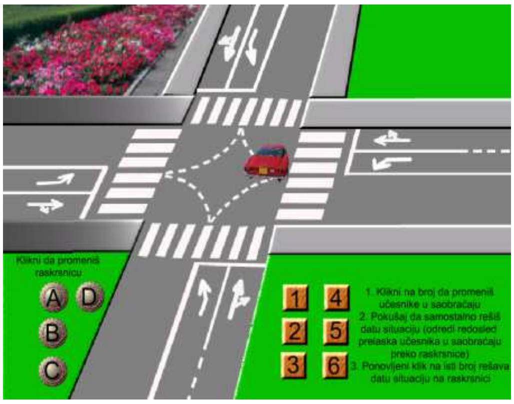

Figure 7. Intersection

When you select the third option-related regulations, data is a crossroads where we can learn the traffic regulations. Students are given an intersection (Picture 8), which must be good to observe. The next step is that the offered answers, select the correct answer (Picture 9). Automatically shows if it is correct or incorrect response (Picture 10).

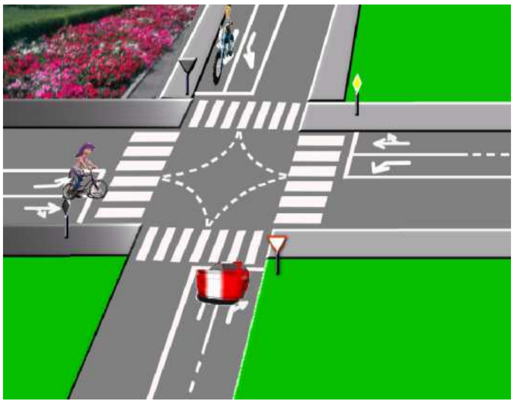

Figure 8. One of the situations at the intersection

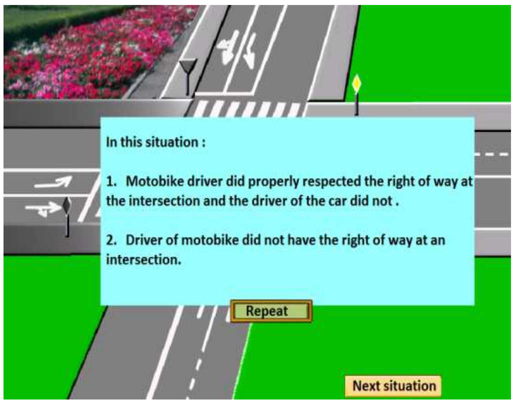

Figure 9. Multiple choice

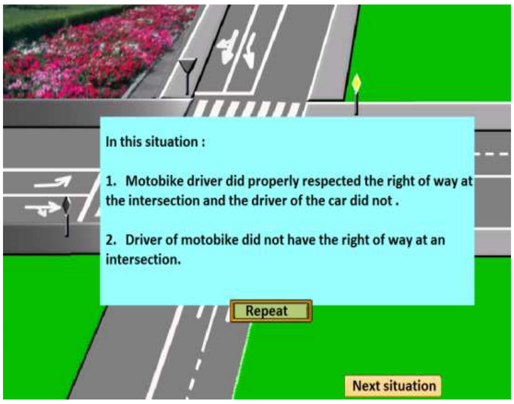

Figure 10. Checking the answers.

Within education, one of the theoretical issues looks like Picture 11.

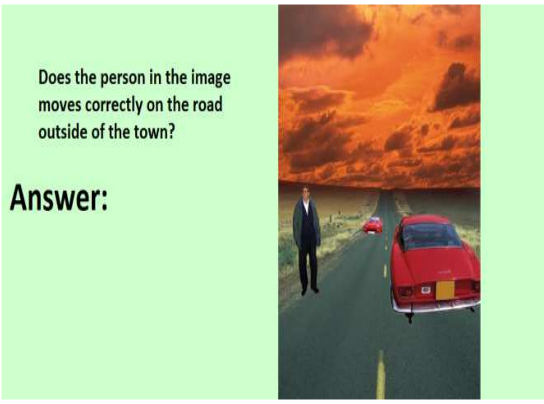

Figure 11. Theoretical issues

The student is asked traffic situations - "Does the person in the image moves correctly on the road outside of the town?" Student is able to answer the question. The next step is the student clicks on the text that says "Answer", which will display the correct answer (Picture 12).

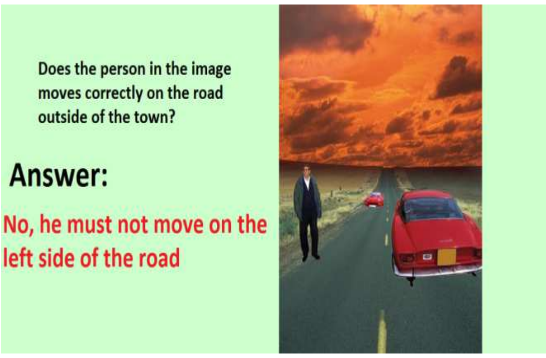

Figure 12. The answer

Another example is given of traffic signs (Picture 13). Traffic signs are arranged in a specific order, and below them are the definitions of characters under a certain number. The students' task is to link the code with the appropriate sign.

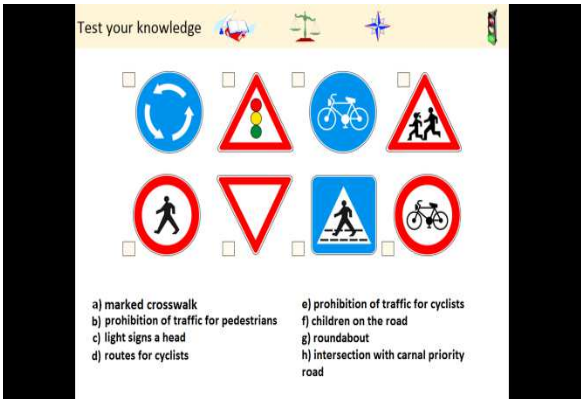

Figure 13. Traffic signs

V. CONCLUSION

With the development of digital technologies and new capabilities of computers, has enabled the development of computer modeling and simulation. The use of software models in the teaching aims, to not only create the technical literacy of students, but also contact with computer technologies and their use. The introduction of software models in the teaching of general and technical education classes demonstrated their feasibility. Application of these classes includes innovated forms of work, encouraging independent learning and research students. Professional qualifications of teachers, more efficient organization hours, using suitable forms of work and teaching tools are an important prerequisite and guarantee for successfully mastering the curriculum. This instruction occupies a special place in teaching technical education because it allows students to express their preferences and creativity and safely step into the world of technology without which the progress and welfare of humankind unthinkable. I believe that increased education with the help of software that I mentioned her or someone similar in many ways literate learners with knowledge of the traffic. In addition, to learning hope that they would be quite interesting, and to solve problems in traffic as they take part in it every day.

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SCHOOL PROGRAM for the fifth grade of primary education school year 2013/2014. The Primary School "Stevan Dukic" Karaburma - Belgrade.

GARDEN SOLAR ENERGY

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Abstract- Until now, man has lived on this Earth using natural resources as if they were inexhaustible endless infields. Including air, ground, water and other natural resources were consumed as inexhaustible.

The production of electric energy also pollutes our environment. The smoke produced by power plants also pollutes the environment. In order to function, power plants need energy, which they get from the deforestation.

With this work, I want to show ways to avoid the environmental pollution and how to use harmless and helpful energy resources. I made a minimized model of a house. During the day it is charging, accumulating, and glows over the night. The accumulator is, during the day, charged by solar energy, while the illumination turns on when the light is gone.

I. INTRODUCTION

"Modeling and simulation are important factors of efficacy in the education and learning, especially in the technical education. Taking into consideration of the minimal number of classes for the curriculum elaboration, the main part should consist of practical work and exercises. They should be combined with teaching of special theoretical knowledge and giving information about materials, tools and steps of adaption for appropriate class, as well as student's adoption of the curriculum. We can conclude that the application of the model and simulation in the teaching and the process of learning are very important, practically inevitable. [4]

With this work, I want to show ways to avoid the environmental pollution and how to use harmless and helpful energy resources. I made a minimized model of a house. During the day it is charging, accumulating, and glows over the night. The accumulator is, during the day, charged by solar energy, while the illumination turns on when the light is gone.

I hope that my work will draw attention to the importance of ecology, that is, protection of the environment.

II. THE APPLIANCE OF MODELING IN TECHNICAL AND IT EDUCATION

Modeling in technical education helps students to obtain the practical part of education, as well. With models, we can show everyday issues, which, otherwise we would not be able to present (e.g. a bridge, big motorcycle, etc.)

III. THEORETICAL PRESENTATION ABOUT SOLAR ENERGY (SOLAR COLLECTORS AND SOLAR BATTERY)

The main aim of the use of the solar collector is the save of energy and money. Nowadays, the big issue makes the heating of some buildings, car gear, etc. The solution to these problems is the solar collector. Solar collector gets the energy from sun. Therefore, there is no need to use the regular resources of energy (e.g. natural gas, crude oil, coal, petrol). For this reason, the consummation of the solar collector is cheaper than heating by the usual resources. Solar collectors are also used on the areas where the mentioned resources are absent, or there is no constant supply of them and the number of sunny hours is high. Solar collectors are ecological, less harmful than renewed energy sources, because they do not support global warming, neither the production of toxic gases. The continuous work for its maintenance is unnecessary (while the material for the coal and natural gas heating systems should be produced, transported, etc.) From the fore mentioned, we can see that the use of solar energy is certainly the best solution. We get pure energy and the only investment is the building up of the system. Of the other "necessities", the nature takes care by its own.

Solar batteries (panels)

Solar panels are collectors of sunrays, which are able to convert the rays of sun into the light rays, i.e. into electricity. The absorbance of light in the solar panel cells makes it possible to create electrically charged particles; with the help of electric field embedded in the structure of the collector, they can move, producing the electricity.

IV. THE APPLIANCE OF MODELS IN TECHNICAL AND IT EDUCATION

Solar bulb is suitable for illumination of garden or entrance, where the light sensor turns it on and off. With the help of the embedded solar battery (high capacity, one- crystal), solar energy is transformed into electric and charges the embedded nickel-aluminum accumulator. The embedded light sensor enables the garden lamp with solar battery glows only in dark.

The garden lamp, which works with the help of solar energy, broke at home. It was pity to throw it away, so this competition was very welcome in order to use the lamp. After separating the device, I found the error. LED diode was broken.

I proportionally minimized a house and made a model of it. I installed the lines from LED diode and appropriate electronics to the house. I took out the broken diode and replaced it with white diodes.

During my work, I used its opportunity of day charging and night glowing. Therefore, the solar battery charges the accumulator during the day. By the time the light vanishes, the illumination is on. I also used my house model and covered it with hungrocel. This type of isolation disables the loss of temperature through the walls.

Maybe the most beautiful part of my work is that in this way, we can preserve our environment.

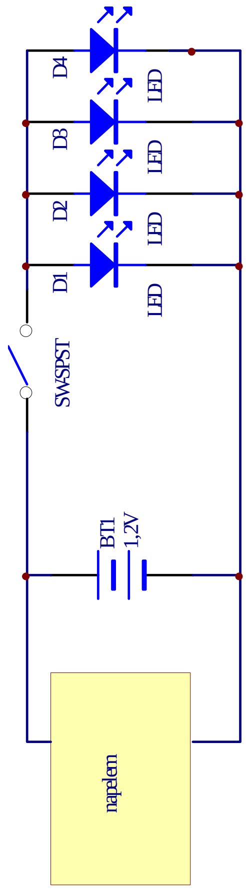

Figure 1. The line sketch

Figure 2. With home garden solar illumination – final work

V. THE ALGORITHM OF WORKING

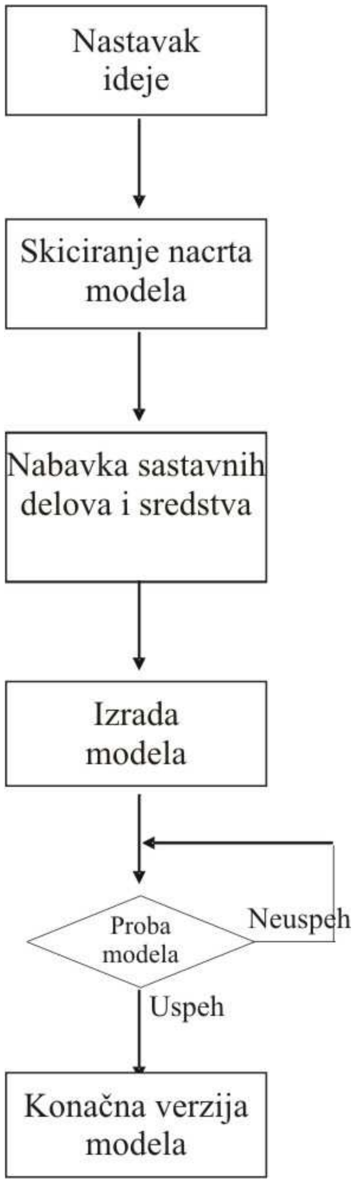

Figure 3. The algorithm of working

VI. The Used Parts and Tools in the Working Process

In the process of work, I used the following parts and tools:

- 4 pieces of wooden supporters
- lesonit
- 4 pieces of white led diode
- lines
- solar battery and electronics
- glue
- rock
- sew dust
- plants (for decoration)
- plastic (window)
- a toothpick
- emery paper
- wallpaper
- styrofoam
- scissors
- saw
- scalpel
- soldering iron

VII. Conclusion

With the computer development, modeling and simulation are getting more and more present as a way of solving even the most complex problems. Education and teaching, process of thinking and process of learning are not researched enough in the area of modeling and simulation theory.

The development of digital technology and the new computer possibility made the development of the new scientific discipline- computer modeling and simulation. Modeling and simulation are having a huge use in business systems, medicine, economics, technique, industry and in scientific research.

In technical education, modeling helps students to obtain the practical part of teaching. By models, we can show everyday things, which, otherwise we would not be able to present (e.g. a bridge, big motorcycle, etc.)

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E-LEARNING AND ONLINE CERTIFICATES FOR ENGLISH AS A FOREIGN LANGUAGE

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Abstract – The paper deals with E-learning, its advantages and great importance of the Internet in distance learning. Assuming that someone's interest is to study in English, the authors have introduced some English language proficiency certificates and their importance in high education. In this paper, two major certificates have been introduced and brought closer to those who plan to finish their studies at those Universities, which provide high education in the English language. Those certificates are a must-have for those who intend to work in international companies, and not only to work, but to improve their competence and advance in their career.

I. PREFACE

Electronic learning is a relatively new form of distance learning. What, in fact, E-learning means?

There are many definitions of E-learning. The most common one is: E-learning implies every form of education where the educational content is delivered in electronic form (Fallon; Brown, 2003). The others are thinking that E-learning is communication between a mentor and a student supported by some technologic form (Keegan, 1986).

Some researchers are thinking that E-learning is the combination of the best and the most progressive achievements of pedagogical technology. It is based on the principles of free learning, using computers in education and modern telecommunication (the Internet) for teaching. Learning is organized as a process of dialogs in virtual classrooms. It marks the apartness of the mentor and the student in space and/or in time (Perraton, H.1988).

One of the greatest problems in defining E-learning is the difference in understanding this complex form of studying, and attempts of classification numerous solutions. New internet technologies are allowing using of text, audio and video material, which are combined in multimedia content and as so are presented to students. Learning is a process that implies many possible activities, from simple reading of text to more complex forms, such as audio-video content or active participation in learning, cooperative learning, etc. The amount of received knowledge is in relation with different forms of presentation education content of E-learning.

E-learning is one of the most famous computer generated communication services. As a useful tool, it has founded its place in learning programs. E-courses through mailing list are representing the simplest form of delivering education content to students. Materials needed for certain courses are delivered to e-address as needed, daily, weekly or on a certain schedule. Students do not have to visit the web site of education institutions. All communication is bounded to e-mail.

If a system of electronic learning is to be used, we use communication based on a computer with different services. The most famous service is e-mail. The component part of using new information technologies is the software named Browser for viewing and searching the Internet (Google Chrome, Mozilla Firefox, Internet Explorer, Opera, Netscape, etc.). The Internet browsers with new graphic solutions and sophisticated interactive communication technology allowed us that E-learning becomes available to students all around the world.

E learning, known as distance learning, has crossed international borders and our country is entering the international market of electronic learning. The USA is a competition market in E-learning and education. Experiences that America, Canada, Australia have in this field dated since the end of 19th century. Today, E-learning is a common appearance even at the most famous universities and faculties (Harvard, Oxford, and MIT) which in their virtual classrooms provide many accredited academic courses. Political and public interest for E-learning becomes greater and greater especially in domains where student population is scattered (Australia, Canada). There is a great motivation for implementation of this new educational model, when there is no way to maximize capacity of known educational institutions, or the budget is insufficient for using new educational programs. Many academic institutions have already made their shorter or longer step in the use of virtual classrooms.

II. THE ENGLISH LANGUAGE ONLINE CERTIFICATES

One of the advantages of E-learning is that certificates can be obtained much more easily than attending schools that provide proper education for acquiring those certificates. These certificates can be used for different purposes. Who is applying for some online English certificates?

- Students planning to study at a higher education institution
- English-language learning program admissions
- Scholarship and certification candidates
- English-language learners who want to track and improve their progress
- Students and workers applying for visas
- Applying for jobs

There are many certificates that can be obtained by finishing online courses, but all of them have similar structure. They are all consisted of usually four parts. Those are reading, listening, speaking and writing.

The reading section consists of questions from the given text. Those texts are the kind of material that can be found for example in university textbooks. The attendant answers questions about main ideas, inferences, details, sentence insertion, essential information, rhetorical purpose, vocabulary and overall ideas. Some of those reading tests contain tables that need to be filled in.

The listening section is also consisted of questions about written few passages. The lectures are a self-contained portion of an academic lecture. It may involve student's participation and does not assume specialized background knowledge in the subject area. Each conversation and lecture passage is heard only once and it is associated with a few questions. These questions are meant to measure the ability to understand main ideas, relationships between ideas, implications, and important details, organization of information, speaker's attitude and purpose.

The speaking section consists of few tasks. Some of them are independent and others are integrated. Test-takers are answering to the questions about familiar topics. They are evaluated on their ability to speak spontaneously and convey their ideas clearly. On integrated tasks, they read a short passage, listen to an academic course lecture or a conversation about campus life and answer to questions by combining appropriate information from the text and the talk. These tasks serve to evaluate test-takers ability to appropriately synthesize and convey information from the reading and listening material.

The writing section measures a test taker's ability to write in an academic setting and consists of two tasks, one integrated and one independent. In the integrated task, they read a passage on an academic topic and then listen to a speaker's discussion. After that, he must explain how these relate to the key points of the reading passage. In the independent task, the test-taker must write an essay that states his opinion and then explain it.

Some internationally accepted certificates are as follows:

- TOEIC (Test of English for International Communication) is an English language test. It is designed specifically to measure English skills of people who are working in international environment.
- Track Test (Track Test Online English Assessment Center) is an online English language assessment tool. It is launched in November 2012 and it measures the English skills of non-native English speakers.
- TOEFL (Test of English as a Foreign Language) measures your ability to use and understand English at the university level. It evaluates how well you combine your listening, reading, speaking and writing skills to perform academic tasks. It is one of the two major English-language tests in the world, beside IELTS.
- TELC (the European Language Certificates) are international standard tests of ten different languages (including English). The biggest limitation is that this test can be taken in only few countries.
- IELTS (International English Language Testing System) is an international test of English language proficiency for non-native English language speakers. It was established in 1989. It is one of the two

major English-language tests in the world, beside TOEFL.

- ITEP (The International Test of English Proficiency) is a language assessment tool that measures the English skills of non-native English speakers. It is available in about 40 countries

A. TOEFL - Test Of English as a Foreign Language

TOEFL is a standardized test of English language proficiency for non-native English language speakers. Many academic and professional institutions accept the test. It is a trademark of ETS (Educational Testing Service), a private non-profit organization, which designs and administers the tests. The scores on this test are valid for two years. After that, they are non-valid. The test itself was made in 1964. Format of the testing itself is given in the table below.

Task	Description	Approximate time
Reading	3-5 passages, each containing 12-14 questions	60-100 minutes
Listening	6-9 passages, each containing 5-6 questions	60-90 minutes
Break	Mandatory break	10 minutes
Speaking	6 tasks	20 minutes
Writing	2 tasks	50 minutes

The TOEFL test is scored on a scale of 0 to 120 points. Each of the four sections receives a scaled score from 0 to 30. Scores are added together to determine the total score. Most colleges use TOEFL scores as only one factor in their admission process. The minimum TOEFL scores range from 61 to 100. More than 27 million people from all over the world have taken the TOEFL test to demonstrate their English-language proficiency. The test can be taken in more than 165 countries on more than 4500 conveniently located test sites. Because the test is composed of 100% academic questions and tasks, many universities consider it the most appropriate test to use when making admissions decisions.

Why is this test good and reliable? You can take a test with a Speaking interview, but what if your interviewer has a bad day and rates you lower than you deserve? With the TOEFL test, there's no doubt your score is more objective and reliable, because Speaking responses are recorded and evaluated by three to six ETS raters rather than only one rater from a local testing site. TOEFL test scores help you stand out because of the TOEFL test's reputation for quality, fairness and 100% academic content. It is the most widely accepted English-language test in the world, including more than 9,000 colleges, universities, agencies and other institutions.

B. IELTS - International English Language Testing System

IELTS was one of the pioneers of four skills English language testing. It appeared over 21 years ago and even today it continues to set the standard for English language testing. IELTS is accepted as evidence of English language proficiency by over 9000 organizations worldwide. It is recognized as a secure, valid and reliable indicator of true-to-life ability to communicate in English for education, immigration and professional accreditation. There are two versions of the IELTS: The General Training Version and the Academic Version. The General Training Version is intended for those planning to undertake non-academic training or to gain work experience, or for immigration purposes. The Academic Version is intended for those who want to enroll in universities and other institutions of higher education and for professionals such as medical doctors and nurses who want to study or practice in an English-speaking country.

No minimum score is required to pass the test. Grade rang is from 0 to 9, in 0.5 band increments. Format of the testing itself is given in the table below.

Task	Description	Approximate time
Reading	3 texts, each containing 13-14 questions	60 minutes
Listening	4 sections of increasing difficulty	40 minutes
Speaking	3 sections of increasing difficulty	11-15 minutes
Writing	2 tasks	60 minutes

IELTS is scored on a nine-band scale. Each grade is corresponding to a specified competence in English. The grades are from 1 to 9, respectively. The test-taker with a grade of 1 essentially has no ability to use the language beyond possibly a few isolated words. The one with a grade of 9 has full operational command of the language with appropriate, accurate and fluent skill with complete understanding. The test is taken every year across 121 countries in more than 500 locations. There are up to 48 test dates available per year. There used to be a restriction to 90 days between retaking the test by one candidate, but now, this restriction has been withdrawn and currently there is no limit for candidates to retake the test.

C. Comparison of TOEFL and IELTS

These are two main English language tests accepted by universities around the world. The big question that faces anyone that has a dilemma is; which one is better? They have some similarities and some differences. Both are primary aimed at pre-university students planning to make the step to higher education. Both evaluate how well can you combine your listening, writing, reading and speaking skills. You must pay a fee to take both tests. Although both tests focus on the same thing, they do so in different ways. One of the main differences is the speaking part of the test. For IELTS you are required to take this with an examiner face to face. For TOEFL the speaking test consists of six questions, which you answer into a microphone. While the differences are not as great as some assume accents and spelling variations can cause a problem for some students. The scoring system is also different. The differences between TOEFL and IELTS grades are in the table below.

TOEFL Score	IELTS Score
118-120	9
115-117	8.5
110-114	8
102-109	7.5
94-101	7
79-93	6.5
60-78	6
46-59	5.5
35-45	5
32-34	4.5
0-31	0-4

The final question about these tests is; which is better? There is not a clear answer to this question because that answer really depends on you.

The question of which is easier is irrelevant as both tests will grade you accurately according to your level of English.

TOEFL may tend to favour more abstract learners as many of the questions are multiple choices whereas IELTS may be more suited to concrete learners as it involves memory recall. If you have more experience with British English (or Australian English), take the IELTS as vocabulary and accents tend more towards British English. If you watch a lot of Hollywood movies and like US idiomatic language, choose the TOEFL as it reflects American English.

III. Conclusion

Thanks to the new Web technologies, conditions were created for the implementation of e-learning sites. The rapid expansion of this new Internet technology makes room for a completely new comparative way of education around the world. The result of this development was the increasing number of universities in the world with E-learning as an offer in its academic programs. However, if you want to attend some of those programs you must possess some certificate about your English-knowing skills. Certificates described in this work give exactly that. Whichever test you choose, you will have great online support in acquiring test samples, lections and official test-providing organization technical support.

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EDUCATIONAL COMPUTER SOFTWARE AS SIMULATION TECHNIQUE-EXAMPLES IN TECHNICAL AND IT EDUCATION

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Abstract - Modern teaching techniques and methods referring primarily to the use of animation, simulation and different interactive contents are listed in the paper; aiming to improve and modernize IT lessons and teaching. Namely, IT subject involves contents from the fields of mechanical engineering, electrical engineering, architecture, construction, traffic, transport, different modeling disciplines and informational-communicational technologies and technologies in general. Introducing modeling and simulating methods is very important, especially when it comes to the process of individualization in lesson planning and teaching. In this paper, we particularly describe possibilities given to students by using informational-communicational technologies in order to expand their previous knowledge in both qualitative and quantitative way. The aim of the paper is to show and connect theoretical and practical students' knowledge, on both primary and high school level of education, making the correlation and highlighting further advancement, as in choosing the right trajectory through their further education. Students are introduced, through simulating methods, to the fields of modern techniques and technologies, emphasizing the fact that they are important factor in human development and progress.

I. INTRODUCTION

Computers have application in every field of human life and work, from art to engineering, education, medicine, trade etc.

Many scientific experiments and tests conducted in laboratories can fail, with possible tragically consequences that can be successfully prevented by using computers. By modeling and simulating, which are inseparable terms, significant effects can be accomplished in both scientific and social disciplines.

II. THE DEFINITION OF MODELING AND SIMULATIONS

Models represent the analogy of the original system or an object, which embody the most important features necessary for the research process, or as often described as simplified copies of the originals.

On IT lessons, models are most often using to show the level of application of theoretical knowledge. Within the lesson topic "Constructive modeling," students have the opportunity to express their knowledge practically, through the form of technical writing, making technical algorithms, thus following the process from the idea to final realization of an actual model.

Models are made because doing research by using originals can be expensive. Models are cheap, simple, environmental friendly, affordable and safe which is very important during the research process, when parameters, structure and dimensions of a model can be easily changed.

Simulation implies observation of model in given circumstances, where the input parameters are provided in order to get output values in a given scale.

"Black box" model implies observing the output values in accordance to input values regardless the inner structure of a model.

This becomes increasingly important when it comes to modeling and simulation by using computers. Namely, all technical and scientific changes influence educational system, especially educators. Teachers become aware of the necessity of professional development in order to follow and apply innovative methods and techniques when teaching today's generations of students. When it comes to professional development, it implies both lesson content and teaching techniques.

The great number of teachers realizes the necessity to change traditional teaching methods and to apply modern teaching technologies including laptops, video-beams, interactive white boards, educational computer software and other multimedia. The application of new teaching technologies is necessary in order to increase students' interests and motivation in the process of learning and acquiring new information, thus to increase the level of application of the acquired knowledge.

III. EDUCATIONAL COMPUTER SOFTWARE

The term educational computer software implies any computer program that can be used in teaching process, and its use is because students are involved both individually and interactively.

"Software in the field of education stands for intellectual technology and it is called educational computer software (ECS), which encompasses computer languages and tools, certain organization of teaching and learning and which is based on logic and pedagogy. "[13]

After the development of intelligent tutor systems, which finds mistakes and "holes" in user's knowledge and work, thus, they lead a user through the completely learning process; a foundation is made for a development of educational computer software. In ECS, individual elements are connected to other texts, and along with the development of eBooks, which are hypertexts with limitations, we come to the development of multimedia and simulation.

When classifying ECS, following parameters are taken into consideration: learning methods, educational functions, control independence, ways of using computers and classification according to subjects.

The meaning of simulation is in experimental model of a phenomenon, which has been studied. A simulation in which a student defines a model is called building model. Simulations can be used in one-on-one practice, or as an instructional help in order to encourage group work learning in the classroom.

Technical-technological processes, which happen in factories and in laboratories, can be introduced and represented to students through different types of models and systems' simulations. In order for teaching process to be successful in the way of introducing modern teaching techniques, it is necessary to provide quality professional development for IT teachers. Teachers and especially those who graduated twenty or thirty years ago would have to master the usage of informational-communicational technologies, especially considering simulation and animation.

Modeling methods allow not only to teach theory, but also to test students without raising the stress level while making it easier and accessible with the results that can give fast feedback.

During the process of examination of learning model, teaching model and the model in teaching, it is necessary to emphasize certain questions:

- How the process of learning can be modeled,
- how the teaching process can be modeled and which model of teaching is the most effective, and
- how learning contents can be modeled.

In considering this issue, it is necessary to avoid all extremes, aspirations to scientific, mechanically centered and phenomenological approaches. For further discussion is necessary to define some general goals:

- Discover ways of modeling in the field of learning and teaching,
- to establish the function and the structure that model must possess in order to be effectively applied in a learning process, and
- measure the contribution of modern methods of modeling in solving problems when it comes to education and educational process.

The most effective way of mastering the material by the students, is for the students to learn by themselves, face to face with a qualified tutor, well- equipped with the instructional material, laboratory equipment and the like. [15]

Technical and IT education as a subject that is taught in primary schools in the Republic of Serbia and the neighboring countries has been suffered significant changes in the last 40 years. From the teaching inclining to stereotypes and skills, based on manual products, where this course was taught by the people who were craftsmen, to today's teachers who are BSCs or MSCs that teach by applying and using new IC technologies including simulation and modeling, but not running away from making actual models. Practical work is now defined as constructive modeling, where students learn about the technology of materials, their use and methods of processing, about tools and machines in school workshops and classrooms.

Not all of this could be achieved, especially when it comes to following modern tendencies in development of techniques and technologies that are taught in the curriculum, without professional development of teachers on formal and informal level.

Modern cabinets that have a room called workshop with tools and means for handling the materials, but also computer-equipped classrooms have become the centre of work of modern IT teachers.

In this way, each student can be accessed individually and in terms of differentiated instruction, which is especially important when you want to keep track of students' progress, his future professional development and commitment to the profession, which is also one of the aims of technical and IT education.

IV. POSSIBLE APPLICATIONS OF COMPUTER SOFTWARE IN TECHNICAL AND IT EDUCATION

The use of Educational Computer Software (ECS) has immense possibilities in technical and IT education, as a source of information and in terms of safety and protection, especially when it comes to primary school students.

Materials and tools ease the process of teaching and learning, and as such, they mediate between curriculum, a student and a teacher. The teacher and the tools cannot be in confrontation, especially knowing that the tools themselves are not enough to enhance the process of learning.

Application of educational tools in modern teaching depends on various factors, the most important ones are:

- positive attitude of a teacher towards new teaching technologies and techniques;
- teachers' clear understanding of an innovation;
- innovation should be within a scope of a teacher's abilities;
- necessary resources should be provided;
- administration and organization;
- providing information through communicational channels;
- time needed for the application and acceptance of an innovation etc.

Educational Computer Software allows interaction and it has very significant role in mastering the curriculum by every individual student.

V. THE EXAMPLES OF APPLICATION OF EDUCATIONAL COMPUTER SOFTWARE IN TECHNICAL AND IT EDUCATION

Modern educational tools find great deal of application in the process of teaching and learning. The concept and the way of teaching technical and informational education has been changed through time and adapted to contemporary concepts of learning and development of students' abilities due to technological enhancements and innovations.

Technical disciplines, as a base for technical education in technical fields, and technical contents in general educational subjects formative for the development of technical culture, have physical and material parameters of phenomena studied. Apart from the fact that in technical sciences contents are expressed as abstract and general knowledge in the complex term system, it is necessary to rely on higher level of actual and shown.

Computers, the Internet and multimedia have become structural parts in the process of technical education. In schools, today, there has been used general software for a large number of potential users, as well as a large number of specialized software developed to solve specific problems, to do specific tasks, activities etc.

The best-known educational software used in teaching today is part of the Microsoft Office suite. This suite was primarily planned to satisfy the needs in different fields. However, it has quickly appeared on personal computers.

The examples of simulations, animations and use of educational computer software in the subject of electrical engineering are the following:

A. Designer's school

Software for design, analysis and simulation in fields of electronics:

- electronics,
- microprocessors and microcontrollers,
- RF modules,
- interface and development of small projects

B. MACROMEDIA DIRECTOR

Macromedia Director is a software tool used for making multimedia applications, and as such, it has a significant place in the multimedia system.

Software tool, Macromedia Director, is based on so-called Stage concept. Creating applications by using these tools starts with a blank screen, or a stage, in, which we put, objects that will be used in actual presentation. Each object is assigned with a certain number of sequences in which it will appear, a path it will follow on the screen and a certain action that it will do, whether they are provided with a tool or created by a user themselves. Director stands for most widely used authoring system. Director is an application that is used primarily for creating multimedia presentations and has excellent characteristics in terms of ease and speed in which the application can be made. It uses timeline approach, scripts and objects, and each object can have numerous features, effects or behaviors.

Director possesses its own internal programming language, which is easy to learn and provides numerous possibilities. Its name is Lingo. This suite generates executable code and this is its good characteristics. In which way the application will be created depends only on author's knowledge and imagination.

Creating software in this programming tool looks like making a movie. In the following pictures the applet is shown, which represents the principles of working of a four-stroke engine. Applet is demonstrative and suitable for using in technical and IT education.

Figure 1. Principle of working of a four-stroke engine - first and second stroke

Figure 2. Principle of working of a four-stroke engine - third and fourth stroke

Another important project in the field of ECS and simulations is Vlabs Electricity, which represents the use and composition of electrical circuits in a simple way. This is very important for 8th graders, because this topic is in their curriculum for IT education.

Figure 3. Tutorial Vlabs Electricity

Software usage is depicted in picture 3. It is intuitive and very simple to use by students, and all others that are interested in the field of electrical engineering.

Figure 4. Starting work in Vlabs Electricity

Picture number 4 represents user interface, where its content and possible ways of usage are shown while simulating work of electrical circuits.

VI. EXAMPLES OF SIMULATIONS IN IT EDUCATION-FIELD OF ELECTRICAL ENGINEERING

Educational computer software made by using Macromedia Director can be evaluated before its active application in educational process, relying primarily on objectivity of an evaluator. On this occasion, the ECS is made to explain Ohm's law, which is unavoidable when it comes to explaining of electrical circuits in IT education.

One of the basic laws in the field of electrical engineering is **Ohm's law.** It is one of the first lesson topics that are mandatory for every future electrical engineer.

$$I = \frac{U}{R}$$

I stand for electrical current, U stands for voltage, and R stands for resistance.

This formula defines principles of change of electrical current in electrical circuits, which is directly proportional to the change of voltage and inversely proportional to a circuit resistance.

Considering the fact that electrical current is not visible to a human eye, students may have difficulties to imagine and understand that micro world. In order to demonstrate them what the formula means in practice, the model of a simple electrical circuit can be used.

Program that is used for this simulation is Macromedia Director MX, Version 9.0.

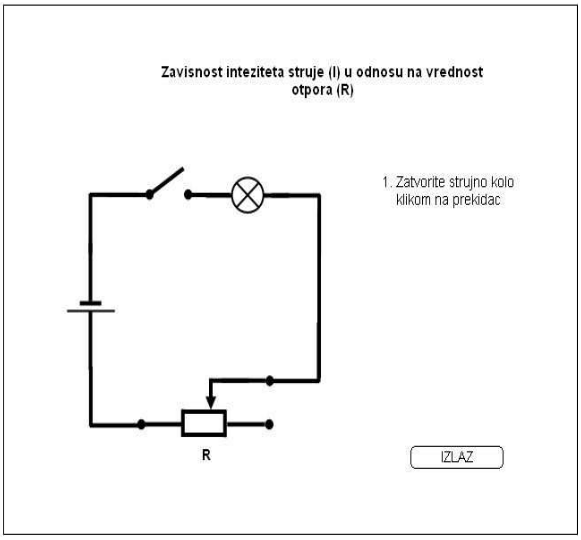

Figure 5. Opening screen

On the opening screen, there is a simple electrical circuit scheme with a switch in an open position. Next to the scheme is an instruction for starting the simulation and a key to exit the program at any time.

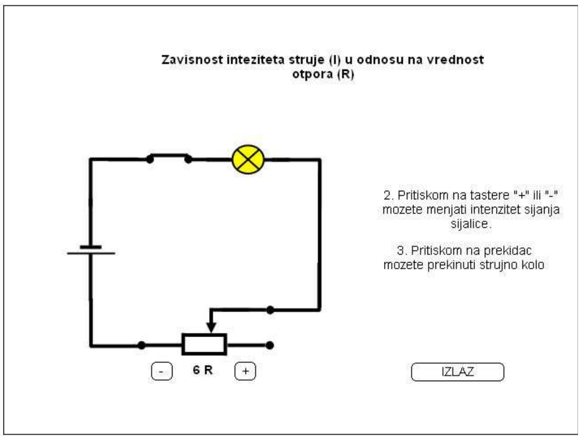

Figure 6. Picture 6. A circuit with medium intensity of electrical current

When the switch is in a close position, the circuit is closed and the light bulb glows with medium intensity.

If the intensity of electrical current is increased (which directly influences the intensity of a light bulb glow), a user can click "+" or "-" in order to decrease intensity. Students will comprehend that the intensity of resistance will fall, in order for the intensity of electrical current to rise, or vice versa.

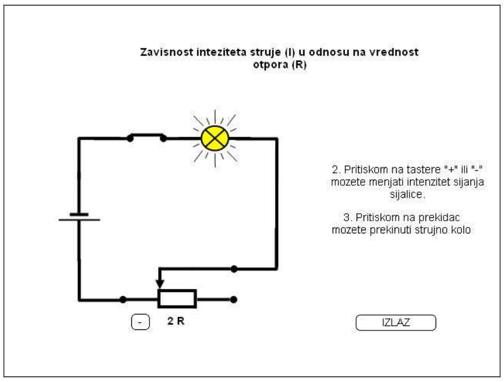

Figure 7. Picture 7. Circuit with maximum electrical current intensity

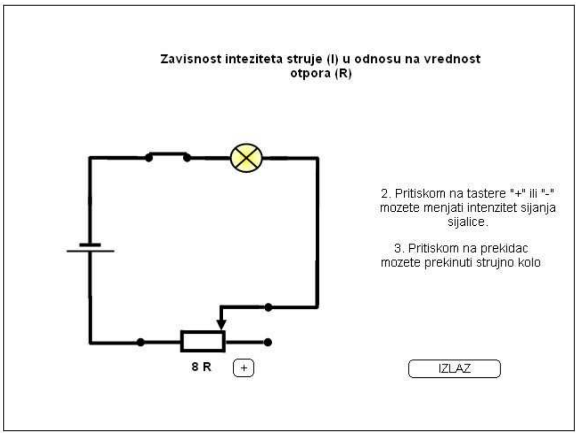

Figure 8. Circuit with minimum current intensity

In this example, resistance is constant and it does not influence the current change.

Simulation model is very effective educational tool because it communicates with students using pictures that are clear and unambiguous, as words, themselves can be.

Safety when dealing with real electrical circuits can be compromised, which is completely avoided by using a model. Students can start the simulation independently without a teacher at any time that suits them.

VII. Advantages and Disadvantages in Using Educational Computer Software in IT Education

Advantages of using ECS as a simulation technique in IT education are numerous, starting from students' safety and health to better and faster level of acquiring and mastering new contents.

However, teachers that prefer practical work and direct contact with machines and appliances will probably find reasons for deficiencies. Namely, it is clear that practical work is irreplaceable, especially in cabinets, factories or craftsmen's workshops. However, it should be bear in mind that the pace of technological process in factories does not tolerate students' slow pace, but requires skilled employees that will contribute equally alongside with their experienced senior colleagues.

On one hand, we have advantages when it comes to acquiring new knowledge and information provided by ECS, and using new software solutions. On the other hand, we have deficiencies, especially when it comes to teachers' lack of aspiration for further professional development.

VIII. Conclusion

First simulations appeared for military purposes, all new; innovative that has been created for military usage, only to find their application in every day education, as useful educational tool. [15]

Basic aim of applying simulation techniques was to provide real states models, repeating scenarios, learning by discovering and learning on mistakes, in a simple and affordable way. Nowadays, a large number of producers use computer simulations as in computer games or making SF movies, while the number of those interested in their educational application increases constantly.

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THE USE OF ALGODOO IN TEACHING TECHNICAL AND IT EDUCATION - AREA OF TRAFFIC SAFETY

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Abstract - Algodoo is educational software, which provides a very simple and easy way to create a variety of two-dimensional scenes, as well as performing simulations over them. The use of educational software is possible in teaching technical and IT areas. Simulative-educational software, which we are going to present, has the task to help students in learning and overcoming the teaching material, enriches the textbook and helps to develop intelligent and creativity among students. They will have a possibility through interesting and interactive way, to get certain knowledge in the area Traffic safety from the mentioned subject.

I. INTRODUCTION

Today, teachers and professors successfully engage in classes with the use of a computer with a solid theoretical and technical knowledge, which is evidence that IT are successfully implemented in all educational institutions.

Algodoo is software that is designed for creating 2D scenes and performing 2D simulations. The interface is designed to allow simple and easy creation of 2D scenes. In addition Algodo already contains within some ready-made educational scenes, and each time we have available a database with countless scenes on the website of the publisher. The software is very suitable for the development of intelligence, creativity and technical thinking of children.

The main purpose of this application is introducing the students with the essential concepts in the area of technology and science.

II. ALGODOO

Algodoo is educational software, which provides a very simple and easy to create a variety of 2D scenes, as well as performing simulations over them. This software can be used for educational purposes and for pure entertainment. Also can be used by children of preschool age. The graphical interface of this software is reminiscent of the design of modern cartoons.

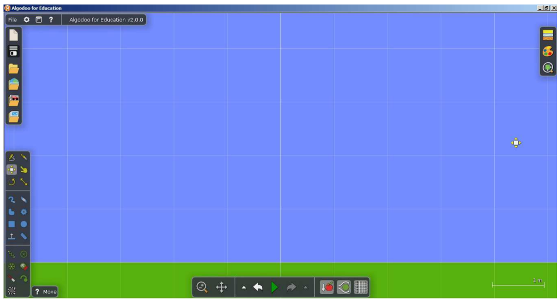

Figure 1. Algodoo for education

A. *Historical development*

Before the historical development of this software, it is necessary to say something about application named Phun Physics. Phun Physics is a game developed by the Swede Emil Ernefeld, for his master's thesis at the University of Umea, Sweden in 2007.

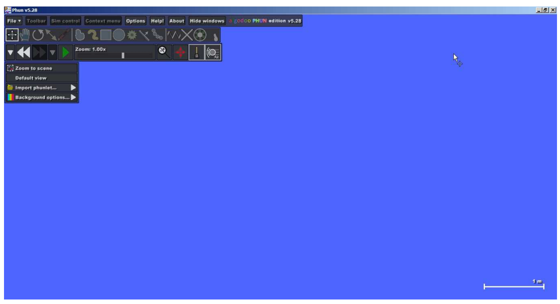

Figure 2. Phun Physics

Phun is written in C++ programming language. Phun and Algodoo use "Thyme", an integrated programming language that was developed by aforecited author. The use of "Thyme" programming language it is possible to do things that we cannot with standard tools.

In December 17, 2007, Phun Physics was officially released. In 2008, the software gets various improvements. Adding new features and capabilities such as the coordinate grid. Later this software will be known as Algodoo.

Phun physics becomes a free version of Algodoo with many modest and reduced abilities. In that period, the Phun Physics becomes a trial version of Algodoo. The last version of Phun Physics was published in 2011, with fully support of Windows 7 operating system. Algodoo continues to develop, with frequent updates. Today, Algodoo is available for PCs, Intel Classmate PC, tablets and interactive boards.

B. Phun Physic

The program is run by clicking on its icon. The next thing what you will see is welcome screen. The main menu and toolbars are in the upper right corner. In the main menu there are following options: File, Toolbar, Sim control, options, and help, about, hide windows.

Option „File“:

- Save scene-save the current scene
- Load scene-run saved scenes
- Clear scene-clear current scene
- New scene-new scene
- Erase all water-delete all fluids in scene
- Change language
- Zoom to scene-zoom to our model
- Show sum info-Information of current simulation
- Toggle full screen
- Find more scenes-dinds more scenes on the internet
- Buy Algodoo

Option „Toolbar“:

- Move
- Resize
- Scale
- Knife – draws a line to cut out a polygon
- Polygon tool
- Brush tool
- Draw rectangles
- Draw circles
- Draw gears
- Plane tool – creates on infinite plane
- Draw chain tool
- Spring tool – connects two objects with a spring
- Fixate tool – weld an object to its underlying object
- Tracer tool – attaches a trace to the object

Option „Sim control“:

- The arrow on the bottom - down menu with the previously executed actions
- „Undo“
- „Redo“
- The fourth icon is identical to the first, there appears a list of actions that we have cancelled with the option "undo"
- The fifth icon- starts or pauses the simulation
- Zoom- enlarge or reduce the view of the scene
- The seventh icon +/- direct click on the icon, and move left or right
- „Move“- can move around the stage with moving the mouse
- Ninth icon - this icon can switch on or off air resistance in the simulation
- Tenth icon-this icon can switch on or off air resistance in the simulation

Options tool

This panel consists of six cards that contain setting for all software, including:

- Interface-set the interface layout
- Simulation-adjust the elements of the simulation
- Rendering-set the rendering quality
- Visualization – turns the scale indicator on and off
- Layers-show and hide objects on different layers
- Defaults-returns al setting to its default state

Option „Help“

Selecting this option appears in the panel that contains the instructions for use of the software.

Option “About“

Clicking on this option a window will appear with information about the software, website and producer advertisement to purchase the full version of Algodoo software.

C. Algodoo

Based on the interface can be seen that the Algoddo is more advanced than the Phun. Algodoo has its own icon and so runs the program. The initial interface has a specific background signs that indicate where things are with a short description of each label. In the middle, it appears window with note greetings with three options.

The first one is setup, which allows you to adjust quickly the layout of the user interface, as well as languages.

Second option is the tutorial and by clicking on this option it will be displayed a window with a detailed description of each tool and instruction for use.

The third option is the Lesson, which refers to the page with the finished educational lectures and exercises. This piece of software is the most important for us because our goal is primarily application of Algodoo for educational purposes only.

Algodoo saves scene automatically when closing the program and when you next time run the software it will appear the same scene. The only defect is that it does not save the previous states and the best thing is to save the scene before executing the simulation. Opening a new blank scene is done by clicking on the first icon tray, which is located under the main menu on the top left corner, and then it will provide the choice of the kind of scene. The difference is related to the configuration of the background color and some other elements.

Now we are going to specify the elements in Algodoo that are not included in Phun Physics.

The main menu has been simplified and unlike Phun Physics contains only 5 options.

Navigation pallet

Navigation pallet is located in the upper left corner below the menu. It contains six options relevant to the management of the scenes.

- New Sceme-used to create a new blank scene
- Save-used for storing new scene or the current state of the existing new scene
- My scenes-opens directory that contains scenes which users have made and put to download
- On-line scenes- opens on-line directory that contains scenes
- Components-the same as they Phunlets Phun in Physics
- Lessons- refers to a scene with a ready-made educational lessons or scenes

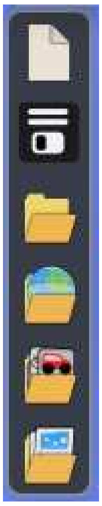

Figure 3. Navigation pallet

Palett with tools for modeling

This palette is in the lower left corner and contains tools for modeling. We will describe those that are not in Phun Physics. There are four new tools:

- Tool for fast modeling. It performs two functions-the first one is drawn closed polygon that turns into an object and a second function is cutting facilities
- Rocket propellant -adding suppressors to the object, it is possible to make the flying objects and adjust their volume and activation key
- Laser-with laser you can demonstrate the refraction of light through glass items such as lenses, prisms, spheres. It is possible to adjust the color and intensity of the laser, as well as the speed of the photons. Lasers can be assigned activation button and then laser can cutting items

Figure 4. Palett with tools for modeling

Simulation control palette

The differences in relation versus Phun Palette for control the simulation is that in this case there is an added option to display a grid, which enables accurate modeling.

Figure 5. Simulation control panel

Palette for control over the visualization

It is located in the top right corner and contains three icons.

Clicking on the first, the window will appear for the management of the materials of the selected object. The second icon is used to adjust the color or texture of the object, and the third is used to enable or disable the display of direction, course of action of some forces etc.

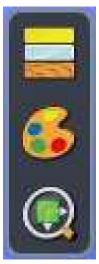

Figure 6. Palet for control over the visualization

Shortcut menu

Unlike Phun Physics, the user interface of Aldogoo does not contain a shortcut menu and he will appear after you right click the mouse on the object.

Figure 7. Shortcut menu

III. THE USE OF ALGODOO - TRAFFIC SAFETY

Algodoo is very good simulation software for use in education. It can be used in almost all areas related to the technical aspects of teaching technical and IT education. This paper presents a simulation that is related to traffic safety.

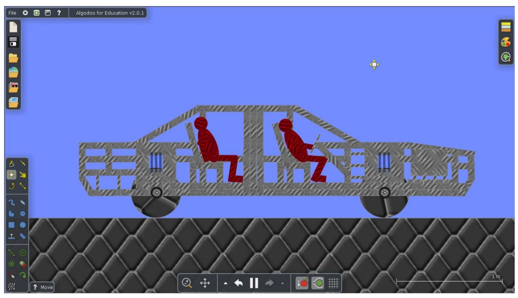

Figure 8. Simulation of traffic safety

On the previous picture was shown the initial state of the scene, the car is at the standstill.

Figure 9. The car after the crash

On the previous picture was shown the same car immediately after the crash into a concrete wall at a speed of 50km/s.

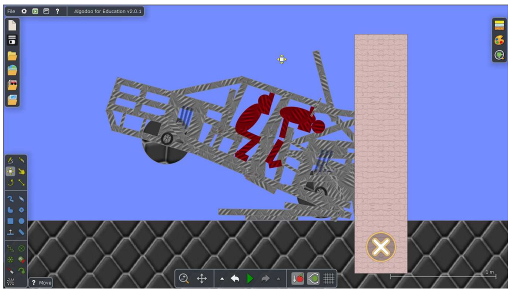

Figure 10. The car after the crash

On the previous picture was shown also the same car collision in the same concrete wall, but this time at speed of 100km/s.

IV. CONCLUSION

The main goal of this simulation is that in a realistic, interesting and creative way represent the students the importance of adjusting the speed of the traffic regulations and the importance of seat belt attachment. Also could be seen the horrifying consequences of a collision at high speed.

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INTERACTIVE SIMULATIONS IN TEACHING TECHNICAL AND INFORMATION TECHNOLOGIES EDUCATION

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Abstract – One of the main goals of contemporary education is independent work of students and development of practically applicable knowledge. In this process teacher directs, advises, encourages and guides a student through the process of construction his/her own knowledge base, The use of computers in teaching makes it possible to provide this kind of individualization in learning, The goal of this work is to represent the utilization of computers in learning by using simulation in teaching,

I. INTRODUCTION

Teaching of Technical and Information technologies Education is specific because it covers broad technical-technological area and as such, it has a task to show students almost all aspects of human life and work. Some of the specific tasks imply getting to know and understand various technological processes, modern technology, principles of machine and device operation, functions of electro-energetic system, mastering and usage of information communication technologies. Thereby there is a great responsibility on the teachers who have to be ready, but also qualified, to use different teaching resources and teaching methods in order to achieve the goals and tasks of teaching considering, that students are not able to follow these processes directly. Introducing computers into teaching process, opens new possibilities for usage of innovative teaching methods. Although in praxis we usually come across multimedia presentations, there are more and more examples of using other advantages that computers provide in teaching by which the emphasis is on independent work and research of students. Those are web tools, internet, educational software, programs for modeling, simulations and likewise.

School subject TIE is one of the most dynamic subjects and it is necessary to provide permanent changes as in the way of innovating teaching contents and in methodical innovations and conditions in which it is implemented [1].

In teaching technical and informational technologies education, moreover than in other teaching subjects, there is a need and also the opportunity to use models and simulations so that students would get familiar with various processes, principles on which machines and devices work, technical and technological systems and also to provide safety of students in the process of working,

This work is going to present one possibility of using computers in teaching – simulation of technological process of producing paper.

II. MODELING AND SIMULATIONS

"Modeling is a scientific method in which we study the object, systems, phenomena or processes through natural or artificial constructions, which are analog to some other object, system, phenomena or process, that are unable to study directly due to various reasons" [2].

Modeling represents a procedure of mimicking phenomena, processes, items, systems with the goal on gaining certain knowledge. By this procedure, only important characteristics of the original, which are significant for the study, are abstracted, the result of modelling is a model. A model is a simplified and idealized picture of reality which is very suitable for using in teaching, since it enables us to get to know real system in a simplified way and without dangers which can arise by experimenting on a real system,

In the process of modeling, we can notice two phases: in the first phase, we recognize important characteristics, moments and factors in ongoing of a certain phenomenon while the second phase is about practical representation of a model. Model can be represented as a layout – physical object, but also as mathematical object, language object, abstract model etc.,

There are two basic forms of modeling: theoretical modeling and practical modeling. The result of a theoretical modeling is every notion, equation or formula and the result of practical modeling is every material product of human activity.

According to Ikonović V., "basic functions of modeling are:

- practically-applied, model can be used to resolve a practical problem,
- demonstrative, using of layouts and models for educational purposes,
- investigative, research and gaining new knowledge" [4].

Recommendations for building a model :

- "boundary of a model must be set so that model includes only phenomena of interest
- model must not be too complicated or detailed
- model must not oversimplify the problem
- model should be divided into a few modules to be easily built and checked,
- some of the proven methods for development of algorhytms and programs should be used,
- checkup of logical and quantitative correctness of both model and modules should be done" [3].

Simulation is an experimental method, which enables the study of a real process through its model.

Modeling is a process by which we make connection with a real system and a model. Validation of a model shows how faithfully model represents a simulation process. On the other hand, there is a simulation as a process, which makes connection between a model and a computer. The assessment of correctness is called verification. Verification is a checkup of whether the simulation program faithfully transfers model onto computer and with how much accuracy does, the computer performs the instructions.

Specified connection between modeling and simulation can be represented by the following scheme:

Real system – Modeling – Model – Simulation - Computer

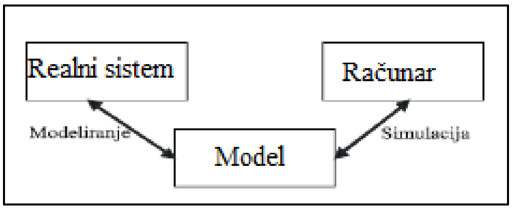

Figure 1. Connection between modeling and simulation

By the process of simulation modeling, we can solve real problems and observe changes in some time interval. The life cycle of a simulation consists of series of steps, which describe phases of solving problems. Number of phases and their order depends on specific situation.

Basic phases in the process of simulation are:

- defining the goal of simulation process – we define a problem which must be solved ;
- identification of a system – description of components, work mode, connection to the surroundings
- gathering and analysis of system data
- building of a simulation model
- building of a simulation program
- verification of a simulation program
- evaluation – validation of a simulation model
- planning and conducting simulation experiments
- analysis of results of experiment
- conclusions and recommendations [3].

Definition of a goal of research

- Identification of a system
- Gathering and analysis of input data
- Construction of a simulation model
- Construction of a simulation program
- Verification of a simulation program
- Satisfies – no – yes
- Evaluation of a simulation model
- Satisfies – no – yes
- Planning and conducting the experiments
- Analysis of results of experiments
- Satisfies – no – yes

- Conclusions and recommendations

Computer simulation represents a program, which solves problems concerning prediction and determination of future states of modeled real systems based on studying computer model of that system [3]. Computer simulations have two basic characteristics:

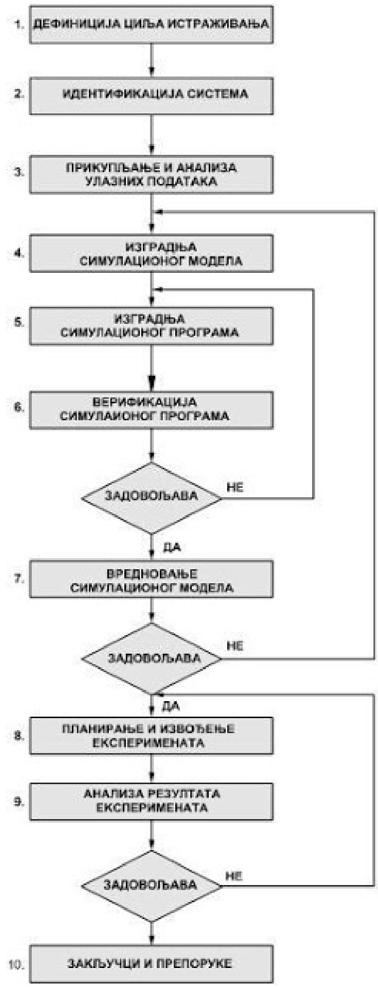

Figure 2. Diagram of the phases of simulation process

1. there is a computer model of real or hypothetical system which consists of data that speak about behavior of that system and,
2. there is a possibility of experimenting with the system by changing input data into model to get various output values,

Some of the common characteristics of educational computer simulations are: interactivity – students have the possibility to change different variables and observe behavior of the system at the outcome; model based – simulations are based on the models which they faithfully represent; operating by the interface – with graphic interface which is adapted to the age of students, they can input and change data; support in the work – in any moment, a support of a teacher is provided through explanation of how to use the simulation.

Simulations enable learning through discovering, research, they stimulate students to ask questions and lead to their own discoveries.

Some of the advantages of using simulations are a model, which was once built, can be used multiple times, simulation methods can be used as help in analysis, and simulation data can be gained cheaper than by analyzing the real system, simulation is sometimes the only possible way of analyzing the system [6].

Basic disadvantages of using simulation can be: high price of simulation models for computers, conducting a simulation can sometimes require too much time and computer memory, for correct usage a permanent support is necessary [6].

III. SIMULATION IN TEACHING TECHNICAL AND INFORMATION TECHNOLOGIES EDUCATION : PROCESS OF PRODUCING PAPER

The curriculum of the school subject Technical and information technologies education, includes areas of mechanical engineering, electrical engineering, electronics, architecture and construction, traffic, graphic communications, information and computer technologies, robotics, energetics, materials and technologies. Each of these areas has its own specificities, which condition also the way of presenting the material to students. In addition, it is advisable to organize visits to museums of technics, fairs and visiting of production and technical objects, always when the conditions allow it. Otherwise, students need to be provided with multimedia programs in which these problems are presented,

"Simulations make understanding and memorizing natural and social processes easier, they speed up the acquisition of skills, they provide positive transfer into real use of acquired repertoire of behavior" [5].

Simulations can be used as highly efficient tools for learning in teaching process because they provide the possibility of changing input data as well as other conditions of system functioning. By experimenting on the model, students can get to know specific systems, which are unable to be really shown due to various reasons.

When analyzing the curriculum of a school subject Technical and IT education from 5th to 8th grade, we can conclude that there are very few lessons, which could be presented by using simulation. In the 5th grade, within the teaching area of Materials and technologies, students learn about materials, which they are supposed to use in construction modeling: wood, paper, textile, leather, plastic materials.

Within the topic of Paper (paper, sheet), basic information about history and usage of paper are given a then students are presented with the technological process of the paper production and types of paper. Because students are not able to observe and follow the procedure of making paper immediately in the facility, it is necessary for a teacher to provide the illustrations, film and alike.

Paper production has three phases. In the first phase, wood is broken in a special machine with the addition of water. By this way, we get a mixture, which is called the pulp. Then chemical ingredients are added to the pulp – fillers, glue and colors. In the second phase, the prepared mass is stirred in the special baths and thus it is smoothed and then conducted into the machine for making paper. Prepared mass flows over the endless sieve, which moves, shakes, and thus spreads the paper mass evenly. Through the sieve, redundant water is removed. Drained mass then travels into machine with cylinders that press the paper, thin it and dry it. Finished paper is rolled around the cylinder into a tube, and then it is cut into specified dimensions and in the end, it is packed for transport.

At the beginning of the simulation, students can choose one of the given topics: life of paper, recycling of paper or production of paper.

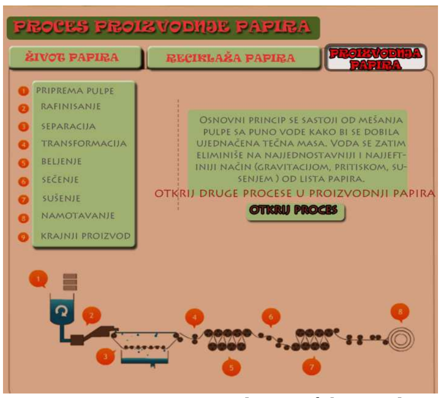

Figure 3. Initial page of the simulation

Process of paper production

Life of paper; Recycling of paper, Production of paper

1. Preparation of the pulp
2. Refining
3. Separation
4. Transformation
5. Whitening
6. Cutting
7. Drying
8. Winding
9. Final product

Basic principle consists of stirring the pulp with a lot of water to get even liquid mass. Water is then eliminated by the simplest and cheapest way (using the force of gravity, thrust, and drying) and we get a sheet of paper.

Discover other processes in the production of paper

Discover the process - On the picture, an area of Production of paper is chosen and by it, a short description of production procedure is opened as well as all phases of this process. By clicking numbers, process is activated from the given number and by clicking the arrow, the whole process from the end to the start.

1. Preparation of the pulp

Fibers are stirred with water into "pulpera". There are two types of fiber cellulose:

1. long fibers (hard wood) and
2. fibers of sustainable forests (softwood)

Cellulose fibers

Water and pulp

Figure 4. Beginning of the process

At the beginning of the process, student should properly click/choose from the given list the materials from which the paper is produced. If he/she has chosen right, he/she can then start the process of mixing into pulpera and if not, the program returns him/her to the initial screenshot where there is an explanation. Simulation shows the direction of mixing represented by an arrow.

Processing - Fiber mixture contains 97% of water. Before machine, processing it is cleared and refined.

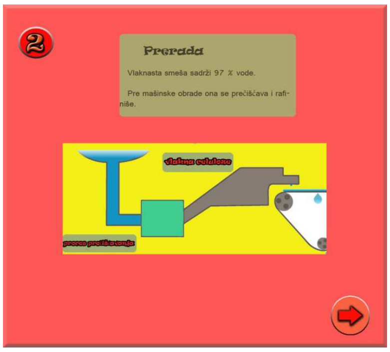

Figure 5. Processing phase

The upper picture shows the phase of a process in which purification and refining of a mixture is simulated before the machine processing. Clicking on the square opens the process of purification. After that, the mass slowly goes to processing.

Wet section - This mixture is then arranged over the canvas, which is on the string. String goes through cylinders and mixture is during that time drained since it is necessary to remove water from it.

String, drained water - Then comes the wet phase in which water is separated from the process and goes into mixture drainage. Water is drained from the mixture and it goes into special container while the mixture goes on to the processing. It is necessary for the students to click on the cylinders to start the simulation/process. Unless they omit this step, simulation takes them back to the beginning where there is a textual explanation of a procedure that they have to repeat from the beginning.

Figure 6. Wet phase

Transformation of the pulp - Pulp gradually changes into fibrous paper sheet. This fibrous paper sheet is pressed on by going through cylinders on the machine, press with the absorbing cylinder

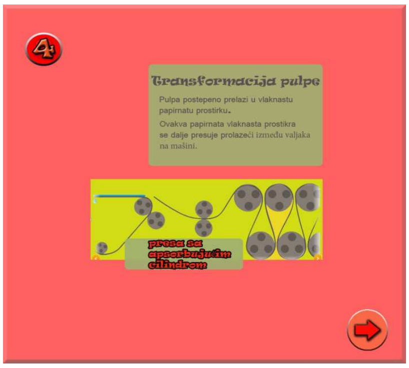

Figure 7. Transformation of the pulp

In this phase, students are shown the process of pressing paper sheet by sending it through the cylinders.

Whitening - Water keeps evaporating from the sheet by going through sections for drying and pressing.

After this process, we get base paper.

In this phase, paper keeps drying and pressing. Students are supposed to turn on the heaters in the cylinders to activate this procedure. Clicking on the cylinder will turn on the heater and the cylinder will change its color – it becomes red.

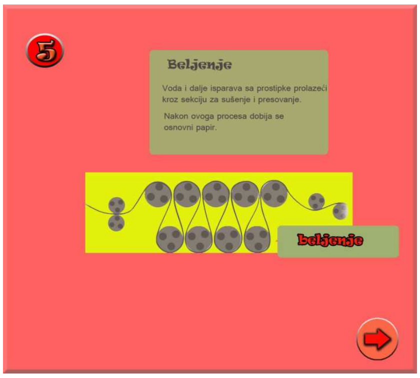

Figure 8. Whitening phase

Coating - To increase the quality of base paper, it is coated through the press on paper machine. Various substances depending on purpose in which paper will be used, as also to improve its characteristics can do coating of paper. Clicking on the brush, opens the menu from which students can choose different sorts of coating material.

Figure 9. Coating of paper

Drying - Base paper goes through the drying section to remove water, which was added in coating.

Heat cylinders - After coating, base paper again goes through cylinders to remove excessive water from the coating. Students have to start the process by clicking on every cylinder that they want to run.

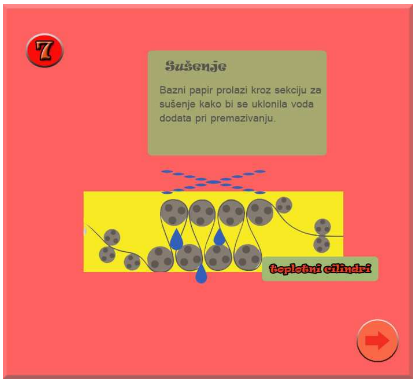

Figure 10. Drying after coating

Big coil - At the end of paper making machine there is a coil for rolling the base paper. Depending on the weight of paper, this coil can weigh up to 15-20 tones.

At the end of process, paper is rolled on the coil, which students start by clicking on the center of the coil.

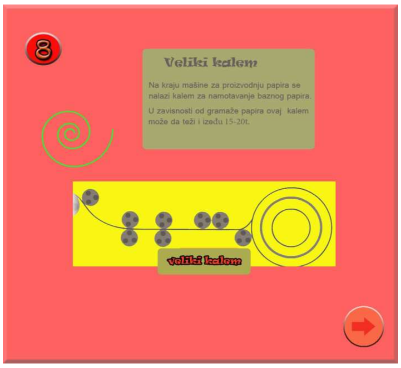

Figure 11. Rolling up of paper

III. Conclusion

We came up with the idea of making simulation of paper production after the analysis of educational areas, which are studied in the school subject Technical, and IT education. Students meet with the process of paper production in the fifth grade and it is necessary to show them this process in the way, which is suitable to their possibilities and age. This simulation offers students to get familiar with this process through a kind of a computer game, which they are close to.

Each screen of the simulation is followed by textual explanation to which the program returns students if during the work they come across difficulties. Auditive effects are also predicted to follow the students work.

This simulation has open possibilities for improvements in the means of comparing process of paper production with process of recycling old paper and its reuse. This would enable students to come independently to conclusions about the importance of recycling paper, about saving water, energy as well as other resources, which are gained through the process of collecting and recycling of paper.

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ANALYSIS OF INFORMATION TECHNOLOGY APPLICATION IN MUSIC PRODUCTION

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Abstract - Around the world and in Serbia, as well, new ideas are starting to develop in connection with the new educational system in music schools. The result is a newly-formed department in music schools. In additon to the department of Music Production and Sound Recording, there is an educational profile called Sound Designer. Students who are a part of this educational program attend the course of Sound and Music Technology Process: Audio 1, 2 and 3 throughout a three-year program, which is different for each year. In the third grade of music high school (educational profile Sound Designer) and during the course of Sound and Music Technology Process: Audio 3, students would only deal with the music sound on the computer. Sound and Music Technology Process: Audio 3 is a new course on this department, therefore is unfamiliar to students. Furthermore, there is a necessity for multimedia presentation, which would help the students to better understand the content of the aforementioned course. The presentation which deals with this course is given as the part of the master's thesis: "Analysis of information techology application in the music production". The presentation will serve as a help during the content analysis of the course.

I. INTRODUCTION

Computer and information technology development influenced its wide application to every aspect of people's lives. Fast hardware development is followed by even faster software development. Aside from suitable hardware, many other software programs are developed and applied for easier and more precise performance of the tasks, such as software systems for precise measuring, software systems for placement, educational software, information systems, expert systems, software systems for sound recording and reproduction, etc. Music production is a complex process which involves different experts and different fields of expertise, such as creation and realization of music by composers and different performers, music producers (experts who can be defined as sound directors) and sound engineers whose task is to finalize the process in music and postproduction studios. Nowadays, music production and music studio work cannot be imagined without the use of computers. Additionally, it is unimaginable for a music school student not to have basic knowledge required for music production and for work in a music studio, as well as for work on a computer. Therefore, there is a need for schooling of young musicians for work in a music studio, i.e. for music production and sound recording. It is necessary to combine students' talent and creative thinking with the latest technology and computers.

II. MULTIMEDIA PRESENTATION: TECHNOLOGY OF SOUND AND MUSIC PROCESS: AUDIO 3

"Technology of sound and music process: audio 3" is a multimedia presentation which is primarily intended for third grade students who attend music high school and who are enrolled in the Department for Music Production and Sound Recording, educational profile Sound Designer. The department is founded with the purpose of clearly presenting the content, helping students to master the material and teachers to present the teaching material for the course of Technology of Sound and Music Process: audio 3.

A. Multimedia computer software

Computer software where all the information is presented as any combination of text, graphics, sound, animation and video, which can be used with the purpose of improving the teaching process is called multimedia computer software, i.e. multimedia presentation. Software presented in this paper is a multimedia presentation.

In order for software to be multimedia, the author has to know how to create all the elements of multimedia and to combine them in such a way to achieve the maximum performance. The author has to be knowledgeable about both hardware and software technology. Since multimedia is a wide scientific field, it is also necessary to be knowledgeable about design, marketing, communication science, psychology and didactics.

B. Presentation of "Technology of Sound and Music Process: audio 3"

Even though it is primarily intended for third grade students who attend music high school (educational profile Sound Designer), multimedia presentation "Technology of Sound and Music process: audio 3" is designed in such a way that it can be easily used. The windows are adjusted so that the user can return to the home page at any time and choose the desired category. At any time, the user knows his/her location on the page and can exit the program or minimize the window, if needed. Multimedia presentation is designed so that the user does not have to open all the windows or categories, but the categories can be chosen as needed.

Introductory page serves as the introduction to the content of multimedia presentation "Technology of Sound and Music Process: audio 3" and is accompanied by pleasant instrumental music. Enter button serves a purpose of shifting the window from Home Page to Main Menu (Figure 1.). This page contains the category names, more precisely, the pointers to the categories that need to be processed. By placing the mouse pointer on the category name, it changes from a hand into an arrow. Exit, Help and Info buttons can also be found on this page and are represented as links that lead to the appropriate page. The window contains buttons for minimizing the window and for exiting the program. When mouse pointer is placed on a button, its name appears.

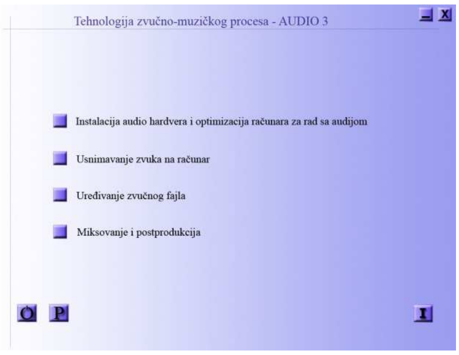

Figure 1.The layout of the window with the main menu of multimedia presentation

At any point of multimedia presentation "Technology of Sound and Music Process: audio 3", the user can return to this window by clicking the Menu button. Pleasant male voice introduces us to the category called "Audio and hardware installation and computer optimization for audio work", which contains the following subcategories:

- "Installation and synchronization of sound card and its drivers"
- "Computer and operating system optimization for audio work", which is divided into following categories:
- "Characteristics of computer hardware for professional sound processing"
- "Operating system optimization for audio work"
- "Sound recording onto a computer" category contains the following subcategories:
- "Audio file recording onto a hard drive"
- "Introduction to the two-channel audio editor, Sound Forge"
- "Manner and type of audio file representation as a part of audio software"
- "Storing of audio file"
- "Dynamics and resolution of audio file":
- "Basic form of digital audio signal"
- "Other forms of digital audio signal – security and channel code
- "General level scales of analogue signal"
- "Quantization noise"
- "Sampling frequency and frequency characteristics of audio file"; shown in Figure 2

Male voice introduces us to the basic characteristics of this category. Buttons for minimizing the window and exiting the program are incorporated, as well as the Menu button which leads us back to the Main menu. The appropriate button name is shown when the mouse pointer is put over each button. As in previous categories, male voice leads us to the topics that will further be processed.

Category called "Audio file editing" contains the following subcategories:

- "Destructive and non-destructive editing"
- "Digital processing of signal and basic procedures"
- "Intensity level optimizing of signal performance with consequences"
- "Dithering and Noise shaping";

- “Representation and interpretation of basic terms related to audio”
- “Mixing and Merging two or more audio files”
- “Absolute and relative audio files’ levels in the process of digital mixing”
- “Audio file converting into different sample standards”
- “DSP adjustment of audio file”
- “Fourier and Fast Fourier transformation”
- “DSP audio adjustment” category contains the following subcategories:
- “Equalizers”
- “Dynamics processors”
- “Compression and expansion of time period and pitch adjustment of audio file ”
- “DSP effects related to Sound Forge”

Each category contains suitable short films, i.e. .avi files which help students to fully understand the subject of each category. By clicking the appropriate link, which is in green colour, the user can open the avi file.

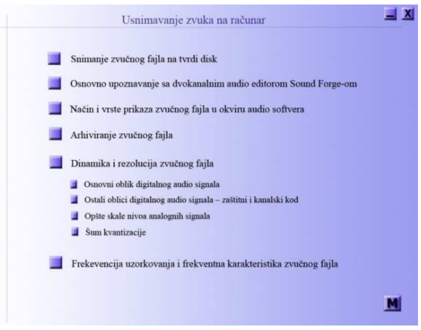

Figure 2. Representation of the category “Sound recording onto a computer”

In addition to buttons for main menu, minimization and exiting the program, showing the button name by putting the mouse pointer across each button, shifting of mouse pointer from a hand into an arrow, shifting to other windows by clicking the appropriate category, there is an arrow which enables the user to return to the previous page. By clicking this category in the main menu, male voice introduces us to its content and the window introduces us to its subcategories:

- Digital and analogue mixing (Mixdown)
- Basics of mastering and postproduction

The screen contains typical buttons for main menu, minimization and exiting the program. By placing the mouse pointer on each button, the button name appears. As in previous cases, by placing the mouse pointer on the name of each category, the mouse pointer shifts from a hand into an arrow and by clicking the appropriate category, it shifts to the next page. “Info” section contains information related to the author of multimedia presentation and information related to the presentation itself. “Help” section shows brief instructions needed for managing the program. The purpose of buttons, arrows and marked text is explained in this section.

III. CONCLUSION

The greatest problem encountered in this field of research is the fact that the lack of faculties results in the lack of teachers who are fully qualified for this type of schooling. Therefore, the teachers are mostly academic composers with limited experience in the field of music production. The positive aspect is that this field is developing very quickly and constant education is necessary. People in this business are already accustomed to that. In the future, it would be best if additional schooling for teachers is organized, either through courses, seminars, distance learning or similar modern methods. Other, less serious problem is the lack of text books needed for the subjects for Sound Designer educational profile. This problem will probably be solved in the next few years. Abovementioned occurrences are the starting point and inconsistencies, imperfections and mistakes are unavoidable at this stage of development.That is why this research is of special significance and can serve as a help in defining and partially solving certain problems. Moreover, it can introduce those who want to participate in music production education to the material, to help them be less anxious and to be a part of a new field where development and application of information technology is responsible for its progress.

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APPLICATION AND IMPORTANCE OF INFORMATION TECHNOLOGY IN TEACHING

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Abstract - Computers, the Internet and multimedia are an integral part of the educational process. Acquaintance and application of information technology in the modern world is one of the basic elements of literacy and culture. Research all around the world shows that computers are effective teaching tools that allow control, adjustment, management of teaching, and learning through constant feedback that has a strong motivational power and which is the basis evaluation system and a fair assessment of student's work. Computer devices enable a completely different organization of teaching educational work, which is adequate for abilities and interests of each student. It has been noticed that computer-assisted teaching enables the development of memory, self-reliance in learning, raising educational levels, development of sensitivity to the problem, openness, flexibility, tolerance, independence in working. This more successfully put knowledge into function of supporting the development of human abilities.

I. INTRODUCTION

In the process of the educational system, it is important to establish a part of basic education, which refers to the knowledge and skills of computer literacy, as well as the application of information technology in learning and teaching. Teachers should be trained in the conducting of educational projects in the field of application of information technology in teaching and learning, for the diagnosis and evaluation of knowledge using information technology, for encouraging self-reliance in learning, for continuing self-improvement. Using the computer students' progress faster and their acquired knowledge is more durable. Teaching and learning helped by computers are more effective than traditional teaching concerning the quality and quantity of acquired knowledge, thoughtful mobility of students, their motivation for learning, and faster, more humane and equitable assessment and evaluation of students' work. Teachers through professional development programs can enhance their knowledge, skills and abilities for applying the information technology. Computers can be used in all school subjects. The importance of educational technology is that it improves the quality and quantity of teaching media and according to that, the process of learning and educational work is improved.

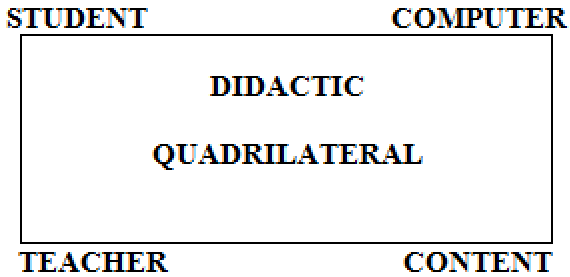

Figure 1: didactic quadrilateral

A. Models of using computers in teaching

Computers in education have many functions. Shortcomings of traditional education can be avoided by computer application:

- The student is not a passive object in teaching, but he/she learns actively, independently according to his/her own pace. He/she is the subject of teaching.
- The students know exactly what is correct in their answer and what is wrong. They continuously receive feedback on the correctness of their answers.

Computers in the classroom:

- The teacher is provided with opportunity to raise the quality of teaching and to provide two-way communication in the classroom.
- Multimedia presentation contributes to the easier maintenance of discipline in the classroom and the creation of pedagogical situations where student's responsibility for teaching success will come into play. Students observe multimedia presentation more assiduously; they memorize teaching contents better and actively participate in the process of learning new contents.
- Faster learning provides opportunities for students to think analyze and conclude, to

pay more attention to learning, exploring, discovering and solving problems.

- Modern computers can be used by students at home and thus students acquire variety of different knowledge that is related to the syllabus and curriculum.

The computer programs used in class are divided into:

- Programs for training – they form habits, skills of the students. They continuously inform students about the result.
- The programs, which impart new knowledge - learning programs
- Programs, which solve a variety of problems -student works self-reliantly and tries to solve problems.

B. The concept of educational software

Software in the field of education is the intellectual technology and it is called the educational computer software. It includes programming languages and tools; specific organization of teaching and learning that is based on logic and pedagogy. The term educational computer software means ready computer programs, which can be used in teaching and also assists and guides the individual learning phase. The world trend in the education system is that the traditional form of teaching ought to be replaced by a new form where the students' activation is done. Modern approach to learning is characterized by replacement of lectures as a central part of the educational process with some more efficient forms of learning. The inclusion of educational software in teaching leads to teaching individualization, which increases student motivation. Applying educational software develops creativity and autonomy of students. Students have an analytical approach to problem solving. They can pay more attention to research, discovering and attacking problems. Activating numbers of senses in teaching process it is enabled better learning opportunity. Teaching contents are adapted to abilities of each student so it is taken students' different skills and abilities into account. By using this software a teacher have the opportunity to increase the quality of teaching. The time needed to explain certain terms is reduced. By combining pictures, sounds, movies and animations, we combine all didactic principles. The use of educational software in the classroom is based on integration of traditional and modern teaching.

By using educational software in the classroom can be achieved:

- Students' motivation
- The individualization of the learning process
- Self-assessment
- Adoption of new knowledge
- More efficient spending time in the learning process

II. EDUCATION COMPUTERIZATION

Computerization involves a new organization of school life and work, as well as a new way of teaching. In the future schools have to accept new technologies that enable easier learning, distance learning, searching encyclopedic knowledge base, improving communication with the latest networking and the Internet technology. Learning through a variety of multimedia contents encourages greater interest and motivation of students. While still in elementary school, students should learn the basic skills and familiarize with technological possibilities, as well as to gain learning skills and self-reliant research. Good organization of teaching does not measure with a lesson where children sit and listen to the teacher, but with a lesson where creative restlessness is felt, movement, experimentation, use of variety of different sources of knowledge. Gaining reproduction knowledge should be replaced with the development of information retrieval skills with use of available technologies and their conversion into information, namely, what students will specifically understand and be able to apply. These skills should be used in the teaching of all school subjects. The integration of information technology into the teaching process entails questions of professors' competence. Information and communication skills of trainers, who choose the content and determine the educational process, are very important and affect the quality of education. The use of information technology has become an integral part of the education system especially as a support to teachers in the implementation of traditional teaching or replacement of such teaching with one of the new methods and ways of implementation of teaching and learning process. Enabling appropriate education and training of teachers is an important goal of information technology.

A. Opportunities provided by computer

Opportunities offered by the computer are great. In the learning process with the help of computer, work can be significantly facilitated for both teachers and students. It can be used for textual study, for the collating of various tables and calculations, for making presentations.

Word processors allow the user to manipulate the text. Modern programs offer the possibility to edit (display) text, formatting, printing, application of vocabulary, grammatical correctness checks, add graphics, drawings. With the help of word processing programs, it can be possible to create class preparation, notes, drawings, various invitations, school newspaper. Benefits of documents made with the help of these programs are:

- Saved documents can be used later
- A simple modification
- Sharing and sending via the Internet
- Reproduction and printing
- Teachers save their time and energy
- Increases teaching quality.

Programs for working with tables are used to display different contents in table form. It is possible to apply various forms and functions from addition to the complex logical and mathematical functions. The user types in the numeric or textual data in a single part of the table, called a cell, and then processes them. These programs can be used by students to calculate the perimeter and area of various geometrical shapes. They can be successfully applied by teacher for making timetables, for calculation of marks from written assignments, subject and grade average.

Programs for working with graphics enable users to create, store, and display or print a variety of drawings and graphics.

Programs for presentations are very popular in the teaching process, because communication with the aid of more senses enables more efficient transfer of information. Benefits of presentations:

- The image, animation and video sketches are shown instead of static texts
- Computer presentation can be sent and put on the Internet
- Simple editing and modification.

Presentation is prepared before lesson and it is displayed in the classroom, which save time that would be spent writing on the board, and the use of multimedia elements replace the application of teaching aids.

III. Conclusion

Information technology is nowadays used all around the world to enable each student individually adequately way of learning. Introduction of information technology to schools and the educational process, the conditions are created in order to change the status of teachers and students. The student is becoming the center of education, getting information from a variety of sources, progressing and assimilating knowledge with the pace, which is adequate to his own abilities, and assimilating the contents according to their abilities. The teachers are more motivated, more responsible, and readier for professional development and career advancement and use of information technologies in the teaching process. The use of information technology includes certain changes in the organization of work, teaching forms and methods in order to raise the quality of the educational process to more sophisticated level.In order to effect fundamental changes in education, the use of information technologies in the teaching process is essential. Everyone has the right to progress and learn. In order to achieve that, the educational process must be more efficient and constantly improved. Education, as an integral part of society, has to respond to the changes occurring in society. Individualization of teaching is achieved, that is to say appreciation of differences among students in terms of personal affinity and capacity. Teaching becomes better and more dynamic. It increases students' motivation, knowledge is assimilated effectively and creativity is developed. To implement this form of teaching, it is necessary the teachers training. By using interactive software teacher has more time to display the content. The interactivity between teachers and students is increased.

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IMPLEMENTATION OF „MOODLE“ IN THE SCHOOL SYSTEMS

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Abstract - The education system today in order to function effectively, it must provide a wider range of opportunities at minimum cost. One answer to this problem could be the development of e - learning. These programs promote the literacy practices and the use of modern information media in education. The most famous free tool that serves exactly this purpose is the "Moodle", a software package that makes learning available to a large number of people and allows even people who do not know programming languages, to fully create their own website, which they will later operate. Its application opens up new horizons for teachers and students in terms of many advantages. Teachers in this way gain more time for his students, but also for creating and refining the teaching materials, on the other hand the students learning material is becoming available at every moment.

I. INTRODUCTION

“Moodle” is an open - source system for management courses (Course Management System - CMS), also known as a Learning Management System – LMS, or Virtual Learning Environment - VLE, that are used by universities, schools and individual instructors to create and improve the courses using the web - technology. [1]

"Moodle" has become very popular among educators around the world as a tool for creating dynamic web sites for their students. The word "Moodle" is actually an acronym for Modular Object-Oriented Dynamic Learning Environment.[2]

The creator of this tool is a professor of computer tools Martin Dougiamas, who has been involved in the study of systems management courses, at University in Perth (Austalia).

"Moodle" is a software tool with open source, which means that the user has granted access to the source code, with the possibility of changes in the applications and adapting to their own needs. The application can be downloaded for free from the official "Moodle" Web site.[1] Many institutions use "Moodle" as a platform for the implementation of on-line courses, and some use it only as an alternative to the classical approach to learning.

This system supports many languages, and there is a localization of the Serbian language. It was created on the basis of clear pedagogical principles to help teachers to more easily create effective visual community. The use of "Moodle" software started at our universities through a variety of initiatives and projects. It is important to emphasize that the "Moodle" was fully translated into Serbian language, and the translation is available in cyrillic and latin versions, which is an important prerequisite for its use in Serbia.[3]

"Moodle Moot" is a general term for a meeting "Moodle" associations. Conferences all around the world are usually hosted by the university or institution that uses this software, or "Moodle" partner. The word “moot” is an old English word for gathering, and to this day is saved by using in the cult book "The Lord of the Rings."[2]

II. STRUCTURE AND DESIGN OF „MOODLE“ SOFTWARE

"Moodle" has a structure that allows you to work out the complex higher education projects that engaged hundreds of users, across the easiest courses for those who are just starting their education or have not had the opportunity to learn this way. This software can also serve as a help to the classical education approach. "Moodle" gives its users several kinds of services such as installation, support, hosting, development and consulting.[4]

Design and development of "Moodle" are guided by the philosophy of learning and thinking, which in theory is abbreviated as "social constructionist pedagogy". The theory can be described by the following concepts:[5]

- Constructivism - This philosophy claims that people actively construct new knowledge through interaction with the environment

- Constructionism - this theory claims that learning is particularly effective when you construct something for others to experience
- Social constructivism - this part of philosophy extends the mentioned idea to a group of people who create a common culture with its own divisible meanings, for each other.
- Connected and individually - this idea is trying to explore the deeper motives of individuals who participate in the discussion

"Moodle" system is completely modular. Basic modules can be classified into the following groups:[6]

- Control modules (modules for managing the site, users and courses)
- Activity modules (module for allocation of obligations, a module workshop, module quizzes)
- Modules for collaboration (module for chat, forums, polls)

III. Activities in „moodle“

Seen from a technical point of view, the processes in the functioning of this software can be decomposed into the following primary activities:[7]

- The installation of program
- Adjustment of parameters
- Creating user accounts and assigning roles
- Creating courses
- Adding content (text and web pages, links, audio recordings)
- Adding activities for school groups by educational units
- Communication between participants in the educational process
- Monitoring and evaluation of students' work

A. The instalation of “moodle” and adjustment of parameters

"Moodle" is flexibly designed and programmed in PHP and can be installed in any operating system, whether it is Windows, Macintosh or Linux programs. Ensuring the independence of the interface and the "Moodle", can be achieved by using XML technology. As this is an open - source software, it means that you can freely download it from the Internet, use it, modify and even distribute it (under the terms of the GNU - General Public License). The information is kept in a database, MySQL and PostgreSQL are best equipped, but it can also be used with Oracle, Access, Interbase, ODBC .. and so on.[2]

A very important thing is the automation of many processes that occur on the site for classes.Once you set the parameters for the operation of the website, and courses are filled with information and activities required, the site can work with minimal presence of administrator. Settings are connecting to all the processes such as: settings for users, courses, languages, grades, layout front pages, reports, server...etc.[8]

B. Creating user accounts, assigning roles and creating courses

Types of user accounts in "Moodle" are:[8]

- Administrator (highest rated position, responsible for the operation of the program)
- Creator of the course (the highest ranked instructor in charge of the creation of the course)
- Lecturer (can enrich the course activities and provide feedback to students)
- Tutor (can only provide feedback)
- The student (corresponding to a given problem)
- Guest (with the least of privileges and usually can not enter text anywhere within a course)

Administrator has the authority to create courses depending on the needs of the participants, the subject of teaching, etc. ..
The main types of available courses are: [8]

- Weekly Format - component material is in the form displayed in groups of a few weeks.
- Topics Format - Every week is named by a theme. This format does not require specifying a particular date.
- Social Format – The teaching material is in the form of more generally forums (course

is conducted in the form of discussion groups)

C. Adding content and activities for teaching group by teaching units

The important materials that can be available to participants include label, a text page, web pages, a link to a file or web site, and display of a directory. Activities are:[7]

- Assignments - lecturers set tasks, with clear requirements for course participants. Usually the tasks are in the form of essays, projects, reports and so on.
- Choices - This activity can be useful for creating quick and short poll to stimulate thinking about particular fields.
- Surveys - Teachers can create questionnaires intended to provide insight into the views of students about the course. These data serve as a guide to the teacher to improve teaching.
- Quizzes - Quizzes are one of the most popular methods for testing students' knowledge.
- Multiple choice questions - have the greatest use, and it is allowed to create question with one or more correct answers.
- True / False - This type of question is very likely that the student hits the right answer and not a reliable method for the evaluation.
- Short Answer - Students answer questions by entering the answer in the form of words or sentences
- Numerical questions - This type of question is similar to questions with short answer, except that the answers are numbers, and measures can be added to numbers. These are ideal for tasks in the field of physics and chemistry.
- Issues with calculation - the most complex set of issues and these are ideal for tasks in mathematics or physics.
- Matcing answers - standard issue with two columns, where the questions are in one, and the possible answers are in the other. This type of question is good for evaluating knowledge.
- Descriptive questions - These are not typical questions that require answers, but are plain text. The main disadvantage is that they must be manually reviewed by professors.
- Random Questions - This is a space that is added to a quiz in which, each time a student starts a quiz, a question will be insert in a given category, at random.
- Random connectivity of issues with short answers – This is type of question that allows student’s answers to be inserted directly into the text of the question. This is a very reliable and a good way to evaluate.
- Lesson - Teacher asks some questions from a lessons that are composed of several sections. At the end of each section instructor asks a specific question. If the student want to move on to the next section, he must give a true answer to the question. Lesson is supported by input materials - presentations (Power Point), which can be a great help to teachers who often produce materials in this way.
- Workshop – Members can evaluate projects to each other and evaluate projects that are set as examples.
- Chats - Chat is a synchronous method of communication that requires users to be on-line at the same time, allowing them rapid exchange of short messages. The main disadvantage is that chat has a bad interface and the course can not include a number of separate activities - rooms.
- Glossary - This activity allows teachers to create and maintain a list of various definitions in the form of a dictionary.
- Forums - The main types are:
    - A standard forum for general use
    - A single simple discussion
    - Each person posts one discussion
    - Question and Answer forum
- SCORM / AICC Packages – These are one of the world's standards for creating quizzes and "Moodle" is capable of displaying them. You can include web pages, flash presentations, graphics, java script program and any other content that the web browser is able to display.
- Wiki - Like Wikipedia, where anyone can give a description of an idea or phenomenon and contribute to a large global knowledge base, and in this module,

the teacher can specify a particular term and all users can post relevant information.

D. Communication between participants in the educational process and monitoring/evaluation of students' work

Social learning material help students to interact with the instructor, with the learning system and with other students.[7]

In the section setting category of grades, you can set options in order to summarize and keep score. Administrator selects a way of summarizing evaluations (mean value, the sum score, .. etc..). In addition to these settings, you can set the items for evaluation, scales, letter, report settings.[8]

IV. STATISTICS OF REGISTRATIONS

Table 1. shows the top country in which the "Moodle" is most used according to statistics from the official "Moodle" site. There is no limit to the number of servers that an organization can have, so many institutions use more than one server. "Moodle" community is increasing every month, and each year (Figure 1).

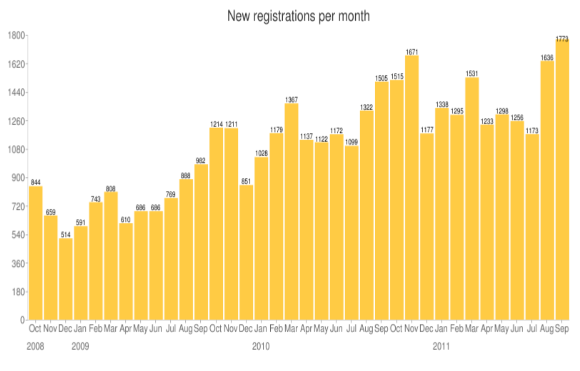

FIGURE 1. REGISTRATIONS PER MONTHS AND YEARS

V. CONCLUSION

Careful planning and implementation of modern technology, is requirement that meets the needs of modern society for up-to-date and quality information. Education systems are increasingly starting to use information technology in their work by focusing on the wider use of e-learning. Tools and software for e-learning are products created from desire for quick and easy control information in the educational process. While traditional learning is increasingly supplemented by electronic, teachers and students can create many positive features and dimensions for effective work and education.

TABLICA I. TOP 10 COUNTRIES THAT USE "MOODLE"

Country	Registrations
United States	11,550
Spain	6,195
Brazil	4,662
United Kingdom	3,762
Germany	2,894
Mexico	2,881
Colombia	2,005
Portugal	2,004
Italy	1,721
Australia	1,589

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DEVELOPMENT OF INFORMATION TECHNOLOGIES INFLUENCE ON TEACHING

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Abstract - Education, from elementary school to college, and certain different specialist courses, should give results in terms of preparation of pupils and students for life and for professional assignments, it is clear that it needs to implements modern tools that are developed in other areas of life and work. The goal of this work is to point to a use of IT technology in teaching, from direct use on lectures of a certain topic to preparation for teaching, examination, giving grades or overview of overall pupils' activities. This work will consider basic conditions for use of IT in teaching, existing experiences, problems and also new trends and directions of development.

I. INTRODUCTION

In a narrower sense, education means acquisition of knowledge, building skills and habits; development of abilities, adopting a system of values and rules of behavior. In a broader sense it is a constant process of creating a non-material values which lasts a whole life. [1]

Given that current activities of work and life in general are characterized by rapid changes, growth, innovation we are much closer to the broader definition of education. It is a fact that criteria of judging someone's literacy is changing and that being literature today means use of different IT achievements and not just to know how to write and read. In addition, some activities are only possible to make in virtual spaces, and it is becoming more and more difficult to accomplish them without this knowledge. For example, some doctor appointments are possible to appoint only via internet, communication with Tax Administration of Republic of Serbia will soon be almost entirely conducted on the internet, use of electronic banking is much cheaper, more comfortable and faster that use of traditional banking services.

Through process of education younger generations, but also adults, are introduced to new knowledge, new skills, are prepared for some actual activities in their lives, it is necessary that education, and process of teaching, keep up with new ideas.

It is hard to give a precise definition of IT; all that we can say is that this term includes all forms of technology that is used for creating, conserving and exchange of information. American Information Technology Association defines IT as a: studying, projecting, development, use and support or management of informational systems, which are based on computers, especially on software applications and computer hardware. [2]

Looking at environment, following trends in all areas we will easily come to conclusion that we live in an era of informatics society and that those trends will also mark future. It has been long since we have to count reasons that every aspect of education becomes permeated with use, following, knowing IT.

II. BASIC PRECONDITIONS FOR IMPLEMENTING INFORMATION TECHNOLOGIES IN EDUCATION

Traditional ways of teaching, which put a teacher forefront, and gives students role of passive listeners, did not consider usage of some additional items. Overhead projector appearance in education in second half of last century can be considered as a big refreshment and innovation, even if it kept same relation between teacher and students. IT implementation in education would bring important changes in many various segments of this activity and requires deep changes of methodology itself.

By using IT, teacher obtains possibility for higher quality preparation of teaching activity, monitoring students' activity, and rating that is more realistic. All activities that are indirectly related with teaching, by using IT are gaining quality, and it does not matter whether it is preparation of materials, or data processing. Teacher gains ability to follow effects of his own work independently, following teaching methods, which he applied, and effects that student made after knowledge check. Accumulating many different important data gives teacher possibility to use them later, compare and analyze, independently or on institution level, make certain conclusions and chance to set guidelines for development of curricular activities based on the data process results.

Based on the experiences from countries in which IT already took place in curricular activities and planning of implementation, we can set basic preconditions for its successful implementation in teaching. Key preconditions can be categorized in next groups:

1. Equipment in schools, hardware equipment primarily, and existing of the other conditions for successful using of this equipment (electric power, internet, infrastructure)
2. Level of training and readiness of teacher to make drastic changes of teaching with previously acquired knowledge in IT domain
3. Students readiness to learn and attend teaching based on using IT

As for the first condition, it is easier to fulfill them in more developed countries, in which money for purchase of IT equipment does not miss. IT equipment is present in schools of more developed countries, even if it is not included in curricular activities. As for the Serbia and countries of similar development, this condition can be barrier for fully IT implementation into curricular activities, and most probably legislation for organizing such education (as is the case in EU member countries), and it would not be the best solution.

The researchers are pointing that biggest resistance towards changes in traditional way of education and implementing IT in it, are providing older teachers, because they have less knowledge and skills on using computers and internet. Regardless on prior knowledge level, this condition must be fulfilled before IT implementation in education begins, so that negative consequences could be eliminated. Using IT considers specific changes in working organization and teaching methods in order to get education process on a higher level. Purpose of professional development of teacher is his constant development of potentials in order to improve his way of teaching. In order to teacher complete professional qualifications, he should overview all the aspects of his profession, since his education and schooling and to increase consciousness about work itself. Professional specialization system along with work is concerted as a formal education's upgrade, knowledge extension, advanced IT skills training, knowledge and praxis appliance using IT.

Although it is known that the kids, in their early periods of life, learn basic IT skills, use Internet, play PC games, it is not well to consider that all students carry this knowledge from their homes. During elementary education, it's necessary for kids to learn basic IT literacy, which should allow them to successfully attend IT classes in elementary school, and as well as in high school. It is necessary to have an IT subject in both elementary and high school. IT can be used in other subjects too, depending on themes of those subjects. Schools should prepare their students for attending modern ways of education.

III. INCLUSION IT IN EDUCATION

In order to implement IT in education more significantly, it is necessary to change essentially education's methodology and organization. While defining of education, opportunities that offer technology, Internet and multimedia contents should be considered. The primary form of implementation of IT into curricular activities is using IT equipment for education preparing and realization and students rating. This could be simple implementing of technical resources into different education steps, which keeps traditional education style (teacher is foreground, students are passive listeners or are partially active) and studying becomes reproduction of exposed. This degree of implementing IT into education is very useful and necessary. IT gives possibility for education to improve, develop and get closer to reality, apropos that students should have materials that will be appropriate to the future ones, available. Good example of such way of IT integration into education is experience of the author of this paper work from high school „dr Radivoj Uvalic“ , Backa Palanka. Over there in accounting subjects online business-accounting software e-accounts [4], which is fully adapted to teaching

Figure 1. On-line busssines aplication

activities, in the sense that for teaching and examination using the application used by business entities, provided that the user rights of students and teachers is defined so that teachers have the administrator to Self and able to fully escorted and evaluate the work of students, and students the opportunity to exercise, repetitive and solve the given problems. Of course, this will contribute to the completion of education, they can easily adapt to work in applications that include everything previously seen and learned. Many areas of expertise provide the opportunity to be on the same way, using IT, teaching accommodate a real working environment.

A higher level of integration of IT into teaching is remote and online learning. The pace of technological change in the field of IT and telecommunications provides the basis for achieving a high level of flexibility in the methodology of distance learning. Technology neutralizes the effects of remote distance students and significantly affects the growth of the availability of learning resources. Here we turn to the Internet to gather material for the preparation of teachers, the availability of digital libraries, online encyclopedia of the students, as well as the complete solution for remote or online presentation courses. Phrases open system (open learning) is used to indicate the model of educational organizations, Its primary goal is to provide the general availability of learning resources, all the people who want or used certain situational factors, must attend some form of teaching. [5] In these systems, it is fully enabled accessibility resources for people with special needs.

As for other students, these systems allow them to take courses at the other end of the planet, at far lower cost, and with a number of other advantages.

Online learning can be fully organized in the remote environment, and can be "Blended" approach, as it named, which links the elements of the remote and traditional learning. To organize online learning use applications that rely on a network protocol and belong to a group of network applications. In the literature, these solutions are called Virtual Learning Environment (VLE) or Learning Management Systems (LMS).

An example of an open source system for online learning [6], [7]

Moodle is an open source software package, which uses the basic educational principles, and is designed to help teachers to create effective educational groups. There are over 75000 users in 138 countries, covering 70 languages. Allows teachers to prepare lessons perm proper information issues, to organize student forums, group students in order to solve specific tasks and problems, install and maintain documentation and organize online examinations and direct assessment.

Figure 2. Moodle

IV. EXPERIENCES WITH THE IMPLEMENTATION OF IT IN TEACHING IN EUROPE AND THE WORLD WITH EMPHASIS ON SERBIA

In the EU, there is no single approach to the implementation of IT in education, although it can be sorted out the main directions of implementation of education policy and commitment to the introduction of innovation in teaching, development of digital and media literacy, the introduction of digital content, developing educational portals and online services, development platforms and educational materials, a number of projects and the preparation of teachers and students for higher degree of involvement of IT. Famous action plan e-Europe and e-learning comprehensively elaborate above and any other relevant issues related to this problem, while the other individual projects focus on specific topics and areas. For example, the project ULEARN deals teaching preparation for the application of IT in teaching.

The use of IT and the Internet are growing rapidly in all Scandinavian countries, Sweden and Finland, and in teaching the highest level of IT presence in these countries. On the other hand, in Hungary, computer science covers the acquisition of knowledge in the power of computing, and in the UK, it is a stand-alone subject, but the use of IT for learning other subjects is big, and in France and Ireland are working on that all cases are taught using IT in the classroom. In Australia, Canada and New Zealand are not taught computer science alone, but is present in many other classes of cases, while in Korea IT knowledge is getting from the first grade of elementary school. All EU member states have regulations regarding the introduction of IT in schools, some even pre-school education too. A basic division can be make regarding whether the Information is present as a stand-alone case or if the inclusion of IT in education as a tool.

In Portugal, the MINERVA project (1985-1994) equipped schools with computers and programs. Alongside, there are trainings for teachers, who later can become lecturers and trainers. Many programs are organized at the national level, which are a special emphasis placed on pedagogical elements.

In Serbia, there are notable significant differences in the distribution of IT equipment in schools, and consequently in the teaching staff relation to the introduction of technology. While some schools successfully applied IT to complete the process of teaching, the other is present only in the IT individual stages, especially in the teaching process, and less in the preparation of teaching and assessment. Positive factor integrating IT, both in education and in other areas of life is the increase in the number of experts in the field of IT, which certainly cannot be the initiator of these activities. In addition, it is important to be passing a long-term plan and regulations regulating this area, which is expected in the future and, above all, the model of the EU.

V. Conclusion

Following the latest trends in all areas of life, we cannot find a reason to education and teaching activities within it, remain at the traditional. Simply put, we are all witnesses of the past decades and years, more IT "spiel" in our lives, changing habits, ways of working, communication. Examples of this are many. More and more people instead of waiting in front of the windows of the banks use electronic banking. In many countries, e-government systems are replaced with complete direct communication with the public services and public administration. Examination by a doctor or a hairdresser, beautician, the more you schedule via the Internet. Trade is increasingly shifting to the Internet. All this is the reason that the educational system is seriously turned the implementation of all aspects of IT in teaching. It is absurd to children and adults, the knowledge they become necessary, arrive at alternative ways. Whether it is a compulsory education, specialized courses or training, it is natural that it should be future-oriented.

Otherwise loses all-purpose and meaning. IT is an area that is in their own development using forecasts and predictions of future trends and always goes a few steps ahead. It is high time that the educational process to take this view. Of course, it does not mean that everything is new, undisputed better, and better. The experience of countries that using IT for decades in teaching is different. Well-implemented IT gives good results, but it should not ignore the opinions of those who say that IT is a great tool for organizing and improving education, but cannot completely exclude the good elements of the traditional approach. Do not ignore problems that apply to existing users of IT in teaching, but it seriously and work to correct them. The fact is that the IT is field of the future. Consolidated on the same task, it will certainly give excellent results, which will be primarily seen in the high level of preparedness of all who attend, for further work and life.

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CHILDREN SAFETY ON SOCIAL NETWORKS

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Abstract - Today, many children hardly make differences between real life and online life. They rarely use sites for children, but very often use social networks designed for adults such as Facebook, MySpace and others. Whichever site they use, children and parents need to realize that all of these websites may be seen by anyone with Internet access. When we speak about the dangers of the Internet, we primarily refer to the abuse of social networks. In this work there are mentioned some of the ways of misuse on the Internet.

I. INTRODUCTION

Social networks represent a shape of human interaction. With the help of known contacts over social networks, people can make virtual contacts with new persons in aim to achieve social and business activities. Sites of social networks enable users to meet new individuals around the world without physical contact. On the Internet, you can find many different social networks, which offer users a variety of ways of interaction. The variety of ways of interaction mostly depends on the amount of data that users are ready to reveal. If the user wants to access the desired social network he has to create own profile (user account) where he puts data about himself, which are personal and some of them can be confidential.

From the view of safety, the most important characteristic of social network is the fact that users choose which information will be visible for other users and which will not be. User can limit the visibility of information, he can adjust that information from profile can be seen only by the users from friend list or to be seen only by the owner of profile. Most users do not take care about privacy of information because they are not aware of the risks they are exposed to.

Except personal accounts, online accounts of this kind can create and legal persons to promote their company or product. The largest revenue social networks originate from advertising. The creation of account on social network is free but the material value of the network increases in proportion to the number of users. The reason for this is that more users the network has, more companies will be interested in advertising on it. Except advertising, the sale over social networks is very popular too. Being a user of social network brings with it many risks, but also has many advantages. Some of the advantages are the feeling of connection with other users, meeting like-minded people, communication with other users, regardless of physical proximity, ability to share life and business experiences of others. The disadvantages of social networks mostly affect privacy of users' data.

These disadvantages of social networks are most dangerous for users that are under 18 years old, because of their immaturity.

II. SOCIAL NETWORKS

A. Twitter

Twitter is a social network that is free to use. It is created by Jack Dorsi in March 2006th year. Twitter began with work on July 2006th year. This network enables users sending and receiving messages, writing notes in the form of blog, posting photos on the profile, etc. The user can create messages more known as tweets that contain a maximum of 140 characters. Those characters are shown on the home page of all users who are decided to follow the creator of that tweet.

This social network is mostly used to represent opinions about different events in country, in the world, for tracking news, companies and famous persons. Politicians, famous persons and various media types generally use Twitter for promotion of their work and for gaining popularity.

According to the latest researches, this social network has over 500 million users all over the world. We cannot precisely tell how much children use Twitter because they usually give false information about their years, but we surely know that their privacy is the most affected. Because of their immaturity, they cannot clearly see that the giving of some personal information can be very dangerous for them. Children do not have enough experience with people, so it is easy to mislead them.

B. Privacy policy on social networks

The privacy policy describes the way of collecting data and their usage. Network collects information about users through different websites, applications, text messages, email reports, etc. When user starts using social network, he automatically permits the network to collect data about him, manipulate with them and he can expose them in some cases. There are many different cases of misuse of information.

Figure 1. - Treats on Internet

C. Facebook

In Serbia, the year of 2009 was declared for the year of Children's protection on the Internet. Facebook aims to be an environment in which people can safely communicate with friends and the people around them. It has an implemented security that enables people to share information only with people who want to see them. This social network's system for identifying and removing inappropriate content and people from the site is constantly improving. Despite Facebook's security and privacy controls, Facebook does not guarantee that the site is entirely free of illegal, offensive and pornographic material. By the time we are using Facebook, people should never give their password, not even to their best friend. They should be careful when posting and sharing personal information, especially information that can be used for their identification such as address or telephone number. Children should report any abusive or inappropriate content on Facebook to their parents and on Facebook using the tools available through the site. They can inform Facebook about the occurrence of pornography, harassment or unwelcome contact by clicking on the "Report" link located on pages within the site. The best thing to do, when someone is talking to us in an appropriate manner, is to block and report him. What is interesting is that data of over 200 million members on Facebook is stored even when we delete them. Another less known fact is that Facebook is using images of users in advertising.

D. Ways of misuse

People who use false information about themselves in aim to abuse children and teenagers are called online predators. They find kids trough social networking, blogs, chat rooms, email addresses, forums and other websites. Online predators seduce their targets through attention, affection, kindness and even gifts. They are good informed about children interests, listen to their problems, even introducing them sexual content into their conversations and show them sexually explicit material. Kids feel they are aware of the dangers of predators, but in reality, they are quite naive about online relationships.

Cyber bullying is defined as young person tormenting, threatening, harassing, or embarrassing other young persons using social networks or other Internet websites. The psychological and emotional facts of cyber-bullying are similar to real life bullying, the only difference is that life-bullying ends with school ends, and for cyber bullying there is no escape. Nearly 43% of kids have been bullied online. 1 in 4 has had it happen more than once. Only 1 in 10 victims will inform a parent or trusted adult of their abuse. Bullying victims are 2 to 9 times more likely to consider committing suicide.

E. Examples of abuse on social networks

˝James is frustrated and saddened by the comments of his high school peers that are making about his sexuality. Furthermore, it appears a group of male students is creating fake e-mail accounts at Yahoo.com and is sending love notes to other male students as if they came from James—who is mortified at the thought of what is happening.˝

˝In 2002, 13-year old Kacie Renee Woody met David Fuller in a Christian chat room. Fuller, age 47, told Kacie that he was 18. They courted for a bit, but Kacie fell in love with another boy and broke up with Dave. One night when Kacie was home alone in her Greenbrier, Arkansas home, Fuller had come into her house, covered her face with a chloroform-soaked rag, and dragged her into a minivan. Fuller drove from California to

Arkansas and stalked Kacie before the abduction. He knew when she got home from school, when her father left for work, and when she would be at home alone. Kacie's friends were worried about Kacie giving out information freely to people that she had met on the Internet and even spoke to a counselor at school about their concern. It was too late in Kacie's situation. Fuller took Kacie to a storage unit, raped and killed her, before turning a gun on himself.˝

III. CONCLUSION

The role of parents is very important in children's Internet safety. Firstly, parents need to know how to use social networks and to be well informed. Communication with children is also very important. Parents should encourage children to tell them if someone or something on the social networks makes them feel anxious, uncomfortable, or threatened.

Insisting that children never meet anyone in person that they have communicated with online only, and encourage them to communicate only with people they have met in person, is also the best way of prevent. Kids are in real danger when they meet strangers in person whom they have communicated with online only. Parents can protect their children by encouraging them to use these sites to communicate with their friends, but not with people, they have never met in person.

Many social networking sites have adjustable privacy settings, so parents can restrict who can have access to kids' profiles. Talking to children about the importance of these settings, and about expectations for who should be allowed to view their profile is also important.

Tell children why it is important to keep some things, about themselves, family members, and friends to themselves. Information like their street address, phone number, and family financial information like bank account or credit card numbers is private and should stay that way.

Parents need to inform their children about cyber bullying and must be fully informed about the activities of their children on the Internet. Kids should not be afraid to tell parents if they feel some threat and talking about their Internet activities should be something normal. Like all the other everyday conversations.

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USE OF MICROSOFT POWERPOINT IN EDUCATION

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Abstract - This paper discusses about the proper use of Microsoft PowerPoint in education. In addition, this paper describes problems and difficulties that can arise when using Microsoft PowerPoint and the benefits brought by this software in education. Microsoft PowerPoint is similar software to a word processor such as Microsoft Word. Unlike Microsoft Word, PowerPoint is used for creating presentations. The main purpose of the presentation is to make maximum impact in a minimal period and to persuade the audience to take physical or mental actions. For that purpose, Microsoft PowerPoint can provide you an easy way to create an attractive presentation quick. Presentations created by PowerPoint can be presented on computer screens, TV screens, computer projectors, webcasts, printed pages etc. Teachers can use PowerPoint presentations to motivate students as well as helping them easily memorize important information about material intended for that class.

I. INTRODUCTION

Microsoft developed Microsoft PowerPoint and it was officially launched on May 22, 1990.

It was originally designed for the Apple computers and its first name was “Presenter”. Later in the 1987, “Presenter” changed its name to “PowerPoint”. The first PowerPoint version for Windows was announced on May 22, 1990.

The version that was launched in 1997 had many changes and one of the biggest was Visual Basic that was incorporated in the PowerPoint 97. One of the key features that Visual Basic brought was predefined transitions and effects that could have been invoked without any programming knowledge.

Three years later came PowerPoint 2000 with a clipboard that had a possibility of keeping multiple objects at once.

In a span of ten years between 2000 and 2012 Microsoft took lead on the market with its various versions of PowerPoint. [1]

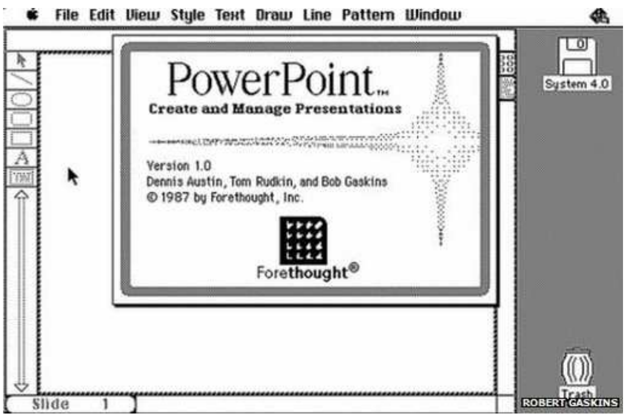

Figure 1. User interface of the first PowerPoint version [2]

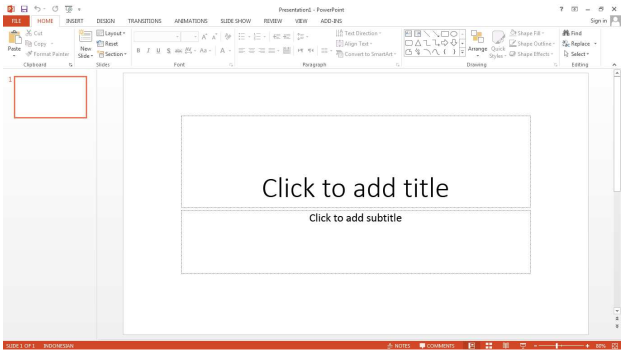

Figure 2. User interface of the PowerPoint 2013 [3]

Nowadays, PowerPoint is widely used for example in: presentations (including diagrams, using library of shapes and connectors), tutorials (including photographs or clip art of various objects for students to label with their names), games (in classrooms for a quiz game, presentation could use a set of question slides), animations (You can create animations from your own drawings, imported into PowerPoint; or you can animate elements from the clip art library. PowerPoint allows you to add effects, sound and music to your animation.) and posters (clip art or custom graphics can be used to illustrate topics or give instruction. It has major usage in education (which will be described in more detail in this paper).

II. WHY SHOULD BE POWER POINT USED IN EDUCATION?

In the text above it was mentioned that PowerPoint has been a part of computing for the past twenty years and there are some good reasons for that. In this paragraph, some of the reasons why PowerPoint should be used will be stated.

PowerPoint can be a useful tool for connecting teachers and students in classrooms. Quality of learning and motivation has always been a problem for both students and teachers. With PowerPoint included in all classes and subjects teachers have managed to make an interactive environment that should result in a more interesting and easier way of learning.

Thick books as well as many different classes have made learning key facts difficult and almost impossible. Teachers should make presentations that include only the key learning points, which “should make” students remember them easily.

Presentations should also include different types of media content. By adding these media files teachers have to be careful in a way of mixing different types of files.

With the fast development of technology, methods of presenting in PowerPoint have changed in the past years. For instance, a presentation made with PowerPoint can easily be transferred to almost any type of device that has a display and be presented at anytime and anywhere. This helped teachers on universities to present their curricula to big number of students on projectors.

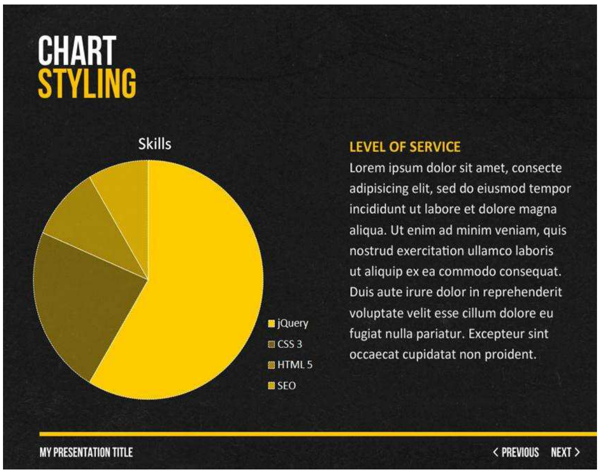

Figure 3. A slide of an interesting PowerPoint presentation [4]

One of the advantages with PowerPoint is that teachers can print presentations for their students immediately after presenting.

In addition, it comes with a free viewer so when teachers want to present, they can do it easily without having the whole PowerPoint software installed on their computer machine. On the other hand, when they have installed the whole package, they can easily edit their presentations in a minimum period.

Slides are the main concept of PowerPoint. They give teachers an ability to group, organize and manage content that has to be presented to their students. The feature of printing chosen slides is also included.

PowerPoint, on one hand, is powerful software that provides endless possibilities in terms of education, seminars and courses with a huge variety of useful tools and features. On the other hand, the real advantage that this software provides is its simplicity and a user-friendly interface. Even novice users can make attractive and useful presentations with a course or two.

In addition, interesting feature that Microsoft provides with its software is a Narrator and a comment voice recorder. In education, this means that teachers can literally provide their lectures by recording their voice and playing it later on to their students. In addition, this feature is very useful for online courses teachers can record even comments for some parts of their presentations. There is software called “AuthorPoint Lite” which is free, and it transforms narrated PowerPoint presentations into flash movies.

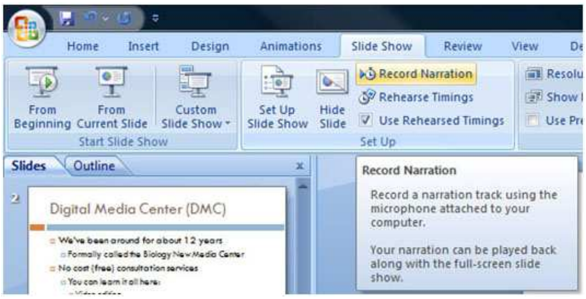

Figure 4. Narrator feature in PowerPoint [5]

For users that want to make high quality presentations in a short period, PowerPoint has added different types of templates, clipart, sounds and slide transitions. This helps when users have deadlines, and when they do not have time to think about the looks, but only the content of the presentation. With each update, Microsoft has added more modern and efficient stock material that can keep up with all new designs and functions.

III. TIPS FOR CREATING AND DELIVERING PRESENTATIONS

The presenter should minimize the number of slides. In addition, font style is very important, when the presenter chooses a right font style it helps your message to be sent in a right way. Helvetica and Arial are one of the most used font styles nowadays. The presenter should avoid narrow fonts, and font styles that include fancy edges.

Size of the font is important as well as font style. When choosing the size of the font, the presentation should be in a full screen mode for easier size decisions.

Bullets should be used in all slides for easier readability, because audience is mainly listening to the presenter with a few looks at the presentation. Long sentences should be avoided because some projectors can crop slides at the edges, so maybe some text would not be visible. A nice way to shorten sentences could be removing articles such as “a” and “the”.

Graphics are good methods for making audience memorize key facts, but too much usage of it could result in a negative way. On the other hand, eye-catching templates can have a good result.

When talking about colors, the presenter should use high contrast between background color and text color. Some templates with high contrast are embedded in PowerPoint.

Spelling and grammar are also very important. Spell and grammar checking show that the presenter respects the audience.

After the presentation is done, the presenter should make sure that equipment is fully functional and working. The presenter should verify that the resolution on the computer is compatible with the resolution on the projector. When all of the technical equipment is checked, the presenter is ready to present.

The most important thing when holding a presentation is that the presenter is aware of the material he is talking about. Reading from slides is the biggest mistake a presenter can make. In that case the audience feels like they could read the whole presentation by them self and the presenter is then not needed.

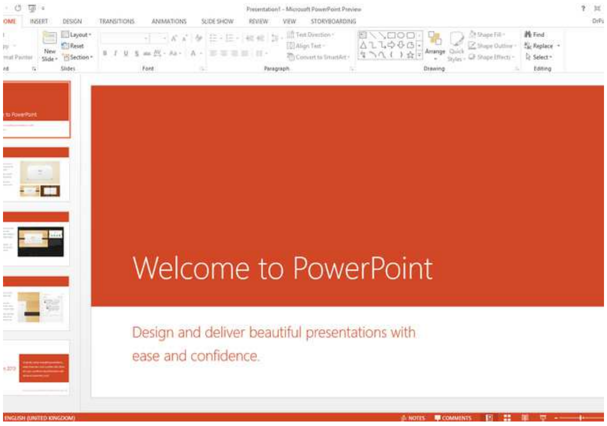

Figure 5. A presentation with good style and font size. [6]

IV. CONCLUSION

Overall, PowerPoint is probably one of the most used software tools in education especially on universities. Nowadays professors can make presentations for their classes with great ease and make their students more interested in the curricula. In this modern computer, time professors should follow written and unwritten rules on how to create and deliver high quality presentations to their students and make a better working environment for both.

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MOODLE - TOOL FOR E-LEARNING

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Abstract - E-learning is a broad term that includes the use of information technology in education. It is now increasingly encountered in practice. Among the much software for e-learning allocates to Moodle. He is a good solution for the production and maintenance of online courses through the Internet. There are a number of good characteristics: free, adaptive, transparent, simple navigation, content and visually well connected.

I. INTRODUCTION

Moodle is a software package designed to create websites and courses online. It is a global development project designed to support teaching via the Internet. **Moodle** (Fig. 1) is open source software that is also known as a virtual learning environment (Virtual Learning Environment - VLE) [1]. This program can be purchased and used for free under the GNU public license. This means that **Moodle** is copyrighted, but its users are free to copy, use and modify if they agree to certain terms and conditions. These conditions are:

- providing programs to other users,
- original license and copyright must not be altered or removed,
- The same license must be applied to other projects stemming from **Moodle.**

Figure 1. Home page Moodle

Moodle has become very popular among educators around the world as a tool for creating dynamic web sites for their students. The word Moodle is an acronym for Modular Object-Oriented Dynamic Learning Environment (Modular Object-Oriented Dynamic Learning Environment). To serve, **Moodle** needs to be installed on a web server that supports PHP and SQL [2]. Able to work under Windows, Mac and Linux operating systems.

Moodle project is always focused on providing the best tools educators, so that they may better to create and manage online courses. There are many ways in which it can be used **Moodle.** It can be used for hundreds of thousands of students, but also can be used for the primary school. Many institutions use it as a platform to implement online courses, while some use it purely as a substitute for direct contact between students and teachers.

II. MOODLE USERS

Moodle users are students, teachers and administrators of the platform. All have their orders; depending on the role, they perform (Fig. 2).

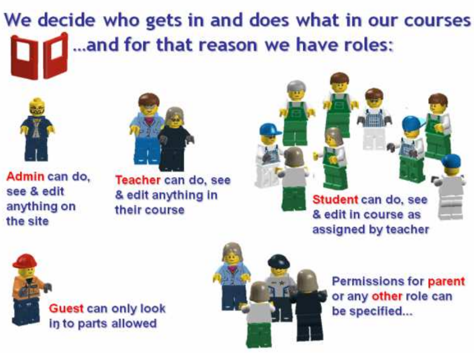

Figure 2. Moodle users

Administrator has the most important role. He has all the rights management system, such as the creation of new courses or edit existing ones, add new users, ... Administrator also maintains the server it is installed on **Moodle**.

Creator of the course is the most important role among the speakers. He is responsible for the creation of new courses, but it cannot change the existing courses. He assigns course teachers and determines their order. Can some teachers to refuse to edit courses, and in some cases you can cut them off. Creator of the course may appear as a teacher.

In **Moodle,** anyone can be a **teacher,** if his face with the appropriate law (administrator or the creator of the course) is assigned to a course. Based on this and the face, which is normally the attendant rights can be assigned to the course as a teacher. Teachers regulate and maintain the courses individually or as a group. First, the teacher adds new material and regulates their visibility and use.

Tutors are teachers, who cannot regulate rates, or to add teaching materials and assignments to trainees. They evaluate the work of students, accuracy tasks that the participants have done, and have the ability to review student evaluations.

Student processes of teaching materials, as they already have available, execute the given tasks and solve test exams.

Guest is a visitor who is not involved in the teaching process, and he is allowed to join a course. He cannot stay a long time on the course, but can only view mode course. Administrator or the creator of the course to decide whether a guest to visit the course or system.

III. MOODLE CONTENTS

Moodle is an application for creating and maintaining courses on the Internet [3]. Development of e-learning courses and their delivery to students is very easy and simple. For this purpose, we use the already existing teaching materials. **Moodle** provides the ability to organize the learning process, to analyze the teaching content, but also to assess students.

a) Static contents

It is very interesting the use of a different use **Moodle** the static material, which can be used by the participants without interaction with them. Although it is called static, these materials can rate it so dynamic.

Caption is text or image on the home page. Special sign a summary that describes the topic of the course.

Web page is on the web page, but that page is created within the course and includes text, images, hyperlinks and other multimedia elements.

Link is a link to a directory or a separate web page off course.

Course directory is a directory that stores a variety of teaching materials.

b) Interactive contents

In addition to resources, Moodle uses activity (Fig. 3), which are interactive materials. They belong to the advanced techniques that allow trainees to interact with the teachers, with a system for learning or teaching materials themselves.

Figure 3. Moodle activities

Assignment is an activity that is done outside of **Moodle**, offline. Course participants can see the tasks on the front page of the course, and when you click on the name of the task, you will see what the teacher wrote in the description. Description contains the subject, method and time of preparation task, and details on how teaching and assessment. When they complete their task, the task of the teacher asks the student to the site. The teacher reviews and evaluates the job done.

Choice is a tool for the resolution of a disputed issue. It is a response to a question that the students can give only one correct answer. The result can be shown to everyone on the course or just certain students and teachers. **Choice** is a fast and good way of getting feedback from the group.

Database is activity, which is rarely used and is used for storage (storage) of data in a certain form. It allows more people to add data to a shared resource.

Journal writing each student separately and can be seen only author and teacher. It is created for a particular course, and it is hard to switch to another. The teacher can determine the topic that will be attendant to keep a diary, and the time limit within which the student can create it. In the journal except text can be entered and pictures.

Lessons are for courses for students. They appear in certain order and contain questions at the end. There is a jump question, which assesses student understanding. The correct answer to this question goes a false or returns back to a page for makeup. In lesson, one can determine the time spent on a particular topic and the success of students by topic.

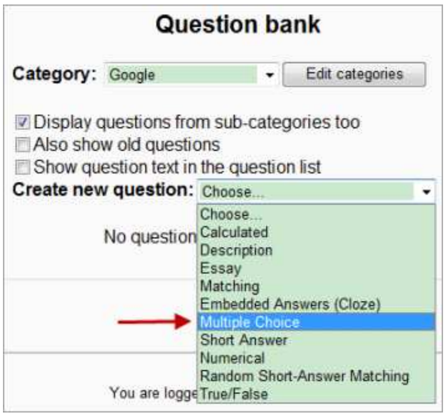

Figure 4. How to make quizzes in Moodle

Quiz (Fig. 4) contains various types of questions that can be prepared from a variety of courses. Questions can contain text, images, sound or video data. Quiz is a good way to test participants' knowledge, but a complex and challenging task for teachers. **Moodle** contains a flexible and efficient system for creating tests and everything is much faster and easier. The following tests exist in Moodle [4]:

- short test at the end of each lesson,
- timed test,
- test as a tool for learning, which allows the student fits until you reach the correct answer,
- test a questionnaire / survey, which does not affect the assessment of students, but it is important for teachers.

Moodle provides a wide range of questions:

- multiple choice – one or more correct answers,
- true/false – the student chooses one of the two options,
- short answer – a student enrolled in a word or phrase in response,
- numeric response – student to enroll,
- calculation – teacher enters a formula with variables, which are later replaced by numbers
- pairing – since I asked questions, given the list of sub-questions with a list of correct answers and the attendant needs to respond mentally to each question.

Survey is pre-prepared form that was created by experts to help teachers learn about their students. On checks the current state of the course or preferences of the participants.

c) Social contents

In addition to all the above-mentioned activities, a few allow communication between students and teachers. These activities are usually used for peer and group learning.

Forum is form of asynchronous communication between teachers and students. Posts on this forum are durable and can be re-reviewed, and it is not possible for synchronous communication.

Chat is a synchronous form of communication in which the speaker directly answers the question of students. Chat creates room where participants can talk in real time (online). It is a place where the participants agreed, to exchange views and information. Of particular concern is the safety of the chat, which is achieved by within a room can communicate only students of a particular group.

Dictionary is a very useful activity, which allows you to create a list of concepts that students supplement and correct. Because of this, a powerful vocabulary the means to group learning.

Wiki page is an activity for teamwork. This page allows participants to work together to create a web page, adding and changing content. Wiki does not delete old versions of the pages, so you can quickly correct errors.

IV. LEARNING USING MOODLE

Design and development of **Moodle** is guided by a philosophy of learning and thinking, which in theory is abbreviated as social constructivist (Fig. 5). Social constructivism means the belief that people learn best when they actively serve the teaching materials so as to create new materials and communicate with others on these materials [5]. This theory is based on four major concepts [6]:

- **constructivism** – people actively construct new knowledge through interaction with the environment,
- **constructionism** – learning is particularly effective when you construct something for others to experience,
- **social constructivism** – extend the ideas to a group of people who construct each other, creating a common culture with its own meaning divisible,
- **related and individually** – this idea further attempts to examine the motives of

individuals who participate in the discussion.

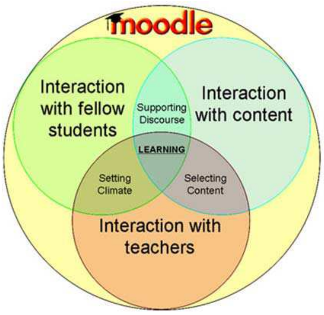

Figure 5. Moodle social constructivism

Teacher in the production of materials used HTML editors on the site. Each teaching a whole can add media files, and the author can edit an existing layout among multiple selected. Content can be displayed depending on the date and the possibility of publication more important announcements related to the course. Calendar may contain links to external sites or some other events. Group members are added manually, so the group can be assigned to a material. The teacher can see the number of visits each page (date and time of first and last login participants in the system and the time spent in the system), a graphical representation of the time spent on each page of content for each user individually, and may have more than one course of public and secret forums and see all discussions and messages of each user. Check students' knowledge enabled the creation of multiple-choice questions, matching questions, issues with replenishment, and issues with self-enrollment response and so on. Each test can limit time resolve and define the score for all attempts and can collect user points from multiple exams. Users can attach their tasks as file. **Moodle** provides teachers a full computational support for the organization and implementation of on-line courses. Some of the important features of **Moodle** are [7]:

- development of a large number of courses on a single system in a variety of forms,
- planning courses - schedule, calendar,
- management of user roles and user groups in courses,
- work with existing files and educational facilities,
- development of different types of on-line tests,
- monitor all user activity,
- numerous tools for communication and collaboration,
- create a vocabulary of technical terms,
- system management - backup, statistics, approaches
- a comprehensive system of assistance in exporting classes.

One of the great features of **Moodle** is its extensibility. There is a huge variety of activities that can be added in the form of so-called **Moodle** module. With the addition of modules can facilitate the creation of mathematical formulas or easier to ask lessons in chemistry from the module that allows printing of chemical formulas. There are modules that enable the delivery of tests on mobile phones students, inserting flash files, creating multiple copies of courses and many others. Each module will be additionally installed.

V. CONCLUSION

Moodle is flexible and fast free software solution, which supports two databases: MySQL and PostgreSQL, for a large number of languages. The popularity of this tool is based on a simple and quick installation, low demand for computer resources on which they are running, simple integration into existing systems and logical interface for students and mentors. **Moodle** has quickly gained popularity among teachers because of their adaptability and pedagogical foundations of an academic environment. Although there are fewer possibilities of commercial software solutions, can meet a large number of users because it allows them quickly mastering tools.

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CLUSTERING OF KNOWLEDGE INNOVATION IN STANDARDIZED "HARDWARE'S" SUBFIELDS OF INFORMATION TECHNOLOGY

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Abstract – The paper describes clustering of knowledge innovation in Information technology (IT) subfields related to hardware. According to the International Classification of Standards (ICS), as IT 35th area (ICS1 = first classification level), continue classified for 12 subfields of its second level (ICS2 = 35.xy0). The original methodology is used here which is applied to ranking/clustering of standardized fields presented on examples of innovation trends in IT subfields (ICS2): 35.160 - Microprocessor systems; 35.180 - IT terminal and other peripheral equipment; 35.200 - Interface and interconnection equipment; 35.220 - Data storage devices. A multi-criteria and statistical analysis of knowledge sources was applied in the paper. The goal of the research is forming knowledge trends and their clustering at more levels, from the standpoint of innovation frequency. Results of study in IT subfields leads to the more sensitive ranking of all 40 classified fields of human endeavor (ICS1 = 1 to 99).

I. INTRODUCTION

Knowledge innovation leads to the continuous improvement of processes and products and it involves a constant systematization through clearly defined fields of work. With the standardization at a local level (Serbian standards [1], hereinafter: SRPS) and at a global level (international standards, hereinafter: ISO/IEC [2]), it directs to linking the knowledge that would lead to identifying potential differences and determining the measures to improve products and processes.

Clustering of knowledge and innovations is imposed as a potential solution at the constant growth of data available in different categories of creativity. Clustering involves the grouping a set of objects in such a way that objects in the same group (called a cluster) are more similar to each other than to those in other groups (clusters) [3].

A clustering method has been applied in many fields, including the analysis of innovations in different fields of creativity: within the analysis of regional innovations in Canada in the field of economics [4]; measuring the importance of innovations which are the results of research at universities [5]; clustering of innovations in technical systems [6] etc.

In this paper, clustering was used in order to obtain accurate information about innovations in the subfields of Information technologies related to hardware. From the set goal, general tasks of the research follow (in PDCA spiral):

- *Plan*: data collection, resource planning,
- *Do*: data analysis, creation and analysis of trends,
- *Check*: determination of the level of innovativeness/ clustering,
- *Act*: knowledge innovation, towards the model of excellence.

II. METHODOLOGY OF WORK

In this paper, the methods of Web searches, then statistical methods with descriptions, multi-criteria analysis and clustering are used.

A. Collection and selection of data

The data were collected from the Website of the National Institute for Standardization [1] and the International Organization for Standardization [2].

The selection of the data is done in terms of clustering and determination of an innovativeness level. Here are excluded (from presentation) those subfields (or sub-groups) in which the entire sample is less than 30. The analysis is carried out with the own software [7], with a review of the data obtained in OpenOffice 4 [8]. After reviewing and sorting the data by years, diagram charts and

This study was supported by the Serbian Ministry of Education and Science (Project III 44006, http://www.mi.sanu.ac.rs/projects/projects.htm#interdisciplinary).

trends are created, and then clustering is performed.

B. Indexes of sampling and innovativeness

The own software [7] - Web application provides effective statistical analyses, presented through appropriate quantity indexes of SRPS and ISO standards, in this case in the subfields of ICS1 = 35: Iqs - sampled documents (samples), of which the Iqp - Number of current published standards (published), Iqw - withdrawn from use (withdrawn), Iqu - at various stages of development (under development) and Iqd - deleted projects (deleted).

Parallel for ISO-SRPS, the defined and specified indexes of quantity/ quantity indexes (Iq) refer to: Samples (Iqs), Published (Iqp) Under Development (Iqu = Std + Amd + Cor), Withdrawn (Iqw), Deleted (Iqd), **Innovations** (Iqi) - including: standards, amendments and corrections (or, Iqi = Iqi(std) + Iqi(amd) + Iqi(cor)). In a general case, for the population Iqs applies the equation (1):

$$\mathrm{Iqs} = \mathrm{Iqp} + \mathrm{Iqw} + \mathrm{Iqd} + \mathrm{Iqu} \qquad (1)$$

C. Creation and analysis of innovativeness trends

After the diagram presentations, a trend is created, with a selection of the most adequate line and presentation of a trend function. The results are graphically presented cumulatively, through the trends, and also through the original mathematical relations: **a**) including quantitative indexes (Iq), indexes of value (Iv) and time aspects, for the entire period of the study research – by years of all the editions; **b**) including annual indexes of value (Iv/year and a cumulative index ΣIv), and also financial trend lines, according to the data from all the previous years (or by selecting characteristic years of XXI century) for the formation of the regression equations (for example, $\mathbf{y}_{\mathbf{ics/ISO}}$ and parallel $y_{ics\ /SRPS}$ function (2.1) and (2.2).

$$y_{35/ISO/2007\text{-}2012/P1} = -32.14\,x + 1020 \qquad (2.1)$$

$$y_{35/SRPS/2007\text{-}2012/P1} = 149.6\,x^2 - 239\,x + 297.6 \qquad (2.2)$$

D. Data analysis with clustering

The indexes of time innovativeness intensity (Iti), provide clustering by subfields of work and further periodical updating of knowledge. Iti periodic frequency is defined on the basis of quantitative indexes Iqi which is in a direct multi-criteria qualitative and financial dependence, according to [9]. The values of periodic checks (Check) of the research for practice: Iti = 0 - annual Check (3.1), Iti = 1 - annual -yearly Check (3.2), Iti = 2 - monthly Check, Iti = 3 - weekly Check or Iti = 4 - daily Checks (3.5), are assigned to this index [9].

$$\mathrm{Iti} = 0,\ \text{for } (\mathrm{Iqu}_{/ISO} + \mathrm{Iqi}_{/SRPS/year}) = 0 \qquad (3.1)$$

$$\mathrm{Iti} = 1,\ \text{for } 1 \le (\mathrm{Iqu}_{/ISO} + \mathrm{Iqi}_{/SRPS/year}) < 10 \qquad (3.2)$$

$$\mathrm{Iti} = 2,\ \text{for } 10 \le (\mathrm{Iqu}_{/ISO} + \mathrm{Iqi}_{/SRPS/year}) \le 50 \qquad (3.3)$$

$$\mathrm{Iti} = 3,\ \text{for } 50 < (\mathrm{Iqu}_{/ISO} + \mathrm{Iqi}_{/SRPS/year}) \le 250 \qquad (3.4)$$

$$\mathrm{Iti} = 4,\ \text{for } 250 < (\mathrm{Iqu}_{/ISO} + \mathrm{Iqi}_{/SRPS/year}) \le 500 \qquad (3.5)$$

$$\mathrm{Iti} = 5,\ \text{for } 500 < (\mathrm{Iqu}_{/ISO} + \mathrm{Iqi}_{/SRPS/year}) \le 750 \qquad (3.6)$$

$$\mathrm{Iti} = 6,\ \text{for } 750 < (\mathrm{Iqu}_{/ISO} + \mathrm{Iqi}_{/SRPS/year}) \le 1000 \qquad (3.7)$$

$$\mathrm{Iti} = 7,\ (\mathrm{Iqu}_{/ISO} + \mathrm{Iqi}_{/SRPS/year}) > 1000 \qquad (3.8)$$

E. Modeling of excellence

Improving the quality in a PDCA spiral means the integration of at least 12 elements of the model of excellence, for quality management (QMx12, Figure 9 in [9]). In this way, a special methodology is created that facilitates the monitoring of the innovativeness trends. The result is a timely updating of the *Knowledge Base System* - *KBS*, in the adequate field/subfield of creativity (KBSti/ics ≈ function (Iti)) according to the relation (4) for the model of excellence.

$$\mathrm{KBSti/ics} \approx \sum (\mathrm{Iti/ics}\ \&\ \mathrm{PiDiCiAi})\ \&\ \mathrm{QMx12} \qquad (4)$$

III. Results

The results show significant quantitative indexes, as well as index values on the examples of ISO and SRPS standards. The original mathematical relations were derived, the lines of knowledge innovation trends. According to the graphs of trend lines, the coefficients of dependence directions of knowledge sources on the ISO - SRPS platform were defined and compared.

The results of the analyses (according to the relations (3.1) - (3.8) and cumulative innovations of knowledge source population on the platform of standardization), can be compared for all the fields of creativity, Figure 1.

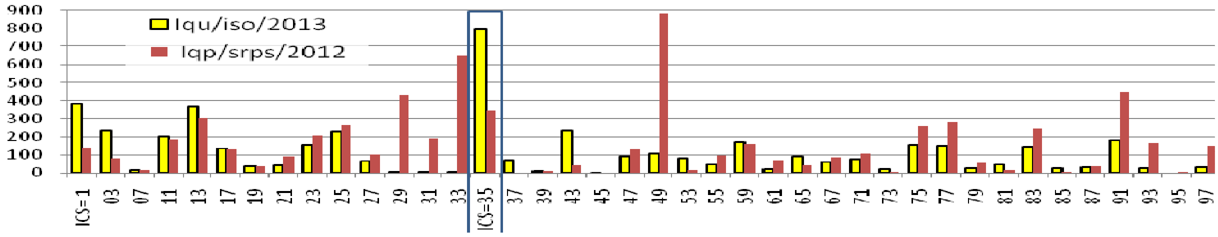

Figure 1: Examples of knowledge sources on the platform of ISO and SRPS standards (ICS1 = 1 to 99)

TABLE 1. ANALYSIS OF ISO - SRPS INNOVATIONS (FOR ICS2 = 35.XY0, 2014/ JANUARY)

I	**Subfield**	**Samples (Iqs)**		**Published (Iqp)**		**Withdrawn (Iqw)**		**Deleted (Iqd)**	**Under devel. (Iqu)**		**2013 (Iqi)**		**“Trend” Iv/2013**		**∑Iv (CHF) ∑Iv/2014.01**	
	ICS2	**ISO**	**srps**	**ISO**	**srps**	**ISO**	**srps**	**ISO**	**ISO**	**srps**	**srps**	**ISO**	**Srps**	**ISO**	**srps**	**ISO**
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*
1	35.160	31	10	20	8	11	2	0	0	0	1	0	27	0	224	3538
2	35.180	120	38	63	38	42	0	0	12	0	14	3	450	318	1205	7058
3	35.200	324	18	256	18	28	0	4	36	0	4	5	154	596	616	34826
4	35.220	250	10	184	9	64	1	0	2	0	2	8	11	1258	212	25812
5	35.240	**1733**	536	**908**	457	**467**	70	**19**	**339**	9	114	**95**	3759	**11828**	16445	**110922**

From the results shown in Table 1, it can be concluded that the global knowledge and innovations are much more numerous than the local ones.

A. Highest degree/ intensity of innovativeness

Cumulative index indicators make the field of IT (ICS1 = 35) in the cluster with the highest intensity of innovativeness - Iti = 7 according to the relation (3.8). Figure 2 shows the characteristic examples of obligatory publications in IT. The highest values of annual index quantities are presented. For example, the maximum of $Iqp_{/35/ISO/2008/2014.05} = 263$. Obviously, the maximum value index of annually published ISO "innovations" is $Iv_{/35/ISO/2008/2014.05} \approx 30000$ CHF (on May 10th, 2014), Figure 2.

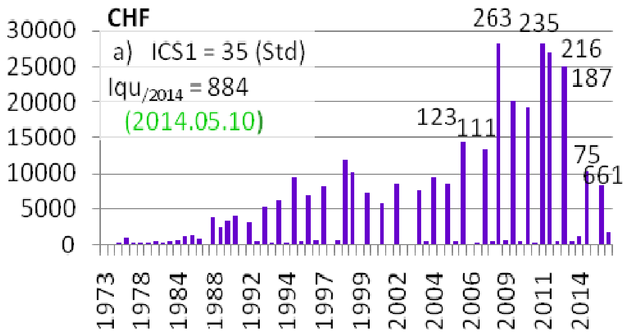

Figure 2: Analyses of IT – the ICS1 = 35 (2014/05/10 – ISO)

By analyzing all 12 subfields of IT (ICS1 = 35), one can notice a significant difference in the innovativeness degree of the subfields. For example, the subfield of IT application (ICS2 = 35.240) belongs to a cluster of high innovativeness intensity - Iti = 4 according to the relation (3.5), [10]. In this subfield, each working day is more than one innovation (Table 1, $Iqu_{/ISO} = 339$, and there are about 250 working days in a year).

B. Subfields of monthly innovativeness intensity

Out of 12 IT subfields (ICS1 = 35) to the cluster of a monthly innovativeness intensity belong two "hardware" subfields (Table 1): the second type - 35.180, and the third type - 35.200. Here follows a presentation of the analysis of results in the two mentioned subfields. Figure 3 shows the results of the analysis of knowledge sources in the subfield IT terminal and other peripheral equipment (ICS2 = 35.180). We analyzed the trends in knowledge on the standardization platform, on January 1st, 2014 and presented them in Figure 3:

a) with the presently actual ISO sources since 1976 and SRPS standards since 2008, with the presentation of the evaluated quantities of standards in the previous years and cumulatively $\Sigma Iv_{/35.180}$ – CHF/RSD,

b) with the knowledge trend and planned (annual) future needs ($Iv_{35.180/ISO/2014/P2} \approx 800$ CHF), according to polynomial relation (5.1).

$$y_{35.180/ISO/2005\text{-}2013} = 186.61 \ln(x) + 363.63 \qquad (5.1)$$

$$y_{35.180/SRPS/2005\text{-}2013} = 62.667 x - 135.25 \qquad (5.2)$$

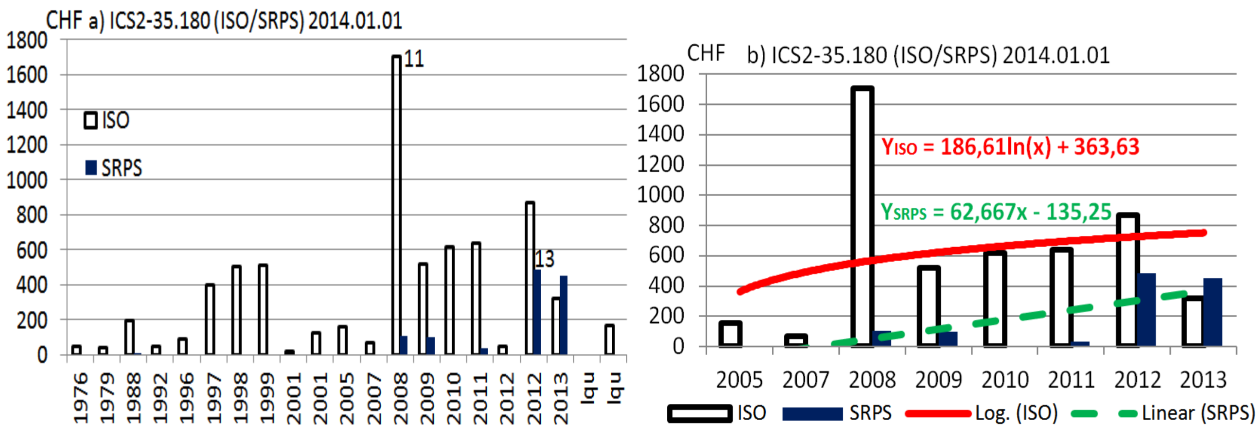

Figure 3: Analyses of knowledge sources (ICS2 = 35.180 - IT terminal and other peripheral equipment) on the platform ISO - SRPS

Figure 4 shows the results of the knowledge sources analysis in the subfield *Interface and interconnection equipment* (ICS2 = 35.200). We analyzed the knowledge trends on the standardization platform, on January 1st, 2014, and presented them in Figure 4:

a) with mandatory ISO sources since 1985 and SRPS standards since 2007, with the presentation of the evaluated quantities of standards in the previous years and the cumulatively $\Sigma Iv_{/35.200}$ - CHF/RSD,

b) with the trend of knowledge and planned (annual) future needs ($Iv_{35.200/ISO/2014/P2} \approx 900$ CHF), according to the polynomial relation (6.1).

$$y_{35.200/ISO/2007\text{-}2013} = -146.6\,x^2 + 1700\,x - 1217 \quad (6.1)$$

$$y_{35.200/SRPS/2007\text{-}2013} = 14.521\,x - 20.867 \quad (6.2)$$

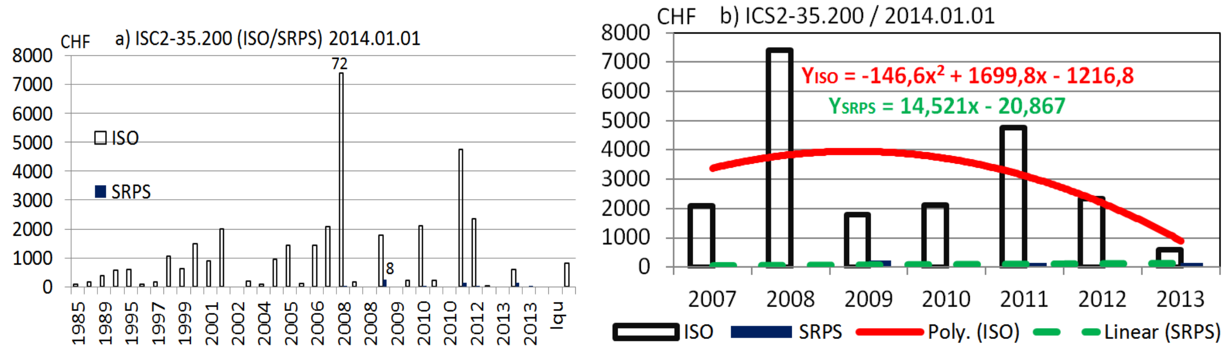

Figure 4: Analyses of sources of knowledge (ICS2 = 35.200 - Interface and interconnection equipment) on the platform ISO and SRPS

C. Subfields with low intensity of innovativeness

Two "hardware" subfields (of all 12 subfields of IT, ICS2 = 35."hw", Table 1) belong to the clusters of low innovativeness intensity (annual – 35.220 and zero level of innovativeness – 35.160).

Figure 5 shows the results of the analysis of knowledge sources in the subfield *Microprocessor Systems* (ICS2 = 35.160).

We analyzed the knowledge trends on the standardization platform, on January 1st, 2014, and presented them in Figure 5:

a) with the presently actual ISO sources since 1976 SRPS standards since 1999, with a presentation of valuated quantities of standards in the previous years and cumulatively $\Sigma Iv_{/35.160}$ - CHF/ RSD,

b) with the trend of knowledge and planned (annual) future needs ($Iv_{35.160/ISO/2014/P2} \approx 70$ CHF), according to the polynomial relation (7.1) and (7.2).

$$y_{35.160/ISO/1999\text{-}2013} = 71x^3 - 706x^2 + 1983x - 1128 \quad (7.1)$$

$$y_{35.160/SRPS/1999\text{-}2013} = 11.6x - 17 \quad (7.2)$$

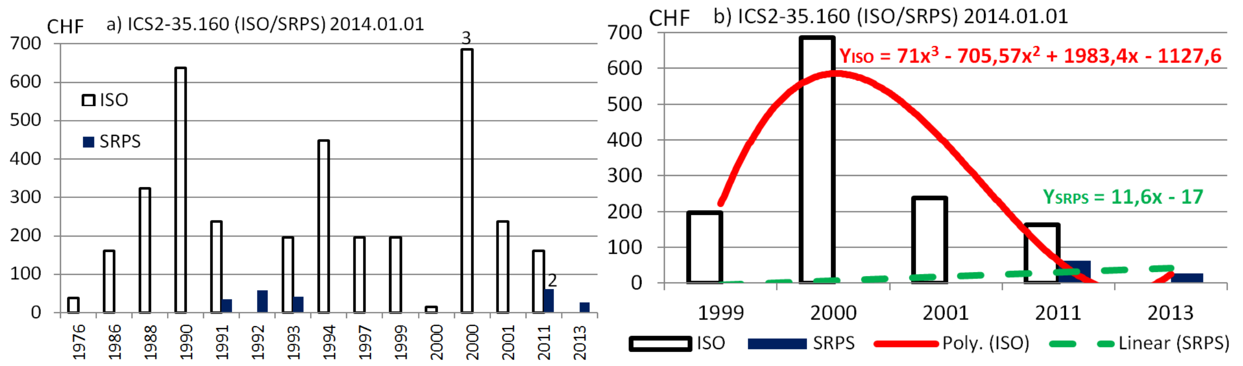

Figure 5: Analyses of sources of knowledge in subfields Microprocessor Systems (ICS2 = 35.160) on the platform ISO - SRPS standards

Figure 6 shows the results of the analysis of the sources of knowledge in the subfield *Data storage devices* (ICS2 = 35.220).

We analyzed the knowledge trends on the standardization platform, on January 1st, 2014, and presented them in Figure 6:

a) with mandatory ISO sources since 1973 and SRPS standards since 2005, with the presentation of the evaluated quantities of standards in the previous years and cumulatively $\Sigma Iv_{/35.220}$ - CHF/RSD,

b) with the trend of knowledge and planned (annual) future needs ($Iv_{/35.220/ISO/2014/P2} \approx 1300$ CHF), according to the polynomial relation (8.1) and (8.1).

$$y_{35.220/ISO/2005\text{-}2013} = 19.4x^3 - 274x^2 + 1046x - 342 \quad (8.1)$$

$$y_{35.220/SRPS/2005\text{-}2013} = -22.5\,x + 213.5 \quad (8.2)$$

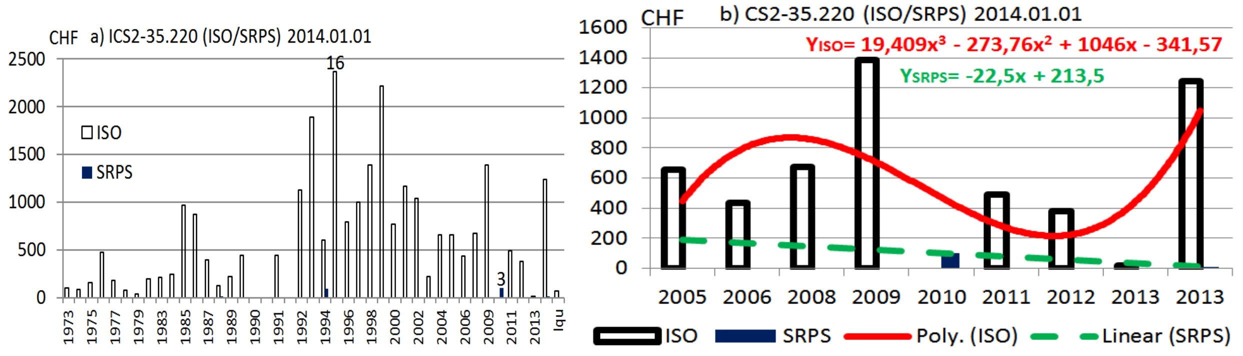

Figure 6: Analyses of sources of knowledge in the subfield *Data Storage Devices* (ICS2 = 35.220) on the platform of SRPS ISO standards

IV. Discussion on Results

The methodology enables to compare the results with the results in other subfields and areas of work and standardized creativity. Thus, in the field of IT, this paper presents the "hardware" subfields, divided into two clusters. At the same time, the study work provides comparative analyses with other standardized areas of creativity: ICS1 = 13, according to [12], ICS1 = 25 according to [13], ICS1 = 29 according to [14], innovativeness in the IT field (ICS1 = 35, according to [9], ICS2 = 35.240, according to [10]), or for comparison with previously published results for motor vehicles (ICS1 = 43 according to [15]), or ICS1 = 77 according to [16]. Previous research and analysis published by certain fields ICS1 [9] to [16], partly facilitate a comparative presentation of the results of innovativeness towards the knowledge base system for new products on the platform of standardization.

The comparative results in the surveyed fields (ICS1 = 1 to 99) and their subfields, provided the evidences of initial hypotheses and general research tasks. At the same time, the above mentioned objectives of the research were realized, presented in the PDCA methodology (Plan – Do – Check – Act).

A. Plan

The research shows that for the planned future access to the sources (or for the purchase of new standards) it is needed to plan many more resources at the global level (ISO) than for the local sources (SRPS), Table 1. Providing of resources leads via other important problems for which adequate solutions should be found.

B. Do

In addition to the original methodology, this paper presents the selected examples from the extensive analyses of situations and trends, evaluation and clustering of innovativeness of the knowledge sources on the standardization platform. Primarily, the focus is on the innovative aspects of IT hardware subfields (ICS2 = 35."hardware"). Also, the primary position of IT among the other 40 areas of creativity is indicated.

C. Check

Obviously, Clustering of Knowledge Innovation in Standardized "hardware's" subfields of IT shows a low level of innovativeness (hardware versus software subfields of IT). Compared to mathematic- historic ways of clustering [17], the presented way has a significant advantage in practice. Clustering is reduced to practical needs for knowledge updating:

- daily (Iti = 4/ 5/ 6/ 7/ 8),
- weekly (Iti = 3),
- monthly (Iti = 2),
- yearly (Iti = 1) or more rarely (Iti = 0).

D. Act

The imporvement act-phase involves the solutions for elimination of the recorded problems. Starting from a number of research approaches in the previous studies, as well as in practice, financial problems have taken a primary position. However, other numerous aspects are also of importance: hardware – software, time – space, qualitative – quantitative, expert – user, practical – theoretical, researching – pedagogical, deductive – inductive, collective – individual, standardization – innovativeness, etc. The goal is the establishment of *Decision Support Systems* (DSS) on the platform of clustered subfields of creativity. That is the subject of future work.

The correlations between the process of standardization and clusters of innovativeness require a special attention. On one hand, the standards provide a legal safety and a basis for innovativeness, create a huge market and build trust among the users [18]. According to the models of the innovation processes, the standardization in companies can affect all the stages starting from a basic research to a product design, manufacture and introduction into the market [19]. On the other hand, all the above mentioned influential aspects are disputable when the standardization process does not encourage the innovativeness of final products. However, in this paper, direct correlations of the standardization process and innovativeness are given. And, the examples of the selected only "hardware" subfields of IT are not sufficient for comprehensive and wider conclusions (in IT field).

V. CONCLUSIONS

Based on many years of research/studies, the analyses were selected from the overall results and presented in the "hardware" subfields of IT (ICS = 35). Conclusions can be made individually and on the whole, parallel in IT, and with the subfields and other areas of creativity. According to the set goals, the paper presents the results of the original research, based on the innovativeness indexes, clustering, quantity indexes and value indexes.

- The original methodology of innovativeness trends research, on the platform of the standardized exemplary subfields of IT application, is a reliable way of determining the gap between local and global sources of knowledge and innovation trends.
- In the local innovations of final products, on the standardization platform, financial resources are critical, respectively it is almost impossible to access to knowledge sources. By that, updating the knowledge of individuals, but also a (mass) approach from educational institutions is debatable.
- The global innovativeness intensity (on ISO platform) is higher than the local one (on SRPS platform) in all the analyzed IT subfields.
- In summary, in the field of IT, the possibilities to follow or monitor the standardization of IT "hardware" subfields are significant and "easily" solvable. Monitoring the monthly innovativeness intensity is also possible by individuals, in comparison with the cumulative or individual values of the published standardized sources of a more intensive degree of innovativeness. The problems of following a higher level of innovativeness (weekly, monthly and daily...) are beyond the possibilities of individuals. The solutions require a team work and a state-institutional level.

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TECHNOLOGIES THAT ARE BEING USED IN E-LEARNING AND ITS EVOLUTION

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Abstract - This paper refers to e-learning as the use of technologies in learning and education. In 1960, the University of Illinois used e-learning as a form for students to access materials and lectures in a video or audio form via computer terminals. Soon after, educational institutions began to take advantage of these systems and started offering e-learning. Various technologies are being used to make e-learning functional. Most e-learning systems use combinations of video and audio materials, virtual classrooms, computer-aided assessments, etc. Uses and importance that e-learning has is shown through the examples. Although e-learning has some disadvantages, the advantages that it has definitely shows that the future of learning lies in e-learning.

I. INTRODUCTION

Learning can never exhaust the intellect. Alexander Pushkin said that the best learning is reading. If Pushkin had lived as our contemporary, he would probably say that the best learning is e-learning.

E-learning is an inclusive term that describes educational technology that electronically or technologically supports learning and teaching. Bernard Luskin, a pioneer of e-learning, advocates that the "e" should be interpreted to mean "exciting, energetic, enthusiastic, emotional, extended, excellent, and educational" in addition to "electronic".

Today, most of the knowledge around the world, in all areas, is available on the Internet. There is no excuses for those who have access to the Internet, for lack of knowledge.

II. HISTORY OF E-LEARNING

In 1960, the University of Illinois created a classroom system based in linked computer terminals where students could access informational resources on a particular course while listening to the video and audio lectures.

Soon after that, Stanford University psychology professors Patrick Suppes and Richard C. Atkinson used computers to teach math and reading to young children in elementary schools in East Palo Alto, California.

About ten years later, educational institutions began to take advantage of the new medium by offering e-learning courses using computer networking for information.

In 1976, Bernard Luskin launched Coastline Community College as a "college without walls" using television station KOCE-TV as a vehicle. By the mid-1980s, accessing course content becomes possible at many college libraries.

The Open University in Britain and the University of British Columbia began a revolution using the Internet to deliver learning. With the advent of World Wide Web in the 1990s, teachers embarked on the method using emerging technologies to employ multi-object oriented sites, which are text-based online virtual reality system, to create course websites along with simple sets instructions for its students.

As the Internet becomes popularized, correspondence schools became highly interested with the virtual education. Online education is rapidly increasing.

According to a 2008 study conducted by the U.S Department of Education, back in 2006-2007 academic year, about 66% of postsecondary public and private schools began participating in student financial aid programs offered some distance learning courses, record shows only 77% of enrollment in for-credit courses being for those with an online component. In 2008, the Council of Europe passed a statement endorsing e-learning's potential to drive equality and education improvements across the EU.

The Texas Government Code, which requires the Department of Information Resources (DIR) to provide a summary of the amount and use of Internet-based training conducted by each state agency and institution of higher education. Report findings are based on a targeted survey of all agencies and universities as well as relevant industry research. The term *e-learning* refers to instructional content or learning experiences delivered, enabled, or enhanced by electronic technologies. Progress:

Over the last biennium, Texas state agencies continued to incorporate e-learning practices into their organizations. State agencies and higher education institutions were surveyed on their existing e-learning practices as part of the 2009 Information Resources Deployment Review (IRDR).

The following table identifies the current and planned delivery methods used by state agencies (Table 1). Respondents also identified how many completions occurred for each of the primary delivery methods stated above. A completion consists of one employee completing one class.

TABLE 1. ***Training Delivery Methods Used by State Agencies***

Delivery Method	**FY2008–09 (Actual)**	**FY2010–11 (Planned)**
Traditional Classroom	88%	90%
Computer-Based Training	72%	74%
Web Conferencing	56%	66%
Video Conferencing	43%	45%
Audio Conferencing	35%	40%
Computer Simulations	16%	18%
Podcasting	13%	15%
Satellite	5%	6%
PDA/Smart Phone	4%	7%
Correspondence (no-tech)	6%	6%

For the more than 2.2 million completions where a delivery method could be identified, 62 percent used technology-related methods and only 38 percent utilized traditional face-to-face classroom. This shows a significant increase from the previous biennium where technology-enabled courses represented only 34 percent in fiscal 2006 and 38 percent in fiscal 2007 (Picture 1).

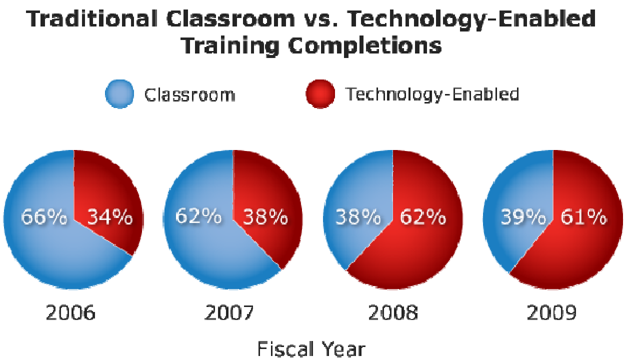

Figure 1. Traditional classroom vs. Technology-Enabled Training Completions

III. AN EXAMPLE OF AN OPEN SOURCE SYSTEM FOR ONLINE LEARNING

“Moodle” is an open source software package, which uses the basic educational principles, and is designed to help teachers to create effective educational groups. There are over 75000 users in 138 countries, covering 70 languages. Allows teachers to prepare lessons perm a proper information issues, to organize student forums, group students in order to solve specific tasks and problems, install and maintain documentation and organize online examinations and direct assessment. “Moodle” is an open - source system for management courses (Course Management System - CMS), also known as a Learning Management System – LMS, or Virtual Learning Environment - VLE, that use universities, schools and individual instructors to create and improve the courses using the web - technology.

"Moodle" has become very popular among educators around the world as a tool for creating dynamic web sites for their students. The word "Moodle" is actually an acronym for Modular Object-Oriented Dynamic Learning Environment. Creator of this tool is a professor of computer tools Martin Dougiamas, who has involved in the study of systems management courses, at University in Perth (Austalia).

"Moodle" is a software tool with open source, which means that the user has granted access to the source code, with the possibility of changes in the applications and adapting to their own needs. The application can be downloaded for free from the official "Moodle" Web site.Many institutions use "Moodle" as a platform for the implementation of on-line courses, and some use it only as an alternative to the classical approach to learning.

IV. TECHNOLOGIES THAT ARE BEING USED IN E-LEARNING

Technologies that are being used in e-learning include:

- Audio
- Video
- Cumputers, tablets and mobile devices
- Blogging
- Webcams
- Whiteboards
- Screencasting
- Combining technology
- Virtual classroom

Because e-learning is asynchronous, it requires a form of preserving lectures so that they are available anytime the student wants to access it. For this reason, audio and video technology is important because it can capture the lessons and preserve them.

Audio technology while inferior to video technology it has a benefit that it doesn't require a screen that people need to pay total attention to allowing them to work on something else while listening to the audio file. The requirements for this technology are a microphone and audio recording software.

Video technology has the possibility of reaching students that are visual learners and those who tend to learn better by seeing the material than only hearing it. Requirements are only a digital camera, a microphone together with some video recording and audio recording software together with video editing software. Audio and video streaming is one of the ways that the teachers and students stay in a more direct contact. This technology allows the teacher to help the student in that moment and it allows the student to ask questions and get the full attention of the teacher. For this technology together with a digital camera and a microphone, it is needed to have a good connection with high upload speed and video streaming software.

Instant messaging technology is important in e-learning because asynchrony is the main benefit for students to use e-learning. This technology allows for the students and teachers to exchange messages that can be answered anytime. The requirements for this technology are low the only requirements are the Internet connection and instant messaging software.

Virtual classrooms are a combination of video and audio streaming and an instant messaging service. Participants in a virtual classroom can raise hands, answer polls or take tests. Other communication technologies available in a virtual classroom include text notes and microphone rights. Virtual classrooms have almost the same requirements as audio and video streaming the only difference is that the software virtual classroom technology is using is different.

V. ADVANTAGES AND DISADVANTAGES OF E-LEARNING

Advantages of online learning is mainly based in the fact that the learning is asynchronous it provides the main benefit to the people that have little free time. The implementation of different media makes the learning seem more interesting and provides a good variety while learning. People are given the freedom to skip material that they already know and make the lessons take less time than needed. It is possible to repeat lessons and material that students did not fully understand.

Because of the fact that sometimes information is altered updating e-learning material is important and it is easier to update than books or other learning material. E-learning also improves the access to education for people who do not have the money or the time to attend classes and lectures.

Even if asynchronous learning is the main advantage of e-learning it is also a major disadvantage, because of that it can happen that the student or teacher has to wait a long time until he gets an answer for some small questions that could be explained in mere minutes.

The main disadvantage of e-learning is based on the technology requirements that the students need to have. Because the material for e-learning contains different technologies like video or streaming a stable internet connection that has no bandwidth limit is required which students sometimes can't afford.

Money is also a concern not only for students that need to have the equipment but also for the teachers because they need equipment for making e-learning possible in the first place.

VI. CONCLUSION

E-learning is a great method for bringing quality education to the people that need it even if the asynchronous functionality is an advantage a disadvantage the freedom of learning in the free time is a greater advantage than disadvantage.

In the future when the technology and the Internet will be available to a greater percent of people, online learning will surely be the way to go for learning new things that people would not be able to learn in their vicinity.

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ACCREDITATION OF HIGHER EDUCATION INSTITUTIONS IN INDIA AND SERBIA: COMPARISON OF AUDIT FORMS

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Abstract – This paper describes institutions that conduct accreditation of higher education institutions in India and Serbia. Since the process of audit in the accreditation is similar, this paper describes differences in audit forms that are in use in these two countries.

I. INTRODUCTION

Accreditation process of higher education institutions (HEIs) is based on national standards and legislation, defined by appropriate government departments and organizations.

In India, National assessment and accreditation council (NAAC) [1] is established as an autonomous Institution of the University Grants Commission (UGC), which provides funding for Government, managed universities and colleges. This institution defines all forms and procedures, gives guidelines and manuals for implementation of accreditation of higher education institutions – universities, colleges that are affiliated to universities and autonomous colleges. Since India is large country divided in states, the conducting of accreditation of particular universities and colleges are organized within State level organizations that are established from Government of India - Department of Education. One of these organizations for Gujarat State is Knowledge Consortium of Gujarat - KCG [2].

In Serbia, National Council for higher education [3] is the highest national institution for quality assurance in higher education in Serbia. It defines national qualification framework and gives guidelines for accreditation documentation preparation and university staff career assessment and teaching staff employment. Commission for Accreditation and Quality assurance of Higher Education Institutions in Republic of Serbia (CAQA) [4] is established in year 2006 by Serbian national council for higher education initiative, to work on quality assurance and the accreditation of higher education institutions in Serbia (for accreditation in institutions and study programmes). Since 2011, CAQA is conducting external quality control of HEI's.

In the world of globalization in higher education [5], national standards and legislation in the field of accreditation are adapted to regional and international standards, in aim to enable international cooperation and improve quality. Therefore, NAAC in India establishes regional cooperation with Asia-Pacific Quality Network [6] and International Network for Quality Assurance Agencies in Higher Education [7]. Serbian national council for higher education cooperates with European Association for Quality Assurance in Higher Education, ENQA [8]. In 2013, CAQA was granted full ENQA membership [9], which means that Serbian legislation and accreditation process complies with the European Standards and Guidelines [10].

Aim of this paper is compare the audit process and forms in accreditation of higher education institutions in India and Serbia.

II. HEI'S AND ACCREDITATION IN INDIA AND SERBIA

In India, higher education institutions are organized as [1]: a) Universities and colleges affiliated to universities or b) Autonomous colleges. Financing of higher education institutions is organized within three modalities: a) Funded by

University Grants Commission (UGC) and maintained by the State Governments; b) Co-financed by University Grants Commission and partly self-financed; c) Completely self-financed (privately held). Since NAAC is an organization that is established as an autonomous Institution of the University Grants Commission, it conducts primarily accreditation to Government managed (financed by UGC) higher education institutions. All eligible HEIs include universities **(**Central/State/Private/Deemed-to-be**)** and colleges (colleges/institutions affiliated to, constituent of, or recognized by universities, including autonomous colleges).

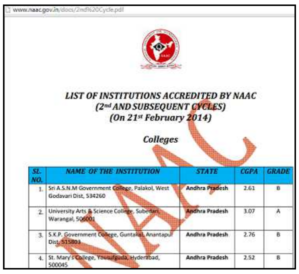
In Serbia, higher educational institutions are categorized as: a) Academic studies: Universities with Faculties – i.e. University Schools or Colleges as institutions that belong to Universities; b) Professional studies: Autonomous High Professional Schools/Colleges – not affiliated to a University. Regarding funding, HEI's are categorized as: a) State Managed (partly financed by Government funds and partly self-financed); b) Private Managed – privately held (fully self-financed). In Serbia, CAQA conducts accreditation of all HEIs, regardless of source of financing. Both Government managed or privately held HEIs are to submit documentation to CAQA and are covered by process of accreditation.

III. ACCREDITATION PROCESS

In India, accreditation process consists of steps: a) On-line submission of the Letter of Intent (LOI). b) On-line submission of Institutional Eligibility for Quality Assessment (IEQA) for applicable institutions) Preparation of Self-study Report (SSR), it is uploading on the institution website and submission to NAAC. d) Peer team visit to the institution. e) Final decision by NAAC.

In Serbia, once in five years, HEIs create self-assessment report for 5-year period. A HEI (each faculty from University of professional college) submit paper documentation at CAQA office. Each HEI's documentation is sent from CAQA to external auditors to control documentation. A commission from CAQA members visits the institution to assess facilities, equipment, classrooms etc. Report from CAQA visit is integrated with report from external auditors' reports on documentation analysis. In Serbia, each higher education institution could assign one or more external auditors for documentation review. They are professors with specialties in certain fields that are trained to be external auditors.

In both countries list of successfully accredited institutions is available at appropriate web site of national institutions for accreditation – India (Figure 1) and Serbia (Figure 2). In India, each HEI, i.e. college (autonomous or affiliated to a university) receives an accreditation, with particular CGPA value and grade. In Serbia, each University (that consists of faculties as higher education institution) receives an accreditation grant, as well as each Faculty that belongs to the University, but no grade points or grade level is given.

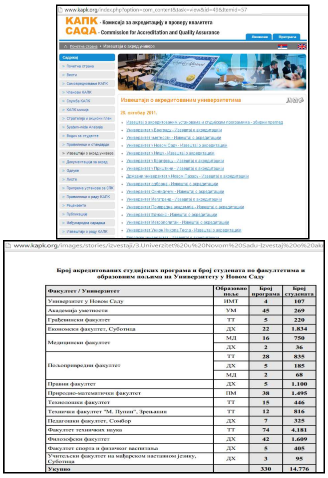

www.naac.gov.in/docs/2nd%20Cycle.pdf

LIST OF INSTITUTIONS ACCREDITED BY NAAC
(2nd AND SUBSEQUENT CYCLES)
(On 21st February 2014)

Colleges

SL. NO.	NAME OF THE INSTITUTION	STATE	CGPA	GRADE
1.	Sri A.S.N.M Government College, Palakol, West Godavari Dist, 534260	Andhra Pradesh	2.61	B
2.	University Arts & Science College, Subedari, Warangal, 506001	Andhra Pradesh	3.07	A
3.	S.K.P. Government College, Guntakal, Anantapur Dist, 515803	Andhra Pradesh	2.76	B
4.	St. Mary's College, Yousufguda, Hyderabad, 500045	Andhra Pradesh	2.52	B

Figure 1. Figure 1. List of accredited institutions (colleges) by NAAC, India [3]


www.kapk.org/index.php?option=com_content&task=view&id=49&Itemid=57

КАПК - Комисија за акредитацију и проверу квалитета
CAQA - Commission for Accreditation and Quality Assurance

Извештаји о акредитованим универзитетима

- Универзитет у Београду - Извештај о акредитацији
- Универзитет уметности - Извештај о акредитацији
- Универзитет у Новом Саду - Извештај о акредитацији
- Универзитет у Нишу - Извештај о акредитацији
- Универзитет у Крагујевцу - Извештај о акредитацији
- Универзитет у Приштини - Извештај о акредитацији
- Државни универзитет у Новом Пазару - Извештај о акредитацији
- Универзитет одбране - Извештај о акредитацији
- Универзитет Сингидунум - Извештај о акредитацији
- Универзитет Мегатренд - Извештај о акредитацији
- Универзитет Привредна академија - Извештај о акредитацији
- Универзитет Едуконс - Извештај о акредитацији
- Универзитет Метрополитан - Извештај о акредитацији
- Универзитет Унион Никола Тесла - Извештај о акредитацији

www.kapk.org/images/stories/izvestaji/3.Univerzitet%20u%20Novom%20Sadu-Izvestaj%20o%20ak

Број акредитованих студијских програма и број студената по факултетима и образовним пољима на Универзитету у Новом Саду

Факултет / Универзитет	Образовно поље	Број програма	Број студената
Универзитет у Новом Саду	ИМТ	4	107
Академија уметности	УМ	45	269
Грађевински факултет	ТТ	5	220
Економски факултет, Суботица	ДХ	22	1.834
Медицински факултет	МД	16	750
	ДХ	2	36
Пољопривредни факултет	ТТ	28	835
	ДХ	5	185
	МД	2	68
Правни факултет	ДХ	5	1.100
Природно-математички факултет	ПМ	38	1.495
Технолошки факултет	ТТ	15	446
Технички факултет "М. Пупин", Зрењанин	ТТ	12	816
Педагошки факултет, Сомбор	ДХ	7	325
Факултет техничких наука	ТТ	74	4.181
Филозофски факултет	ДХ	42	1.609
Факултет спорта и физичког васпитања	ДХ	5	405
Учитељски факултет на мађарском наставном језику, Суботица	ДХ	3	95
Укупно		330	14.776

Figure 2. List of accredited Universities (left) and colleges affiliated to a particular university (right), CAQA, Serbia [4]

For each University in Serbia, list of faculties that belong to that university is presented in CAQA report with educational field, number of education programmes (courses) and number of students to be allowed to apply to study at that HEI in next year (Figure 2, right).

IV. INSTITUTION ACCREDITATION - AUDIT FORMS IN INDIA

In institution accreditation in India, for each HEI (college) there is a list of 7 criteria. Within each of these criteria, there are several sub-criteria, each grouping key aspects. Each key aspect has defined maximum points (weightage). Key aspects are defined as questions (regarding quality aspects and quality goals) that easily could be answered. For each question an auditor gives points 0/1/2/3/4, estimating level of accomplishment of particular key aspect (Figure 4).

Criterion No.	Key Aspect No.	Criteria wise Input	Weightage Wi	Peer Team Assigned Key Aspect Grade Points (KAGP) 4/3/2/1/0	Key Aspect Grade Points KAGPi=KAGPi*Wi
I		**Curricular Aspects**			
1.1		Curricular Planning and Implementation	20		
	1.1.1(a)	Students of the college know the vision & mission and objectives of the institution.	1	2	2

Figure 3. MS Excel form for criteria accomplishment estimation in audit of HEI in India

Criterion I - Curricular Aspects - Curricular Planning and Implementation - Students of the college know the vision & mission and objectives of the institution. Teachers & staff of the college know the vision & mission and objectives of the institution. Other stakeholders of the college know the vision & mission and objectives of the institution. Institution has developed effective system of planning, implementation and monitoring regarding curriculum. Faculty members receive support from the institute by various ways to translate the curriculum effectively. Faculty members receive support from the institute by various ways to improve teaching practice. The institution contributes for effective curriculum delivery and transaction on the curriculum provided by affiliating university. The institution interacts with beneficiaries such as industry, research bodies and the university for effective operationalization of the curriculum. Institution has mechanisms to anlayse /ensures that the stated objectives of curriculum are achieved in the course of implementation. Institution has developed curriculum for any of the courses other than those the purview of the affiliating university. The institution ensures effective curriculum delivery and transaction. Academic Flexibility - The institution offers a number of program options leading to different degrees, diplomas and certificates (UG/PG/PG Diploma/Diploma Certificate). The curriculum offers a number of Choice Based Credit System (CBCS)/elective options. A number of new programs and program combinations are developed/adopted to meet the needs of the students and the society. Options are available to students for additional/supplementary/enrichment courses along with their regular curricula. (Eg. UG degree + a Certificate, PG degree + a diploma and so on). The institution provides for inter institutional credit transfer. The institution follows semester system; Curricular Enrichment - The institution make efforts to supplement the University's Curriculum to ensure that the academic programmes and Institution's goals and objectives are integrated. Efforts made by the institution to enrich the curriculum cater to the need of the dynamic employment market. The institution integrates the cross cutting issues such as gender, climate change, environmental education, human rights, ICT, etc. into the curriculum. All learners have access to value-added programmes, including communication skills/soft skills. The institution cites use of the feedback from stakeholders in enriching the curriculum. The institution monitors and evaluates the quality of its enrichment programmes; Feedback System- The institution contributes in the design and development of curriculum prepared by university based on feedbacks. Faculty takes initiatives in the curriculum revision based on the feedback from stakeholders. Feedbacks from students are taken in structured manner. New programmes / courses were introduced by the institution the last four years. New programmes / courses were introduced with some rationale.

Criterion II Teaching Learning and Evaluation- Student Enrolment and Profile - The admission process of the institution is widely publicized and is transparent with predetermined criteria. The criteria adopted and process of admission to various programmes of institution are on merit/merit entrance test combination/entrance test interview, which is appropriate. "There is a mechanism in the institution to review the admission process and student profiles annually. It has contributed to the improvement of the process. “The college has an admission policy to cater diverse student groups. The institution implements the statutory reservation policies. The institution has offered various programmes according to trends in last five years; Catering to Student Diversity -"The institution caters to the needs of differently- abled students and ensures adherence to government policies in this regard." The institution assesses the students' needs in terms of knowledge and skills before the commencement of the programme. The institution has adopted the strategies to bridge the knowledge gap of the enrolled students (Bridge/Remedial/ Add-on/ Enrichment Courses, etc.) to enable them to cope with the programme of their choice. The college sensitizes its staff and students on issues such as gender, inclusion, and environment. The institution identifies and responds to special educational/learning needs of advanced learners.

"The institute collects, analyzes and uses the data and information on the academic performance (through the programme duration) of the students at risk of drop out (students from the disadvantaged sections of society, physically challenged, slow learners, economically weaker sections etc. who may discontinue their studies if some sort of support is not provided)."; Teaching-Learning Process - The college plans and organizes the teaching, learning. (Academic calendar, teaching plan, etc.). The college plans and organizes the evaluation schedules. (Evaluation blue print, etc.). IQAC contributes to improve the teaching – learning process appropriately. Learning is made more student-centric. Support structures and systems are available for teachers to develop skills like interactive learning, collaborative learning and independent learning among the students. Interactive learning system is actively working. Collaborative learning system is actively working. Support structures and systems are available for students for independent learning. The institution nurtures critical thinking, creativity and scientific temper among the students to transform them into life-long learners and innovators. The institution nurtures creativity among the students to transform them into life-long learners and innovators. The institution nurtures scientific temper among the students to transform them into life-long learners and innovators. The following technologies and facilities are available and used by the faculty for effective teaching. Virtual laboratories. E learning - resources from National Programme on Technology Enhanced Learning (NPTEL). "National Mission on Education through Information and Communication Technology (NME-ICT)". Open educational resources. Mobile education. Others. "The students and faculty are exposed to advanced level of knowledge and skills (blended learning, expert lectures, seminars, workshops, etc.)." The academic, personal and psychosocial support and guidance services (professional counseling/mentoring/academic advice) provided to students. The faculty has adopted innovative teaching approaches/methods during the last four years. The institution has made efforts to encourage the faculty to adopt new and innovative approaches and the impact of such innovative practices on student learning. Library resources are used to augment the teaching-learning process. The institutional approaches are used to overcome any challenges in completing the curriculum within the planned period and calendar. The institute monitors and evaluates the quality of teaching learning appropriately. Teacher Quality - The institution adheres to UGC/ State Govt. norms for faculty recruitment and promotion. The institution has adequate faculties. All the faculties have minimum qualification as per UGC norms. (NET/SLET /SET). All the faculties have research qualification. (M.Phil., Ph.D., D.Lit., D.Sc. etc.). "The institution copes with the growing demand/ scarcity of qualified senior faculty to teach new programmes/ modern areas (emerging areas) of study." The efforts made by the institution to cope up the growing demand has achieved good outcome during the last three years. The institution has nominated teachers to academic staff development programmes during the last four years. (Refresher courses, Orientation programmes, HRD programmes, staff training programmes, summer/winter schools, workshops.) "The institution organizes faculty training programmes to empower and enable the use of various tools and technology for improved teaching-learning. (Teaching-learning methods/approaches, handling new curriculum, content/knowledge management, selection, development and use of enrichment materials, assessment, cross cutting issues, audio-visual aids/multimedia, Open Educational Resources, Teaching learning material development, selection and use". Faculties are invited as resource persons in Workshops / Seminars / Conferences organized by external professional agencies. "Faculties participate in external Workshops / Seminars /Conferences recognized by national/ international professional bodies." Faculties present papers in Workshops / Seminars / Conferences conducted or recognized by professional agencies. The institution has adopted a system/policy to recharge teachers. e.g.: providing research grants, study leave, support for research and academic publications teaching experience in other national institutions and specialized programmes industrial engagement etc.). Faculties have received awards / recognition at the state, national and international level for excellence in teaching during the last four years. The institutional culture and environment have contributed to such performance /achievement of the faculty significantly. The institution has introduced evaluation of teachers by the students and external Peers. The evaluation is used for improving the quality of the teaching-learning process; Evaluation Process and Reforms- The institution disseminates the evaluation processes to all its stakeholders. The evaluation reforms adopted /initiated by the institution are significant. Transparency and security of evaluation system is ensured. The institution has adopted the formative and summative assessment approaches to measure student achievement. The institution has documented positively impacted system to measure student achievement. The institution ensures timely declaration of the results of internal examinations. The institution ensures rigor and transparent system to assess overall development of students, which has weightage for behavioral aspects, independent learning, communication skills, etc. The college ensures the attainment of graduate attributes specified by the university/college. The institution has an effective mechanism for redress of grievances pertaining to examinations; <u>Student Performance & Learning Outcomes -</u> The graduate attributes/ student-learning outcomes of the institution are clearly defined/articulated. Students and staff are made aware of student learning outcomes. The institution ensures that its various programmes and activities help to achieve the stated graduate attributes. The institution monitors and communicates the progress and performance of students through the duration of the course / programme. The institution has mechanisms in place to analyze short falls in achievement of learning outcomes and suggest improvement measures. The achievement of intended learning outcomes is central to the pedagogical and assessment processes of the institution/university. The institution has taken initiative to enhance the social and economic relevance (student placements, entrepreneurship, innovation and research aptitude developed among students etc.) of the courses offered. The institution measures the social and economic relevance. "The institution collects and analyses data on student performance and learning outcomes and uses it for planning and overcoming barriers of learning." The institution monitors and ensures the achievement of learning outcomes. The institution and individual teachers use assessment/ evaluation outcomes as an indicator for evaluating student performance, achievement of learning objectives and planning.

<u>**Criterion III - Research Consultancy and Extension-**</u> <u>Promotion of Research -</u> The institution has recognized research center/s of the affiliating University or any other agency/organization. The institution has a research committee to monitor and address the issues of research. The composition of the research committee is well designed. Recommendations made by the committee for implementation and their impact are useful. The institution has taken following measures to facilitate smooth progress and implementation of research schemes/ projects:"(i) Autonomy to the principal researcher "(ii) Timely availability or release of resources "(iii) Adequate infrastructure and human resources “ "(iv) time-off, reduced teaching load, special leave etc. to teachers " "(v) support in terms of technology and information needs” "(vi) facilitate timely auditing and submission of utilization certificate to the funding authorities (vii) any other. The institution has made efforts for developing scientific temper and research culture and aptitude among students. "The faculties involve in active research (Guiding student research, leading Research Projects, engaged in individual /collaborative research activity, etc." The institution conducts workshops/ training programmes/ sensitization programmes with focus on capacity building in terms of research and imbibing research culture among the staff and students. The institution priorities research areas and the expertise available with the institution. Faculties are given due recognition for guiding research. "The efforts of the institution in attracting researchers of eminence to visit the campus and interact with teachers and students are significant. “ The institution has a good percentage of faculties who have utilized sabbatical leave for pursuit of higher research in premier institutions and within the country and abroad. The institution has the provision for contribution to improve the quality of research and imbibe research culture on the campus. The faculty is encouraged to undertake research by collaborating with other research organizations/ industry; <u>Resource Mobilization for Research -</u> Financial provisions are made in the institution's budget for supporting students' research projects. The institution encourages its faculty to prepare proposals of research project and to file patents. Projects sponsored by the industry / corporate houses are availed by the institution. The institution receives quantum of research grants from external agencies for major and minor projects. The institution has recognized Research Centers. ; <u>Research Facilities -</u> Efforts are made by the institution to improve its infrastructure requirements to facilitate research. Available research facilities and efforts for enhancement are considerable. Residential facilities (with computer and internet facilities) for research scholars, post-doctoral fellows, research fellows of various academies and visiting scientists (national/international) are available. The institution has a specialized research centre/ workstation on-campus and off-campus to address

the special challenges of research programmes. The institution has faculty of national and international recognition/repute.; Research Publication and Awards- Significant faculty involvement in research is evident. The institution has an official Code of Ethics to check malpractices and plagiarism in research. Interdepartmental / interdisciplinary research projects are undertaken. The institution has instituted research awards. Incentives are given to the faculty for receiving state, national and international recognition for research contributions. The faculty and students receive research awards and recognition (including patents). Output in terms of M.Phil., Ph.D. students is significant. A significant number of research articles are published in reputed/refereed journals. The institution has published books and proceedings based on research work of its faculty. The institution is acclaimed for its research as evidenced by metrics such as Citation Index, Impact Factor, h-index, SNIP, SJR, etc.; Consultancy- The institution publicizes the expertise available for consultancy services. The institution renders consultancy services to industries/Government/Non-Government Organizations /Community / Public. Resources (financial and material) are generated through consultancy services of the institution. Mutual benefits accrued due to consultancy. The institution has an official policy for structured consultancy; Extension Activities and Institution Social Responsibility - the institution promotes the conduct of extension activities. Need-based extension programmes are organized. Students and faculty participate in extension programmes. NSS/NCC activities are organised. Awards and recognitions have been received for extension activities. The impact of extension activities on the community goes through a cycle of evaluation, review and upgrading the extension programmes. Partnerships with industry, community and NGOs for extension activities are established. The institution has a mechanism to track the students' involvement in various social movements/activities, which promote citizenship roles. The institution is cognizant of its Institutional Social Responsibilities (ISR). All constituents of the institution are made aware of its ISR.; Collaboration - The institution has linkages for various activities such as faculty exchange, student placement, etc. The linkages established by the institution have enhanced its academic profile. Specific examples of linkages to promote curriculum development, internship, on-the-job training, faculty exchange and development, research, etc. The institution has MoUs with institutions of national/international importance/other universities/industries/corporate houses etc. Institute-industry interactions have resulted in the establishment /creation of highly specialized laboratories /facilities.

Criterion IV - Infrastructure and Learning Resources- Physical Facilities -The institution has adequate facilities for teaching learning. The institution provides necessary facilities for laboratories. (Furniture, fixtures, equipment and good laboratory practices). The institution has adequate facilities for general computer education of students. Infrastructural facilities are augmented from time to time. Infrastructure facilities are being utilized optimally. Additional facilities for sports and extra-curricular activities (gymnasium, swimming pool, auditorium etc.) are provided. The institution provides health services for students, teaching and non-teaching. The institution facilitates active academic participation of physically disabled students by providing the necessary facilities; Library as a Learning Resource - The library has adequate physical facilities such as reading room, reprography, and internet. Number of book titles per student (in the central library) excluding book bank is greater than 80. The library is stocked with adequate number of journals (national +international) and other library resources (i.e. CDs/ cassettes, etc.). Library resources are augmented every year with newer editions and titles. The library operations (issue of books, getting the necessary references, etc.) are effective and user-friendly. The Library Advisory Committee is responsible for the effective functioning of the library. The library collects feedback from users and incorporates the suggestions for its enhanced functioning. The library is computerized and networked with other libraries; IT Infrastructure - The institution has adequate computer and internet facilities available for faculty, administration staff and students. The institution frequently upgrades its IT facility and has latest computing facilities - hardware and software. The faculties are provided with the requisite facilities for preparation of computer aided teaching learning material. The institution is connected with the National Knowledge Network and other such facilities. Budget provision is made for purchase, upgrading and maintenance of computers. Maintenance of Campus Facilities - The institution has a budget for maintenance of the facilities available on the campus – physical facilities and academic support facilities. There are established procedures and systems for maintaining and utilizing physical and academic support facilities - library, sports complexes, computer, classrooms etc. The funds allocated for maintenance of infrastructure are utilized in total for the planned activities.

Criterion V - Student Support and Progression- Student Mentoring and Support - Adequate student welfare measures (scholarships, free ships, insurance, etc.) are provided by the institution. Personal enhancement and development schemes - coaching classes for competitive examinations, career counseling, soft skill development, etc. are available to the students. Information about the institution is publicly accessible. Student participation in co-curricular and extra-curricular activities is encouraged. The institution has a placement cell which helps to identify job opportunities and develop entrepreneurship skills. The Alumni Association contributes significantly to the development plans of the institution. The institution has a mechanism for timely redressal of student grievances. The institution has an anti-ragging committee, which monitors student interactions effectively. Specific student support is provided for SC, ST, OBC, PWD and economically weaker sections of society. The institution has a mechanism for prevention of sexual (gender) harassment; Student Progression- The progression of students in various programmes of the institution is regularly monitored. The institution makes special efforts to reduce its dropout rate and increase its pass percentage. The institution keeps systematic card of Percentage Progression of students to higher studies/employment. The institution has a successful record of accomplishment of students appearing and qualifying in competitive examinations. Average academic performance of the institution is notable in comparison of university results; Student Participation and Activities - The institution has a range of games, other extra-curricular activities and co-curricular activities. Feedback from students is used for planning and developing support services. Active student participation (through Student Councils) and representation of students on academic and administrative bodies of the institution is encouraged. Institution facilitates for students to publish materials like catalogues, wall magazines, institution magazines, etc. Student participation in university, state, national and international level sports events is encouraged.

Criterion VI - Governance Leadership and Management- Institutional Vision and Leadership- The vision, mission and goals of the institution are in tune with the objectives of higher education. The governance of the institution is reflective of an effective leadership. The institution practices decentralization and participative management. The institution formulates its strategic planning and interacts with stakeholders. The institution monitors and evaluates its policies and plans. The institution grooms leadership at various levels. All decisions of the institution are governed by management of facts, information and objectives; Strategy Development and Deployment- Perspective plan document is an important component of the institution's strategy development and deployment process. The institution has a well-defined organizational structure with effective processes developed for all its major activities. The institution has an effective feedback system involving all stakeholders. The institution has a well-defined Quality Policy and deployed with a systems perspective. The institution has an action plan and schedules for its future development. The institution has an effective Grievance Redressal Cell. Student Satisfaction Survey is an integral input factor for all policies of the institution. Faculty Empowerment Strategies- The institution takes sustained interest in recruitment and promotion aspects of its employees. The institution adheres to GOI/ State Govt. policies on recruitment (access, equity, gender sensitivity and physically disabled). The institution has an effective welfare mechanism for teaching and non-teaching staff. The institution ensures transparent use of Performance Appraisal Reports. The institution conducts programmes to enhance the competency of its faculty and non-teaching staff. Performance budgeting is a core planning activity used by the institution for informed decision-making. The institution encourages its faculty to participate the programmes for professional development; Financial management and Resource Mobilization - The institution has adequate budgetary provisions for academic and administrative activities. Optimal utilization of budget is strictly adhered to by the institution. The institution maintains a Reserve and Corpus fund. The institution has conducted internal and external audits regularly. The institution and leadership takes initiatives for mobilization of resources.

Internal Quality Assurance System - Academic audit and its impact is an important quality initiative of the institution. The institution has an effective quality management and enhancement systems. The institution reviews its teaching learning process, structure, methodologies of operations and learning outcomes at periodic intervals. Internal Quality Assurance Cell (IQAC) has contributed significantly to institutionalizing quality assurance strategies and processes. External members contribute significantly in the functioning of the IQAC. Autonomy to academic departments is encouraged.

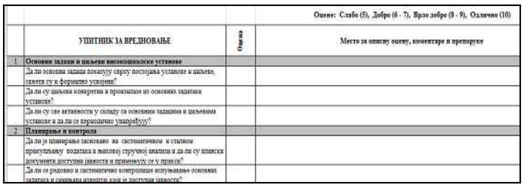
Criterion VII- Innovations and Best Practices - Environment Consciousness- Green audit. Promotion of eco-friendly campus. E-waste management; Innovations; Best Practices

V. INSTITUTION ACCREDITATION - AUDIT FORMS IN SERBIA

In Serbia, accreditation of HEI has two separate accreditation processes:

- Scientific accreditation of HEI – separate documentation and process, precedes the educational accreditation.
- Educational accreditation of HEI: consists of: a) Accreditation of institution b) Accreditation of study programmes: BSc and MSc Studies, PhD studies.

Audit forms in educational accreditation is used by external auditors that estimate level of standard criteria accomplishment by giving points 5/6/7/8/9/10, with meaning: 5- not satisfying criteria, 6-7 (good), 8-9 (very good), 10 (excellent – completely satisfying). Next to the quality aspect there is a cell to enter a grade point (5-10) and another cell next to it, to enter comments and suggestions for improvements, if any (Figure 5).



			Оцене: Слабо (5), Добро (6 - 7), Врло добро (8 - 9), Одлично (10)
	УПИТНИК ЗА ВРЕДНОВАЊЕ	Оцена	Место за описну оцену, коментаре и препоруке
1	Основни задаци и циљеви високошколске установе		
	Да ли основни задаци показују сврху постојања установе и циљеве, сажети су и формално усвојени?		
	Да ли су циљеви конкретни и произилазе из основних задатака установе?		
	Да ли су све активности у складу са основним задацима и циљевима установе и да ли се периодично унапређују?		
2	Планирање и контрола		
	Да ли је планирање засновано на систематичном и сталном прикупљању података и њиховој стручној анализи и да ли су плански документи доступни јавности и примењују се у пракси?		
	Да ли се редовно и систематично контролише испуњавање основних задатака и сачињава извештај који је доступан јавности?		

Figure 4. MS Excel form for standards criteria estimation estimation in audit of HEI in Serbia

Audit form for institutional educational accreditation (2a) of a HEI consists of 13 standards:

STANDARD 1 - Basic goals of HEI - Do basic objectives show the purpose of existing of the institutions and goals, are they formalized and formally accepted? Are goals specified and based on basic objectives of the institution? Are all activities related to basic objectives and goals of an institutions and are they periodically improved?

STANDARD 2 - Planning and control – Is planning based on systematic and continual data gathering and their analysis, are the planning documents available in public and are they applicable in practice? Are basic tasks fulfillment systematically and regularly controlled and is there a report about it, available for public?

STANDARD 3 – Organization and management – is there a legislation (statute) based organizational structure and management system?

STANDARD 4 – Study programmes - Do students acquire qualifications that are appropriate to the finalization of certain study level. Do study programmes have appropriate structure, of appropriate depth and width and appropriate study methods? Is a study program a coherent document with defined goals, structure and content, policy and procedure of students' admission, study methods and knowledge assessment, learning outcomes and students' competencies in which each subject is presented by ECDL points?

STANDARD 5 – Scientific work – is scientific work present at national and international level? Are the results of scientific work comparable with goals of the study programmes and are they included in educational process?

STANDARD 6 – Faculty (teaching staff) – is number of teachers and associates (teaching assistants) and their teaching assignment appropriate according to the numerical standards? Is qualification of teaching staff documented; is the engagement of teaching staff adequate to their educational/scientific specialization fields? Are there positive conditions for working, improvement and development of teaching staff? Is the number of students in a teaching group for lectures and practical lessons adequate to the predefined standards?

STANDARD 7 – Non-teaching staff (administrative and other) - Is there a qualified personnel for working in library and working in information system activities? Is there a qualified staff for secretary work and work in students' administration office?

STANDARD 8 – Students – Is there a defined limit of number of students that could admit to study programmes and is there clear information for admission conditions? Is there a continual and systematical system of students success monitoring and their advancements at each study programmes? Is success of students at each subject being monitored constantly, is the success constantly evaluated during teaching process and is there an impact to final exam grade?

STANDARD 9 – Facilities, working space and equipment – Is there an appropriate space for teaching process and for administrative and management activities? Is space and equipment in alignment with in urbanism standards, technical standards, hygienical standards and healthcare standards and conditions? Is modern equipment available for the teaching and management process?

STANDARD 10 – Library, books and information system support- Is there a library, with appropriate number of books, which cover each teaching subject in a curriculum? Is there an automated information system and appropriate computer-equipped classroom?

STANDARD 11 – Sources of financing – Are financial results positive? Is there a financial plan available in public?

STANDARD 12 – Inner mechanisms for quality assurance – Is there a clear and public quality policy, which is practically conducted within an internal quality committee and which is particularly related to quality of teaching process? Is there a self-evaluation system that is performed periodically with active involvement of students and in which the students' evaluation of teaching process is considered?

STANDARD 13 – Public availability of work – is there public information available about basic objectives, goals, expected educational outcomes, description of study programmes (curriculums) and other relevant data that enable students and potential students to make appropriate decisions about their education? Is there a public available list of all teaching staff members (teachers and associates) with data about their qualifications and engagements in the HEI?

VI. DISCUSSION AND CONCLUSIONS

Comparison of accreditation in India and Serbia shows many similarities:

- Eligible institutions are both government and privately held HEIs
- Accreditation units are Universities and colleges (affiliated to university) or autonomous colleges
- Self-study report (India) and Self-assessment report (Serbia) is to be created before submission of documentation to appropriate accreditation organization.
- In both countries, external audit include visit of appropriate peer review members to evaluate institution facilities.
- In both countries, audit is based on estimation of auditors on the level of accomplishment of certain criteria/aspect giving estimation points 0-4 (India) or standard/criteria giving estimation points 5-10 (Serbia).

Differences in accreditation in India and Serbia are:

- In India, both scientific and educational aspect of HEI accreditation is united in institution accreditation. In Serbia, scientific accreditation of HEI is separated from educational accreditation. Within educational aspect of HEI accreditation, in Serbia there is separate accreditation of institution and each of study programmes. Educational accreditation for institution is complete with institution and study programme accreditation.
- In Serbia, external auditors evaluate documentation by sending documentation to auditors, while in India documentation is evaulated within the visit of external audit peer team members.

Comparison of audit forms for HEI accreditation in India and Serbia shows many differences:

- In India, there are 7 criteria, each containing several sub-criteria and appropriate key aspects. In Serbia, there are 13 standards, each having groups of questions and each is related to several aspects.
- In India, there are criteria such as Curriculum related and Best practices and Innovations, that are not present at Serbian forms.

- In India, institution CGPA forms are very detailed, with much more key aspects. In Serbia, several key aspects are combined within one item.
- In India, key aspects are formulated as quality policy statements with positive connotation, while in Serbia key aspects are formulated as questions.
- In India, key aspects are more easily evaluated and are practical oriented (particularly related to specific IT equipment usage). In Serbia, aspects are more general and more standard-oriented and auditor should know the underlying standards and indicators' measures and limiting values.
- In India, each key aspect has a "significance measure", i.e. Key aspect weightage, while in Serbia all questions are equally treated.

Final decision on accreditation in India is based on total CGPA points. If an institution has less than 1.51 CGPA points, it gets grade "D" and status "unaccredited". If the CGPA is >1.51, an institution is "accredited". Partial CGPA are calculated, but only final CGPA points are used for final decision. In Serbia, HEI must have each of 13 standards accomplished in aim to be considered satisfying for accreditation.

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WEB APPLICATION FOR PROJECT MANAGEMENT SUPPORT IN INFORMATION SYSTEMS HIGHER EDUCATION

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Abstract – This paper presents research results on application of project management in higher education. Particularly it presents a developed prototype of web application for project management support in higher education in the field of information systems.

I. INTRODUCTION

Project could be defined as "complex and unique set of activities that is to be done in certain period of time in aim to fulfill a goal in specified time frame and with specified resources and costs " [1]

Project Management Institute conducted a research [2] with a large number of companies from different working areas in aim to determine the value and impact of project management to finalizing projects and quality of business processess, through measurable and non-measurable performance indicators. Components influencing value of project management are:

- Context (economic, people, culture, projects, organizational attributes, strategic);
- Implementation (training, tools, people, motivation, organization).

They influence value determined as: satisfaction, alignment, consistent practices, process outcomes, business outcomes, benefits realized.

In research [2] has been shown that tools used in project management have very important role. „Without information system, that gathers data about starting planned data about realization of project and timely gathered information about the state of project during project realization, it is not possible to start any managerial activities, i.e. not possible to permanently monitor and control and manage project. " [1]

This paper presents part of results from Ljubica Kazi's PhD thesis research, conducted at University of Novi Sad, Technical faculty „Mihajlo Pupin" Zrenjanin, Serbia. Results presented in this research briefly show a prototype web application made in aim to improve project management in information systems higher education, i.e. to enable better insight in progress and quality of students' information systems related projects. The prototype application is available at URL:*www.it-project.rs*. It consist of administrative (teacher's) and user (student's) part of application.

II. THEORETICAL BACKGROUND

According to Project Management Institute's Book (Body) of knowledge (i.e. PMBOK [3]), „project management is considered as directing and coordination of human and material resources in aim to finalize project within planned time-frame, with planned quality and with planned costs". PMBOK defines project life cycle with phases [4]: a) Project initialization, b) Project planning, c) Project implementation / execution, d) Project monitoring and control, e) Project closing.

Project management is performed within systematic activities in nine basic functional areas, i.e. knowledge areas [3], as presented at Figure 1.

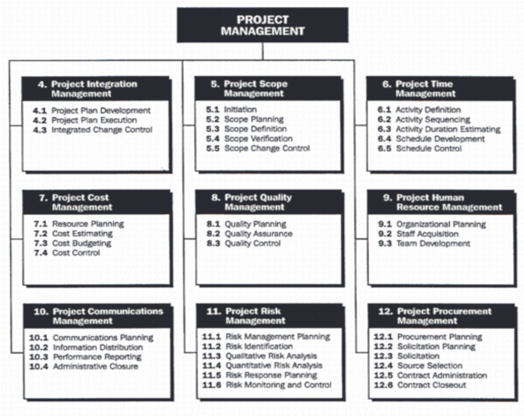

Figure 1. Project management functional areas [3]

These nine areas include Project integration management, Project scope management, Project time management, Project cost management, Project quality management, Project human resources management, Project communications management, Project Risk management, Project procurement management.

III. PROJECT MANAGEMENT IN HIGHER EDUCATION

Application of project management in higher institutions has different perspectives.

One of the perspectives is related to establishing project management organizational units (i.e. PMO – Project Management Office) to support all project management activities, such as development and improvement of integrated information system [5].

Second perspective is inclusion of project management as a subject, i.e. course in higher education institutions curriculum. Subject could be generally named "Project Management", but mostly it is related to specific application of project management, such as IT project management [6, 7] or project management in education [8].

Third perspective is establishing project management methods within teaching process. Within this perspective, one of the educational approaches is engagement of students in projects. Particular consideration in research is focused on the role of tutor in project-based learning [9]. When teamwork projects are considered [10], some research results are related to the problem of assessment of individual's contribution to a group project [11].

Fourth research perspective is related to software tools and technologies to be used within project management of students' projects. Web environments are considered as appropriate environments for tools that support group-based projects in higher education [12].

IV. TOOLS FOR PROJECT MANAGEMENT OF INFORMATION SYSTEMS DEVELOPMENT

The study of use of project management tools has been conducted among 1000 project managers (members of Project Management Institute) and the necessity of using project management supporting software tools in project management and satisfaction with particular available tools has been presented in [13]. In the information technology industry, Gartner Research estimates that 75% of large IT projects managed with the support of a project management information system (PMIS) will succeed, while 75% of projects without such support will fail [14, 15].

It has been shown in professional practice that tools for project management support should be integrated with the tools that produce results of these projects [15]. Projects in the field of information systems development include variety of tools such as CASE tools (Computer Aided Software Engineering), DBMS (Database management systems) and programming IDEs (Integrated Development Environments).

Particularly important is collaboration for the success of projects. CASE tools' modules for collaborative work are particularly developed for the support of collaboration in systems analysis and design phase [16, 17]. Since programming is one of the crucial activities in information systems development, research and practical results in enhancement of programming IDEs with collaboration tools are presented in [18].

V. WEB-BASED PROJECT MANAGEMENT SOFTWARE SYSTEMS

Among many available solutions of software tools, generally they could be categorized as desktop (single computer), client/server (desktop + remote database) and web solutions.

Web based solutions are developed and available in recent years. Web-based project management software systems are named as "Project web sites" [19] or "Web-based project management systems" [20].

Experiences of constructing and using such web sites are presented in research [19] and [20]. Research [20] shows that small sector of construction industry (which was a focused type of industry) implemented web based project management systems and determines the reasons. Research [19] determines the key issues in implementing and using project management web sites, which could be considered "first generation" of such software systems. The key finding [19] is that web sites for project management support should be:

- Better integrated with particular job activities,
- Enable adaptation to different types of users, working roles and personality, i.e. “one size fits all team members” approach does not enable using all the advantages of this technology.

VI. Proposed Solution

A. *Research objective*

Aim of this section is to present the prototype of a web application that is created for support of project management of students projects at University of Novi Sad, Technical faculty “Mihajlo Pupin” Zrenjanin, Serbia. This prototype web application is available at www.it-project.rs (Figure 2).

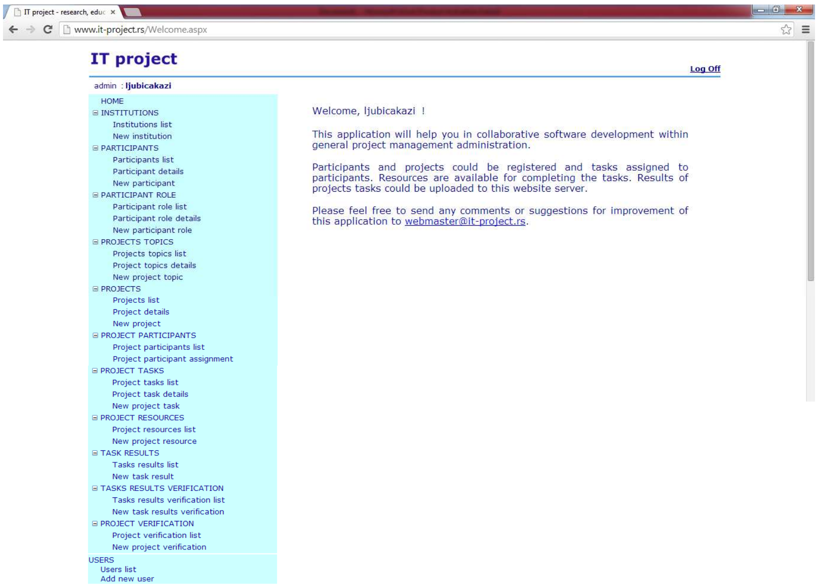

Figure 2. Wellcome screen of web application www.it-project.rs for project management support (detailed approach)

The web application is developed to meet challenges of previous key findings on issues about using web-based project management systems:

1. Integration with job activities:
   a. Support to all crucial general project management activities (Figure 3.)
   b. Particular focus on Information systems development projects (Figure 9)
2. User – centric approach and different working roles and styles:
   a. Detailed approach – each phase has separate detailed page (Figure 3,Figure 4, Figure 5, Figure 6)
   b. Unified approach – data about all activities are centrally documented at a project records page (Figure 9, Figure 10)

Illustration of the specified approaches and results within a prototype web application is presented at following figures.

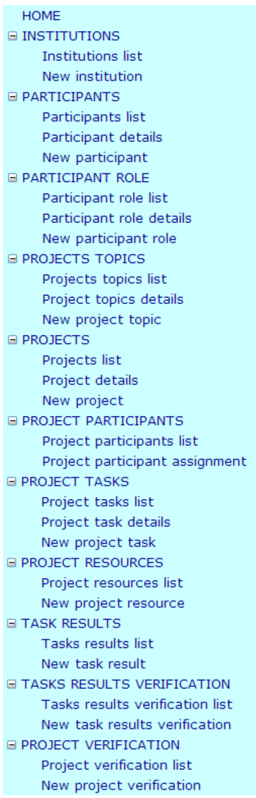

Figure 3. Main menu of detailed approach in web application www.it-project.rs

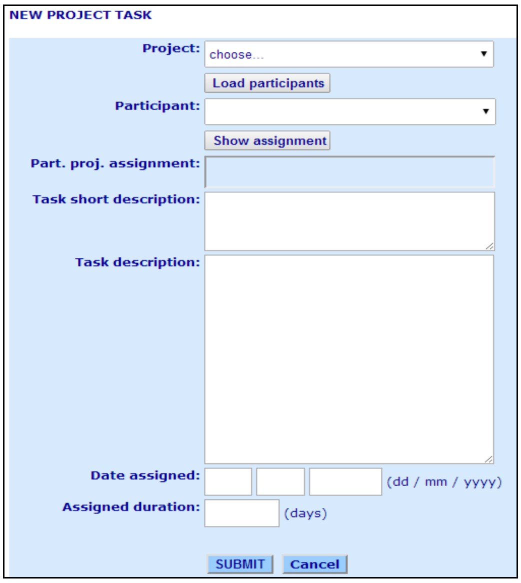

Figure 4. Form for adding a task in detailed approach

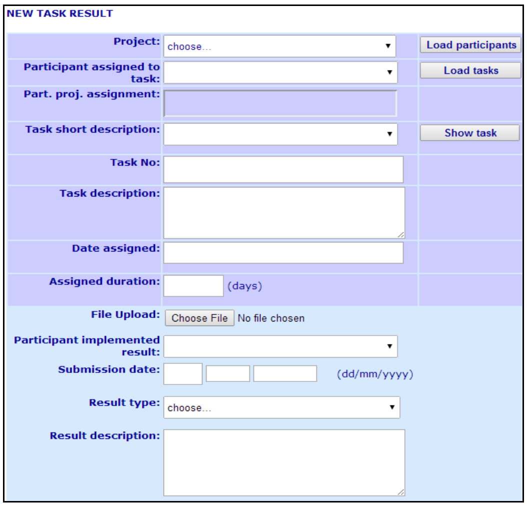

Figure 5. Form for adding a task result in detailed approach

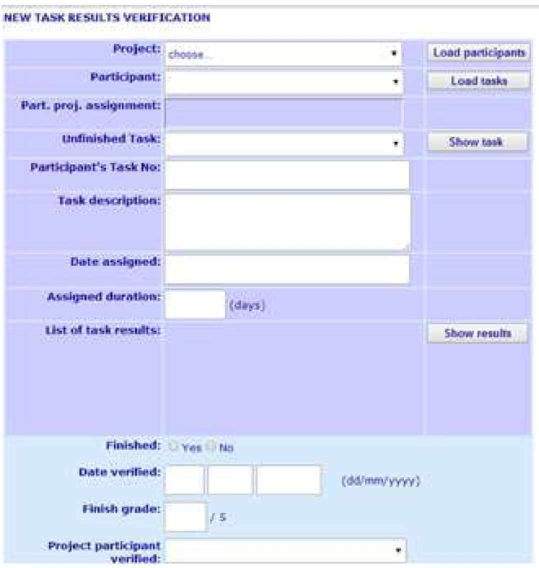

Figure 6. Form for result verification in detailed approach

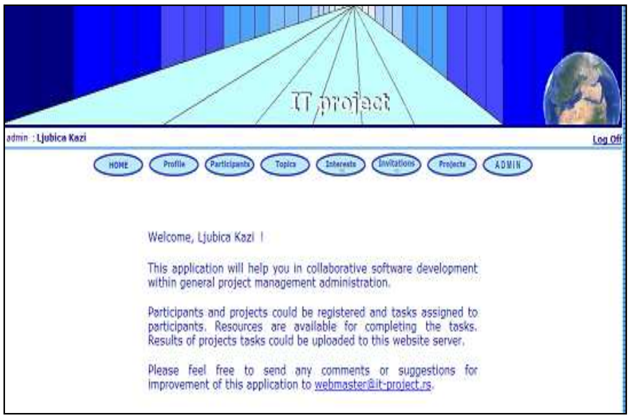

Figure 7. Wellcome screen for www.it-project.rs (unified approach)

Figure 8. List of projects for active user (unified approach)

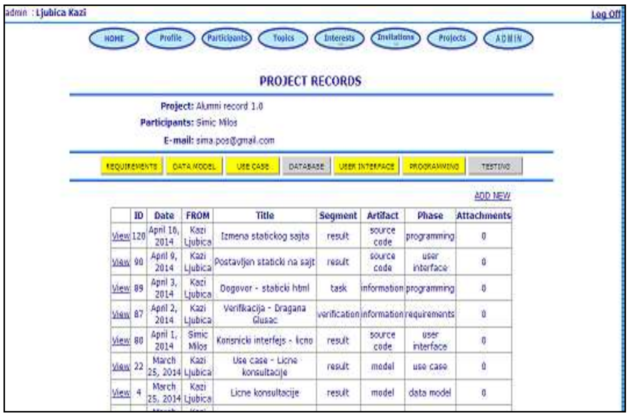

Figure 9. Project records list for particular project, related to Information systems development (unified approach)

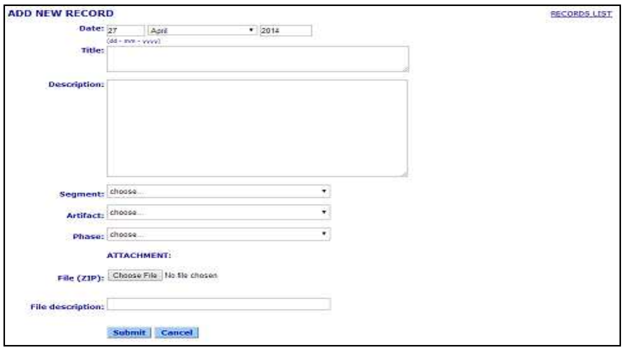

Figure 10. Form for adding a new record in project's records (unified approach)

In unified approach, after successful login, an active user is faced with a welcome screen (Figure 7), where he can use options:

- Profile (for changing personal data, if needed),
- Participants (for list of participants in projects),
- Topics(for list of projects topics that are available or all projects topics, i.e. projects)
- Interests (for adding new project proposals) or Invitations (to see if some project manager has invited an active user to participate in certain project)
- Projects (starts page with list of active projects of an active user) (Figure 8).
- ADMIN (if active user is administrator, this option enables using DETAILED part of web application).

After an active user loads page with list of projects, project records about the particular project is presented as list of all events and activities in grid below, as well as current state of each phase of information system development (Figure 9). Phases of information system development are presented at Figure 11. They are requirements, data model, use case, database, user interface, programming, testing.

Figure 11. Markers for phases of information system development – inactive for a particular project

For each phase that there are results submitted, the appropriate button at the top of the project records page will be ‘enlighted”, i.e. coloured “yellow” meaning – “active” (Figure 12) .

Figure 12. Markers with active phases in information system development for a particular project

If there are no results for some phase, it will remain gray coloured, meaning – “not active” (all inactive as at Figure 11).

Within a records list page, if an active user starts a page for adding a new record, the page for adding new item in project records list will appear (Figure 10). Within the page for adding an item to project record, an active user could enter submission date, title, description, segment, artifact, phase, upload a file and enter a file description.

Segment is related to general project activities in project and could be task, resource, result, question, verification, information (Figure 13).

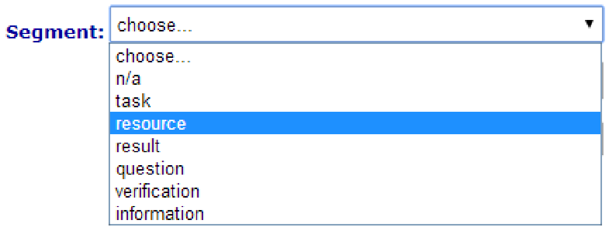

Figure 13. Items of segment combo box

Artifact in information systems project could be document, information, model, database, and source code (Figure 14).

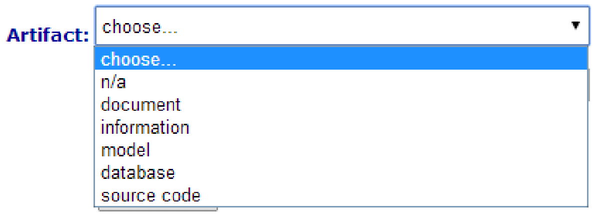

Figure 14. Items of artifact combo box

Phase in information system development could be requirements, data modeling, use case creation, user interface design, programming, database implementation, software testing, documenting (Figure 15).

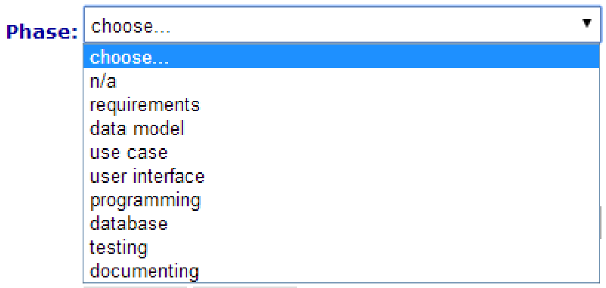

Figure 15. Phases in information systems development

Mapping an entry of project records item with phases will result in “switching on”, i.e. colouring “yellow” appropriate button at the top of the project records list.

VII. Conclusion

Aim of this paper was to present current state in the field of web-based project management systems and to show the necessity for development of specialized web sites for project management support. Specialization is oriented to particular working domain, such as information systems development. In this field, the contribution of this paper is related to the development of specialized web application for project management support to information systems projects in higher education.

Another aim of this paper was to present the necessity of user-centric approach in constructing web sites for project management. Therefore, two development approaches are presented for the developed prototype of the web application: detailed approach with separate detailed page for each development and project management phase or activity type and unified approach, with central project records.

This way, both crucial issues in using web-based project management systems are resolved.

Future plans for the developed web application is to be tested with more students' projects (currently is tested by 15 student's projects) and to be deployed at the official website of Technical faculty "Mihajlo Pupin" in Zrenjanin. It is planned that this application could be used within an international cooperation with other IT students from universities from other countries. Further development will be directed towards application of models for evaluation of success of teamwork students' projects.

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USE OF THE COMMERCIAL SOFTWARE TOOLS IN THE PREPARATION PHASE OF MILITARY PILOT EDUCATION AND TRAINING

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Abstract - The education and training of military pilots is a very long, complex and expensive process. One of the methods how to improve this process and make it more economical is wide use of commercial software tools, especially in the first phases of the military pilot education and training. The scope of applied software tools is wide, starts from the software used in psychological selection, and continues with simple flight simulators, broad range of interactive learning training materials and some form of e-learning platforms. This paperwork primary describes some innovations and use of commercial software in the preparation phase of the military pilot education and training.

I. Introduction

The only high education institution in the Republic of Serbia, which has the study program in aviation, within its graduate studies, is Military academy. This study program, named Military Aviation is specific in many ways. First of all, it is recognized by Bologna process standards and also satisfies all the air force requirements. Because of that, the program is unique.

The purpose of the program is the education of the Military Academy cadets (military term for students) for the occupation of Aviation officers – aircraft pilots or helicopter pilots, as well as traffic engineers. Undergraduate studies in Military Aviation are performed during four academic years (with total number of 240 ECTS).

Cadet gains a degree of Traffic Engineer and in addition to a Diploma, a cadet is also issued with a Diploma Supplement, which means the cadet's competences for professional Air Force pilot. This is the reason why the path to be an Air Force pilot is very complex. The whole process is very demanding for cadets and their professors and instructors. The study is divided in two main parts. The first one which lasts five semesters is realized in the Military Academy headquarter which is situated in Belgrade. The main goal of that phase is theoretical preparation for the upcoming flight training in an airbase near Belgrade. This phase is also considered as a preparation phase in terms of core activities (flying) during studying. The second phase is flight training on airplanes and helicopters and it is crucial for the cadet-pilots.

Having in mind that the first (preparation) phase has very important role regarding to quality of flight training as a crown of education process, there is permanent task to improve this process and make it more effective and safer.

Swift progress in the field of commercial software that can be applied in this specific teaching process and its affordability provide new opportunities, especially in the preparation phase.

The scope of applied software tools is wide and starts from the software used in psychological selection and continues with simple flight simulators, broad range of interactive learning training materials and some form of e-learning platforms. This paperwork describes and explains some of the commercial software tools, which are implemented in study program Military Aviation. The emphasis is on the tools used in selection process and theoretical part of studies, which are prerequisite for the flight training in the last two years of study.

II. Selection of Cadet-pilots

The study program Military Aviation is also specific by its selection process of future pilots. It consists of medical check, basic parachute training and flight screening.

The medical check is the task of Aero-medical Institute in Belgrade. One of the core activities within medical check is psychological assessment. Department of Psychology of the Aero-medical Institute deals with the activities of narrowly specialized, expert assessment of capability and suitability of different work profile flight personnel. Through aimed selection and qualification tests, the adequate narrowly profiled staff of military and civilian pilots, military flyers, parachutists, air traffic controllers, aircraft hosts is selected.

Selection and classification tests of flight personnel are realized through battery of tests, which examine cognitive, conative and psychomotor aspect of personality. Traditionally, the main tools are paper-and-pencil tests.

This year, Aero-medical Institute made a great step forward with the implementation of the Vienna Test System. This is a computer-assisted application of a large number of highly diverse psychometric tests, measuring reaction times in a task that required choosing among complex stimuli.

Hardware parts of the Vienna Test System with peripheral devices to measure sensomotor /psychomotor skills: eye-hand-leg coordination, three-dimensional eye-hand coordination, hand fine motor skills, peripheral vision and reactive behavior (simple or multiple-choice decisions) are shown on Figure 1.

Figure 1. Vienna Test System hardware with peripheral devices

The use of the computer ensured the highest possible level of objectivity and precision and enables dimensions to be tested that could not be measured by traditional paper-and-pencil tests. In addition, the scoring of test results is guaranteed to be fast and accurate. Vienna tests are used to assess the suitability criteria specified in the JAR-FCL3 guidelines.

This assesses all the ability and personality factors recommended in the international JAR-FCL3 guidelines, including logical reasoning, attention and concentration, memory, numerical and perception functions, spatial processing, psychomotor coordination and decision quality (depend on executive functions and personality traits).

With the help of these tests, it was possible to preselect reliably applicants for pilot training by checking both for specific abilities and for relevant personality traits.

The flight screening or Ab-initio training is the very first stage of flight training. The flight screening is a flying-based assessment of potential candidates. This is intended to establish whether the student has the necessary aptitude to become a military pilot in a reasonably short time. It will eliminate, for example, those who get airsick or lack co-ordination or judgment. Experienced instructors make qualitative assessments of applicants.

The airplane, which is used in the flight screening, is UTVA-75, domestically produced piston-engine trainer. This plane belongs to the older generation of piston-engine trainers and new trainer will replace it by 2016th. Such situation imposes consideration of additional teaching tools only after the new plane adaptation. Because of waiting a new airplane, there are no big possibilities to improve the existing process. The other reason is fact that candidates are still no belongs to any category of military personnel neither cadet.

III. THEORETICAL STUDIES

After successfully completed selection process, cadets entering Military Academy and they are starting to attend Military Aviation study program. As mentioned before, the study program is basically divided in two main parts. The first one lasts five semesters and it has focus on theoretical preparation of future pilots. During this, phase cadets attend 31 subjects. The first groups of those subjects are theoretical, methodological and scientific ones. The second groups are professional and applicative subjects. The study of second groups of subjects performs at the 2nd academic year and 5th semester. It includes subjects such as General and Radio Navigation, Communications (Phraseology), Mechanics of Flying, Aerodynamics, Aircraft Construction, Meteorology, Aircraft Engines, Flight Instruments and Systems and Air Law.

Because of international standardization most of the listed subjects are compatible with similar subjects who are part of studies in other aviation universities all-round the world. Military Academy's professional and applicative subjects respect the standards recognized by Civil Aviation Directorate of the Republic of Serbia. It means revision of national protocols and harmonization with the demands of JAA Europe, as a fully-fledged member of that aviation family encompassing 44 European countries. The Civil Aviation Directorate has agreed to bring the national aviation in compliance with European standards thus make Serbian aviation an integral part of the European and World aviation area [1].

Joint Aviation Requirements (JAR) are a series of accepted comprehensive aviation rules created by the JAA, more specifically the joint aviation authorities of European countries. The new system of European aviation rules (EASA - European Aviation Safety Agency). The CAD has standardized many fields and the most important from the Military Academy standpoint is standardization of requirements for airplane pilots - JAR FCL 1.

It means that learning objectives of all professional and applicative subjects (except the flight training syllabus) has to be standardized, including subject description. After the Military Academy has adopted those learning objectives, it was reasonable to find appropriate literature and other learning materials, including interactive.

A. *Interactive learning materials*

Today there are broad ranges of interactive learning materials, which provide cadet pilots with the aviation knowledge they require to prepare for the theoretical examinations and to become safe and competent pilots. After evaluation, Military Academy opted for CAE Oxford Aviation Academy interactive materials. These materials take the form of full color textbooks and multimedia computer-based training (CBT), both comprehensively covering the theory but delivering it in a different way [2].

Each book features comprehensive explanations of the relevant concepts and applications in order to cover thoroughly its subject matter. There are thousands of illustrative diagrams that help to explain the more difficult concepts and multiple-choice questions, which allow students to test vital elements of their knowledge. An example of illustrative diagrams is shown at Fig.2.

Within the CBT, each lesson is accompanied by clear precise narration, which instructs students through each essential teaching point. The lessons are built with an effective combination of graphics, animations, audio voice-overs, textual key-points and revision questions, providing a unique and effective way of mastering difficult concepts in an engaging way.

During the two years of CBT application, cadets demonstrated better results in subjects in which the CBT were used. The comprehensible manner gave cadets a lot of good examples and advices on how to deal with the problem in tomorrow's flight training.

Figure 2. An example of illustrative diagrams in Radio Navigation CBT

B. *Flight Simulator X*

Microsoft Flight Simulator X, also known as FSX, is a 2006 flight simulation computer game originally developed and published by Microsoft for Microsoft Windows. It is the next in the sequence after Microsoft Flight Simulator 2004. It is the tenth and last installment of Microsoft Flight Simulator series. It includes a graphics engine upgrade.

Flight Simulator X was released in three editions: Standard, Deluxe, and later Gold. The Deluxe Edition incorporates additional features, including an on-disc software development kit (SDK), three airplanes with the Garmin G1000 Flight deck, and the ability for the player to act as Air Traffic Control (ATC) for other online users with a radar screen.

The Deluxe Edition features 24 aircraft compared to 18 in the Standard Edition; 45 high-detail airports compared to 40; 38 high-detail cities compared to 28; and 51 structured missions compared to more than 30. Microsoft Flight Simulator X: Gold Edition combines the Deluxe Edition and the Acceleration expansion pack into one.

The Matrox TripleHead2Go expands Flight Simulator X across three displays (Figure 3.), providing a panoramic view that lets you see more of your virtual cockpit and improves your flight visibility at the same time. This extended view provides a more realistic flight experience by fully engaging your peripheral vision on the side displays.

Speaking about assessment and worthiness of kind of software like Flight Simulator X is we must first mention what kind of simulators and simulation there are on the market. Simulation can consist of virtual modeling on a computer workstation, part task devices with actual system hardware and software, or full-mission man-in-the-loop simulators with visual systems and motion. All have their place in the process, and all play a role in shortening development time and cost [3].

Figure 3. Expanding of FSX across three displays

So this Microsoft flight simulator software can be classified as virtual modeling on a computer workstation.

One of the enduring problems with any flight simulator is the restricted field of view (FOV) imposed by the computer display screen. This restriction severely limits peripheral vision, which in turn detracts from perceived realism. High-end military simulators use multiple screens to provide a wider field of vision (FOV) in our case we use The Matrox TripleHead2Go to expand scenery over 3 displays (3 HD projectors), but that is not very practical for PC-based simulation.

FSX simulator is mainly used to demonstrate cockpit views and basic systems characteristics in the aircrafts used in real flight training (UTVA-75, Supergaleb G-4, Gazelle). It works with obvious success.

However, it is important to stress that during the flight-training phase in military jets (G-4 Supergaleb in our case) full-scale flight simulator is used [4]. However, the use of this simulator is expensive and impracticable in the theoretical study phase, which is our point of consideration.

C. E-learning in flight training preparation phase

After completing the first five semesters cadets go to Batajnica airbase where they are starting with their flight-training program. Although the Batajnica is not so far from Belgrade, cadets are not in possibility to visit Military Academy’s facility every day and communicate with their professors in charge for subjects directly connected with flight training syllabus. After consideration, the Military Academy staff has decided to implement MOODLE e-learning platform in Military Aviation study program (http://adl.elearning.mod.gov.rs/).

MOODLE (Modular Object-Oriented Dynamic Learning Environment) is a free source e-learning system shell (LMS - Learning Management System), written in PHP.

It is an important tool for e-learning and blended learning, which provides a framework for preparing courses and for learning over it. There are the following levels of permissions in the system: system administrator (highest level of permissions), course creator (permission to create courses), teacher (may teach in the assigned course – create contents and score); student (learns and performs tasks within the chosen course). Users may define the permissions of other users below their level (the course creator assigns teachers to the course; the teacher registers students to the course).

Various content is provided over this system shell (texts, pictures, optional files, links, multimedia etc.), but the tasks related to them that can be scored are also important (assigning tasks in the form of online text, file, varied types of tests, offline tasks etc.). This system unifies and presents in a single surface all the services that are otherwise applied by teachers on parallel surfaces, often offline (sharing documents and information, sending messages, evaluation etc.) [5].

The first implemented course over the MOODLE platform is General Navigation. After the finishing semester, it was possible to identify some advantages. First, MOODLE allows for many different types of content formats to be uploaded and available for use by the students and the professor (instructor). MOODLE not only allows for learning to be done online or at a distance but also it allows resources to be available to students in who are in instructor-led classes. MOODLE also has different options and tools available for use. MOODLE allows communication to happen between the professor (instructor) and students and students can also communicate with each other. Communication in MOODLE range from forums, blogs, chats and messages among the individuals who are enrolled within a course. This is an advantage because if the course is an online or distance-learning course, communication is key to ensure that the lesson is effective and if there is a problem, there are resources available to allow for effective communication.

D. *Other software*

By the modernization of the Serbian Air Force, a lot of new electronic equipment has been installed inside the cockpit of the airplanes. That equipment primary is primary intended for navigation and communication use. Introducing modern navigation and communication equipment and pilot-static instruments too, brought a new human-machine interface. The main reason is conversion from analog to digital interface. For example, typical instruments presented the bearing of non-directional beacons and VOR/ILS stations with needles in the center of instruments display. The same situation was with primary flight instruments (based on Pitot principle) such as altimeter, airspeed indicator, vertical speed indicator etc. The difference between visual interfaces of analog and digital instruments is shown at Figure 4.

Figure 4. The difference between visual interface of analog and digital instruments

Embedding the new instruments imposed the new training approaches. Because of Garmin origin, Military Academy introduced dedicated Garmin software and hardware simulator for its complex devices such as Garmin G500/600. The basic variants of this simulator can be viewed and downloaded at Garmin support pages (http://www8.garmin.com/support/download_details.jsp?id=4867). This simulator allows cadets to perform basic functions within the Garmin system. It is possible to learn how to input data and frequencies using tips and tricks for "best practices". You will be able to navigate using flight plans and GPS direct courses. The cadet will be able to navigate the pages and page groups of the Flight Management System, while recognizing the most important functions using tips and tricks.

The first generation of cadet pilots who started their flight training after practicing this simulator shows better performance in basic stages of flight syllabus.

IV. CONCLUSION

Improving the process of selection and theoretical education of the cadet pilots is permanent task of the Military Academy staff. During the last two years, several categories of commercial software were introduced in the preparation phase of the military pilot education and training. Application of commercial software starts with the selection process using Vienna Test System in the field of psychological assessment. This assessment showed many advantages especially by level of objectivity, precision and reliable preselecting of applicants for pilot training.

Military Academy theoretical study program emphasis is on the professional and applicative subjects. Study of those subjects is improved by implementation of multimedia computer-based training created by CAE Oxford Aviation Academy. First exams demonstrated significantly better results and better understanding of curricula and learning objectives.

Parallel with CBT, the FSX simulator is used to demonstrate cockpit views and basic systems characteristics in the aircrafts used in real flight training (UTVA-75, Supergaleb G-4, Gazelle). It works with obvious success.

Military Academy staff also implemented MOODLE e-learning platform in Military Aviation study program. The platform is intended for cadets who completing their flight training in airbases from Military Academy headquarter. It helps cadets to keep communication with their professors in charge for subjects directly connected with flight training syllabus.

Modern teaching methods are also supported by using dedicated software and hardware simulator for navigation and communication equipment as well as basic flight instruments.

All of these commercial software tools significantly improved the preparation phase of the military pilot education and training, and creates preconditions and basis for better, safer and more economical flight training.

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ALIGNING EDUCATION WITH INDUSTRY REQUIREMENTS: BIG DATA ERA

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Abstract - Information and communication technology (ICT) has been pronounced as potentially powerful enabling tool for education change. According to fact that vital part of education is to prepare people for future challenges, it is very important to align education with industry requirements. This question becomes more important in the era of big data when industry needs proffesionals with new skills and knowledge. The aim of this paper is to answer on the questions: 1) What are the main benefits of ICT in education in the big data era? and 2) What are the key challenges in aligning industry requirements with education in the big data era?

I. INTRODUCTION

The field of education has not been remained beyond the influence of information and communication technology (ICT) which has become the part of life and impacted on the quality of teaching and learning. With ICT potential to enrich and deepen skills, motivate and engage students in active learning, contribute to radical changes in many schools, provide opportunities for connection between the schools from very different geographical location, ICT helps to create economic viability for tomorrow’s workers [1].

ICT has always been in education, but its role has changed as technology developed. At first, from early 1950s until 1980s ICT has been used in universities and other higher education organizations for calculations and analysis rather than educational tool [2]. The situation changed with the introduction of personal desktop computers during the 1980s, which stimulated major changes not only in the economy but also within education. Pioneer enthusiasts developed various software for specific educational functions, and some of the teachers began to prepare materials for their students using ICT. Then occurs the development of Internet, and the range and quantity of materials available online is increased [2]. This involves new forms of learning and teaching in which students deal with knowledge in an self-directed, active and constructive way [3]. The current period of educational development is characterized by increasing role of ICT which has become an important component of the curriculum.

In this paper we will try to answer on the following questions: 1) What are the main benefits of ICT in education in the big data era? and 2) What are the key challenges in aligning industry requirements with education in the big data era?

II. THE ROLE OF ICT IN EDUCATION

Education as a fundamental human right is the key for sustainable development, peace and stability within and among countries, and thus an indispensable means for effective participation in the societies and economies of the 21st century [5]. A vital part of education is to prepare people for future challenges how to access and manage information and communicate in everyday life. This goal is more important in information society which is characterised by a high level of information intensity in the everyday life of most citizens, in most organizations and workplaces [4]. The development of information society provides new possibilities for employment but also requires a new skills and knowledge which lead to changes in education.
There are at least three ways in which ICT can take part in education. It can be used for [6]:

- Computer Assisted Learning - CAL
- Computer Assisted Research - CAR
- Distance Learning - DL

Using ICT in education brings many changes in many aspects, regarding teacher role, learning, instructional paradigm, grouping and student activity (see table I).

TABLE I. PROGRESS OF EDUCATIONAL SYSTEM IMPACTED BY ICT

Variable	Traditional model	Emerging model
Teacher role	● Expert ● Recalls facts ● Sage on the stage	● Collaborator ● Resource person ● Guide on the side
Learning	● Focused on the teacher	● Focused on the student
Instructional paradigm	● Content-oriented ● Teacher-oriented	● Processes-oriented ● Student-oriented
Grouping	● Homogeneous	● Heterogeneous
Student activity	● Personal work	● Group work

Source: Adapted from UNESCO Institute for Information Technologies in Education (2006) *ICTs In Education for People with Special Needs*, Moscow, p. 24

By reviewing the literature, several studies try to emphesise the benefits of ICT, many of them showed that students using ICT achieve higher results than those who do not use. Benefits of ICT can be summarized in the following [3]:

- ICT can contribute to establishment of learning environments where students can actively work on solving real problems through multimedia programs, text, image, sound, animation and video which are simulation of real environment.
- ICT applications can be used as tools in the learning process because of the simulations that make it possible to visualize complicated problems.
- ICT applications enable collaborative and cooperative learning.
- ICT facilitates connections not only within the classroom, but also between the school and the outside world.

ICT has a positive impact in inclusive practice. There are many assistive technologies as integral part of the life of many individuals with disabilities. Assistive technologies provide support for communication, assisting many learners to engage with learning, including those who are hard to reach and help to tear down some of the barriers that learners with special needs have [29]. Using the right assistive technology, children who cannot hold a pencil can draw and write; also, children unable to speak can use the computer as a communication tool [30]. The key benefit is that ICT helps teachers to support all students' full inclusion irrespective of their varying abillities.

III. THE BIG DATA ERA: IMPACT ON EDUCATION

Big Data concept is best described by 4V [22]: 1) Volume (huge amount of data), 2) Variety (data from digital TV, credit cards, medical devices, sensors, bar codes, surveillance cameras, etc.), 3) Velocity (the speed of collecting and converting data into value), and 4) Value (creating value of collected data). By using big data concept these data can be digitalized, analyzed and stored in real time [26], forming the basis for decision making.

Academia may use the big data in the learning process to customize courses right down to the level of the individual. In this way, big data can amplify factors that contribute to student success – personalized courses, the instructor-student communication, and a sense of community [10].

Twelve-year-old Susan took a course in order to improve her reading skills. She read short stories and the teacher gave her a written test measuring vocabulary and reading comprehension. After a few days, instructor graded the paper and returned the exam. The test showed that Susan did well on vocabulary, but needed to work on retaining key concepts.
Nowadays, her younger brother Richard is likely to learn reading through a computerized software program. As he goes through each story, computer collects data on how long it takes him to master the material, and after each answer Richard gets instant feedback showing whether his answer is correct and how his performance compares to classmates and students across the country. For items that are difficult, the computer will send him links to websites that explain words and concepts in greater detail [12].

Using big data in education is expected to benefit it with following [27]:

- Feedback in the real time
- Motivation (learners potentially become interested in inputting data because they see the impact of how it works)
- Personalization of courses to fit learners individual needs
- Efficiency (time saving on research and analysis)
- Collaboration, cooperation and interdisciplinary throught processes
- Tracking a learner's experience in an e-learning course

- Understanding the learning process.

It is clear that education will see tremendous positive change in the coming decades as rising connectivity reshapes traditional and offers new paths for learning. Most students will be highly technologically literate, schools will integrate technology into lesson plans and as a result education will be a more flexible experience [11].

Among all the advantages, there are many concerns and challenges of big data: privacy, dehumanization, deception by numbers, expenses, infrastructure [27]. The next story is just one of the challenges in the big data era.

> Several years ago, my mother gave me a large manilla envelope full of my old schoolwork – drawing and writings, my report cards, certificates of accomplishment etc. I was overwhelmed by emotion. I saw in her eyes that she is very proud on me, and I remember that she has always shown that envelope to all familly.
> But, that raises the question what happens now that schoolwork is increasingly born digital. Is there a virtual equivalent to that manila envelope of mine? [19]

It is important to argue that ICT alone cannot solve all problems and we cannot achieve its all potential advantages without commitement of educators. There must be the willingness of educators to develop innovative teaching methods or to adopt the existing approaches with modern ICT.

IV. TEACHER AND TEACHING IN THE BIG DATA ERA

The future of knowledge, communication, learning, and teaching is in the hands of educators [28]. The preparation of educators must include a vision of teachers as stimulus of new directions for today's technologies. In one word, teacher is considered to be the architect of the nation [14]. The use of ICT in the clasroom or in distance education does not diminish the role of the teacher. Furthermore, experience has shown that a variety of support and enabling mechanisms must be implemented to optimize teacher use of ICT [13]. Lifelong education throughout formal learning, non-formal learning and informal learning [20], and on-going professional development is extremely important for teachers.

The role of teachers is changing from being not only a transmitter of knowledge but also a facilitator of the teaching-learning process, which caused a need for updated curricula with technical skills. Teachers need to familiarize themselves with new approaches and applications in the use of ICT, in order to facilitate learning process [14]. We can argue that ICT will not be used in education if teachers are not trained to use it [24], so training teachers for their new roles and tasks in the big data era need to be priority of national educational policies.

ICT provides opportunities for use of new teaching methods and new organization of teaching in order to eliminate or reduce disadvantages of traditional teaching by increasing active participation of students and constantly monitoring their progress.

Teachers must complete the move from being lecturers to becoming organisers and enablers [16]. For them it will become crucial to encourage critical thinking skills, promote information literacy and nurture collaborative working practices in order to prepare future workforces for entry into the world of work [15].

V. ALIGNMENT OF EDUCATION AND INDUSTRY REQUIREMENTS

Today every professional occupation, whether business or technical will be impacted by the era of big data [23]. Universities in partnership with industry must move quickly to ensure that the graduates they produce have the required skills for the digital age. Data and analytics literacy must become an expectation across all curricula, regardless of the ultimate field or degree pursued. Graduates without big data skills will not be prepared for the business challenges they will face upon entering today's workforce [25].

The change in the ICT landscape leads to a change in the nature of the skills and capabilities required by both – beginner and experienced ICT practitioners, especially for recent graduates who have yet to adjust to their new roles in an industry [9]. Through history, there have always been a significant gap between the rate of adoption of new technology by academia and industry [7]. Many authors believe that academia lacks the motivation to respond automatically to current industry demands [8].

In the big data era, organizations need to acquire new type of resourse for real-time decision making – professionals which can make value with the big data, which are called data scientists, digital and analytics experts [26], information strategists, information systems professionals, data governance and ethics professionals [25]. These professionals must have mathematical, technology, statistical skills, but also the knowledge of business and so-called X-factor which is intellectual curiosity [21]. In one word, these professionals must be T shaped. In 1991 David Gust introduced the idea of T shaped person (see Figure 1) which nowadays is extremely important in the big data era.

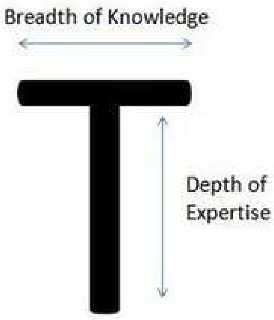

Figure 1: T shaped professional 0

T shaped professionals must have deep knowledge from one field (that represents the vertical line of the letter T) and simultaneously must posses knowledge and skills in other areas and disciplines (horizontal line of the letter T) in order to communicate and cooperate with other experts.

Being able to respond better and faster to changes in the market lead to advantage over the competition. Academic leaders in partnership with industry need to assess the rapidly changing technological landscape and create new curricula and programs to develop talent for the increasing number of big data jobs. They should join together to create a national consortium to address the big data challenge [25]:

- Create formal definitions of prioritized jobs such as data scientist, information strategist, big data architect, and data governance professional.
- Establish curriculum requirements and accreditation standards for programs designed to produce the required knowledge and skills for specialty jobs.
- Set minimum standards for data and analytics literacy required by all students in the age of big data. Create and deliver literacy training via massive online open courses.
- Create open online communities around shared interests to engage industry, government, and academia.
- Build partnership with industry organizations in order to establish strong internship programs and increase collaboration between business and academia.
- Foster the creation of textbooks and courseware to address both literacy and specialized skills at all levels from undergraduate to executive education.
- Establish working groups to address key data policy issues such as information security, individual privacy, and the ethical use of big data.

A recent McKinsey Global Institute study forecasts a significant shortfall in big data skills in the United States. “By 2018, the United States alone could face a shortage of 140,000 to 190,000 people with deep analytical skills as well as 1.5 million managers and analysts with the know-how to use the analysis of big data to make effective decisions” [22].

Industry has recognized the need for data science service and education, so numerous consulting organizations offers data scientists services, while some vendors (IBM, Deloitte, and Accenture) enable their employees to provide a data science education [18]. Leading technology firms, like Hyperion, Teradata, SAP, and Sun Microsystems have developed formal academic alliances and partnership programs to direct their investments and manage their collaborations with universities [33]. Also, some universities have alone recognized the industry requirements and established programs for education of data scientists: Columbia, University of San Francisco, New York University, Stanford, Northwestern, Geogre Mason, Syracuse, University of California, Indiana University, Harvard, and Berkeley have the programs aligned with the the requirements in the big data era [17].

According to one recent research in domestic Serbian ICT companies, about three quarters of the surveyed companies are faced with the following problems when they recruit new employees: candidates do not have the required experience, they are not familiar with ICT and business processes, while at the same time they have unrealistic expectations about earnings [31]. In Serbia, there are still no programs at schools and universities that would provide future graduates the necessary knowledge and skills for work in the big data era, but there is a number of initiatives, projects, programs, strategies with the aim to encourage and stimulate the use of ICT in education [32]. However, integration of information and communication technology into business curricula is challenge for many schools and universities, especially in situation when technology rapidly evolves in the business world.

VI. CONCLUSION

The aim of this paper was to present the main benefits of ICT in education and to acknowledge key challenges in aligning industry requirements with education in the big data era.

ICT in education can increase access to learning opportunities, help to enhance the quality of education with advanced teaching methods, and improve learning outcomes. Faster acquisition of knowledge provides an opportunity for students to think, analyze, conclude, detect, and solve problems.

It is clear that ICT provides opportunities for use of new teaching methods in order to eliminate or reduce disadvantages of traditional teaching by increasing active participation of students and constantly monitoring their progress. The role of the teachers in the big data era is changing from being not only a transmitter of knowledge but also a facilitator of the teaching-learning process, which caused a need for teachers to update their curricula with technical skills.

In the big data era which is characterized with volume, variety and velocity of data, every professional occupation, whether business or technical will be influenced by ICT. Universities in partnership with industry must move quickly to ensure that the graduates they produce have the required skills for the digital age. Data and analytics literacy will become an expectation across all curricula, regardless of educational field.

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STUDYING WITH TABLETS

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Abstract - Introduction of information technology in education improves better conditions for students learning. Tablets are product of development information technology. They helps students to learn faster and more interesting. Thick textbooks can be presented into a simple, easy-to-read ebook. On each tablet can be stored many different textbooks and students can follow their lectures outside of the class. Atmosphere in classroom is more dinamic and students are more involved. Information tecnology has a large impact on education system. Using tablets for educational purposes will change the traditional way of learning.

I. INTRODUCTION

Today, information technology is very important for education because technology can help a lot for understanding education material. Another important thing is that the computers, phones and tablets are cheaper today. Using information technologies for educational purposes are, definitely, future. Learning with tablets is more interesting and students can acquire new knowlage through teamwork. Tablets allows students to learn in group and makes easier learning with many diferent multimedia contents. Considering that progress of information technology develops fast students will replace their textbooks with modern ebooks. In fact, tablets will make easier way for learning and student will be able to get their informaton from the internet.

II. INFORMATION TECHNOLOGY IN SCHOOL

In the next few years everyone will use his own laptop or tablet in school. So, why information technology is important for education? At first, students will be more involved in school thematic. Today, activities on social networks are become a normal part of our life. Mostly, students spend their free time on social networks such as Facebook, Twitter Google+, etc. Education material will be shared on these networks and students will still be able to take this material and use for their learning. Using internet, as one of information technologies, every student is able to ask his professor or teacher about education material. If they have any problem with their learning they can ask their professors and get the answer instantly. That is why information technology is very important for education. Teaching with technology is different from teaching in a typical classroom. Teachers must be trained in how to plan, create, and deliver instruction within a technological setting. It requires a different pedagogical approach. If teacher wants to use technology effectively, they need to be trained in using technology and they need to develop a good understanding of it. The most important thing about using information technology in school is that the technology is used to enhance learning. If teachers do not understand how to use technology they need to be trained. Using interactive electronic boards and LCD PowerPoint presentation is the most effective but there are many more applications available for students to be hands-on with their learning and gain deeper knowledge than they could before. Teachers also need to learn about new technologies and ways to integrate them effectively in their classroom. Information technology will, definitely, remake our schooling system. Modern information technology including software, hardware and communication technologies enables this new form of pedagogy to be applied effectively. Sometimes when students were used technology on classes to improve their knowledge, in many cases, it showed good results. Information technologies in schools need to have pedagogical applications of hardware and software that maximize the ability of young people to control information technology and use it creatively. As information technology becomes more useful for education purposes, unfamiliarity with information technology will increasingly limit students educational opportunities. Today we have more different application for education purposes. Those applications are specially designed for different subjects such as math, graphic design, development etc. Application gives all information about certain domain. Those applications are specially designed. Teachers should know which material is the best for their students. A good thing about using information technologies in schools is that the students are work in group. Every student use material in front of him on his laptop or tablet.(*picture 2*). All computers are in network so students in classroom can share education material. Teacher need to keep attention on their classes and using information technology helps them a lot. As the rate of using the Internet rapidly increases in countries across the globe and the investment in technological infrastructure in schools teacher training, and software too, is surely one of the important things in education system.

III. WHY USE TABLETS?

Before we use to talk about why is good to use tablets in school we should tell something about tablets. What is tablet? Tablets are highly portable, touch screen, internet enabled hand-held computers. In comparison with laptop tablets have some benefits. Tablets are smaller and they have better price point. But each tablet and operating system will have its own benefits and drawbacks. Using the internet, as source of information will enable schools to make informed decisions about tablets and their use in an educational environment. Proponents of tablets say that they are supported by most teachers and students, are much lighter than print textbooks, and improve standardized test scores. They say tablets can hold hundreds of textbooks, save the environment by lowering the amount of printing, increase student interactivity and creativity, and that digital textbooks are cheaper than print textbooks. This is a good side of using tablets in school but there is another side which is against of tablets in school. Opponents of tablets say that they are expensive, easy to break, and costly/time-consuming to fix. They say that tablets contribute to eyestrain, headaches, and blurred vision, increase the excuses available for students not doing their homework, require costly Wi-Fi networks, and become quickly outdated as new technologies emerge. Tablets are portable and assist inclusion on classes. Students can get instant feedback from their teacher and they can do their exams on tablets. Students can easily work together in online blogs and education-focused social networks. A good thing about doing exams on tablets is that the students cannot cheat. Because they do their exams on specially designed software for that purposes. Teachers have access to their tablets in any time and they can see what student doing. Every tablet has a video camera and gives students more opportunities. If, for some reason student is unable to attend on classes he can follow lectures online via internet. Students can be involved even if they do not attend their lectures and they can ask questions. If the school decides to use tablets, their classrooms should be with digital environment. The research points to how devices and software will enable learning. Some of them are: access to anywhere, anytime learning during and after schools, school and classroom connections and collaboration between students, parents and teachers, intuitive and easy-to-use devices for younger learners and educational applications and digital content such as digital textbooks. Tablets make communication of outside of school easier for students and teachers. All types of applications and programs on tablets can allow students to have better access to homework, study-guides, test reviews, upcoming tests and papers.

IV. SHOULD TABLETS REPLACE TEXTBOOKS?

Thick textbooks can be presented into a simple, easy-to-read ebook while innovative learning apps can be accessed all through tablets. Electronic books can be the same as textbooks and they can be stored on tablets. Advantage of using ebooks is that a single tablet can hold hundreds of textbooks. Tablets also can hold quiz materials and animated illustrations, and students can even highlight text. Today every student can have a library of books on his tablet. Those books are written in electronic form and do not take up much storage space on tablets (*picture 1*). Another important thing about ebooks is that they are cheaper than printed versions of books. Students can share their textbooks and those books can't be damaged so many generations can use them. Ebooks may be easier to find than printed versions. Tablets give users the ability to highlight and edit text and write notes without ruining a textbook for the next user. Tablets have a search function, a backlighting option to read in low light, and a built-in dictionary. Interactive diagrams and videos increase student creativity, motivation, attentiveness, and engagement with classroom materials. An interesting thing about tablets against the textbook is that the print textbooks are heavy while tablets are lighter and can store several books. Students that learn technology skills early in life will be better prepared to pursue relevant careers later in life. Sometimes students are using old books with outdated material but on their tablets ebooks cannot be outdated because they can be updated instantly to get new editions or information. E-textbooks and other files can be stored on "cloud" servers and accessed on any equivalent device. Users can sign into an account on a different device and access all of their information. This is the good thing because students and teachers can access to their files at anytime. There are thousands of education and tutoring applications on tablets and they are allows teachers to better customize student learning. Possibilities for teaching with tablets may be fun and exciting. On the other side there are some facts about bad things of using tablets. At first, using tablets is more expensive than using print textbooks. People who read print text remember more than those who read digital text. The brain interprets printed and digital text in different ways, and people generally read digital text 20-30% slower than print. Unlike tablets, there is no chance of getting malware, spyware, or having personal information stolen from a print textbook. Print textbooks cannot crash, freeze or get hacked. Another problem is also that many textbooks are not available in digital format or on the specific tablet used by a school. Using tablets is still a new technology which is introducing into a schools system. Because information technology is develops rapidly for next few years tablets will surely replace textbooks. Tablets will be cheaper and more accessible to students.

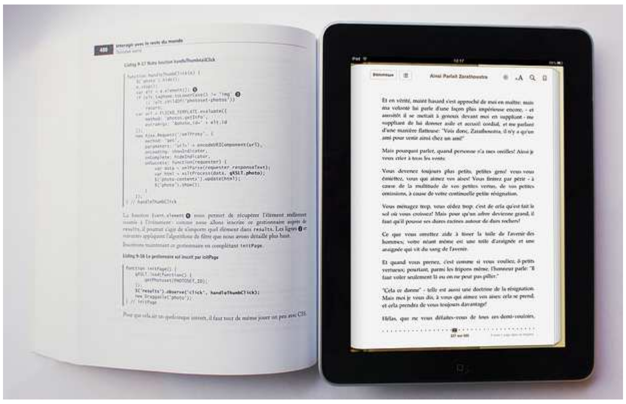

Figure 1: Differences between textbook and ebook

V. USING TABLETS IN THE CLASSROOM

In fact, tablets are even suitable for young children due to its portable format, fast load-up time and responsive touch screen. In any case, interactive technology makes learning more engaging and memorable. Instead of searching for a dictionary and flicking through the pages to find the definition of a word, students simply can use the dictionary on the tablet making learning five times faster. Other tools like audio and video recorders can contribute a better education, too. For instance, foreign language teachers can use the tablet's audio recording tool to record students speaking in a foreign language, play it back and subsequently advise them on diction and technique. There is also a teacher-to-teacher benefit. Documents can be emailed straight over to colleagues during a meeting, for example. On a student-to-teacher basis, students can engage in a Skype call with their tutor to find out more information about a piece of homework or a particularly tough subject. If a student has forgotten their textbook, the teacher can take a photograph of the relevant study page and send it over. It is very important to mention work in groups. When students in classroom work in group their attention is focused on specific educational content. For example, teachers can use Twitter on their class to promote discussion, and tablets can make it easy for them to quickly type out a tweet to their students using their class hashtag[*] from anywhere in the room. Also, smart-boards are very useful during the lectures. Smart boards help improve learning outcomes. Combining the smart board with the tablet, the smart board lets you deliver dynamic lessons, write notes in digital ink and save your work – all with the simple touch of a finger. The smart board accepts touch input from a finger, pen or other solid object. Smart Board can be used for teaching, training, conducting meetings, and delivering presentations. Using smart board and tablets in classroom are the best combination when we talk about using information technology in school. Tablets can change dynamic in classroom. Specially designed software for education purposes can make learning more interesting. Sometimes textbooks can be boring but animations and video clips on tablets keeps student attention. There might be some technical problems like battery life of tablets. The length of the battery charge varies widely among tablet devices, and finding enough electrical outlets in the classroom to charge several tablets at once can be difficult. Not all apps or software will work on all tablets. Many applications use software written for special brand of tablets and won't work on another tablets. In this case schools should decide which brand of tablet they will use.

Figure 2: Using tablets on class

VI. STATISTICS OF USING TABLETS IN SCHOOL

As it is already mentioned above, tablets are increasingly popular in schools around the globe. Here are some statistics about using tablets in school:

- Over 50% of polled believe mobile devices will become an important part of the teaching tool kit in next five years.
- Over 50% needed more technology training.
- Over 90% consider technology an essential or useful teaching tool.
- Over half see their school using the technology “somewhat effectively”.
- 62% noted their school did not provide adequate support.

Those statistics are the result of research conducted in schools around the UK. About 62% of polled think that their school did not provide adequate support which is not so good and schools have problem with this. Because information technology is increasingly represented around the globe and develops rapidly so this might be a problem for schools because of adequate support. Schools do not have the financial means to follow the development of new technologies. Over 50% of polled believe mobile devices (such as tablets) will become an important part of the teaching tool kit in next five years which shows how information technology will be represented in schools. Today students use digital technologies for educational purposes a lot. All the necessary information for their study search on the internet and less from printed versions of books. The reason of this is because taking a lot of time when they searching for the information. Information from the internet is obtained instantly and don’t take much of their time.

VII. CONCLUSION

As information technology develops learning with tablets will surely be one of the main things in educational system. Information technology will enable easier communication between students and their teachers. Increased development of application for tablets that helps for student learning may be the reason of using tablets for education purposes. The main factor is easy organization and work as a whole on classes. Tablets keep students attention and gives them many opportunities such as access to their education material at anytime and communication outside of the classes. Electronic books may be more represented and textbooks may be replaced but the question is will them be more useful and easier to learn for students. One thing is sure that using tablets and information technologies in schools makes easier work for teachers and learning for students.

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*Hastag - a word or phrase preceded by a hash sign (#), used on social media sites such as Twitter to identify messages on a specific topic.

HIGHER EDUCATION INSTITUTIONS ACCREDITATION IN INDIA AND GUJARAT STATE OF INDIA

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Abstract – The paper presents accreditation of higher educational institutions in India, Gujarat State. The process of audit, forms and results of audit are presented.

I. INTRODUCTION

Accreditation of higher education institutions started in aim to establish a quality assurance system in this field. Special concern in accreditation is focus on set of criteria and standards that each accreditation institution is to define, quality assurance auditors are to apply in their audit process and higher education institution is to accomplish.

Higher educational institutions in India are financed by University Grants Commission (UGC) and maintained by the State Governments, co-financed by University Grants Commission and partly self-financed, completely self-financed (privately held). [1] In India, for state government managed higher educational institutions, once a year there is personal achievements assessment of faculty members [1], as well as the academic and administrative audit of higher education institutions (colleges affiliated to universities).

Standards of accreditation of higher education institutions and universities are defined within National Assessment and Accreditation Council in India [2], which coordinate standards development with regional Asia-Pacific Quality Network [3] and International Network for Quality Assurance Agencies in Higher Education [4].

Aim of this paper is to present activities in quality assurance of higher education institutions in Gujarat State of India. These activities are organized within Knowledge Consortium of Gujarat [5] that belongs to Government of Gujarat, Department of Education.

II. THE UNIVERSITY QUALITY ASSURANCE AUDIT PROCESS IN INDIA

Quality assurance audit at universities in India is performed as Internal Audit and External Audit. According to predefined standards, Internal Commission for Quality assurance at a university is to check standards accomplishments and determine problems, suggesting solutions for improvements. The report about internal audit is to be presented to external audit commission.

Each college that is affiliated to a university has a visit from external auditors regarding academic and administrative audit. External audit in India, Gujarat State is organized within several sessions:

Session 1: Meeting with the Principal- In the first session, the peer team will meet the Principal wherein the last AAA or NAAC report of the college will be studied and based on the report what improvements are done in the college will be discussed.

*Session 2: Meeting with the Steering Committee/ IQAC Members-*During the meeting the peer team will study/evaluate the SSR (Self Study Report) prepared by the steering committee and the relevant documents will be placed for perusal of the team

Session 3: Department wise meeting with teachers- During the second session, the peer team will interact with the teachers in which the teachers will be evaluated on the basis of their teaching capability, their research area & experience, list of their publications, conferences attended, total years of teaching experience etc.

Session 4: Checking of documentary evidences **-** The peer team will carry out the physical verification of the all the documents submitted by the college which include: Act and Statutes of the Affiliating University; Rules, regulations, and/or guidelines relating to the composition, powers and functions of the various Academic and Administrative authorities and committees; Guidelines for the Grievance Redressal Cell and the Complaints Cell for addressing issues of sexual harassment of women at workplace; Guidelines for the publication units (if any); Criteria for facilitating professional development programs for the faculty; Documents containing the current list of academic programs, duration, fee structure etc.; Institutional annual Calendar; Annual Reports of the past two years; Master plan of the institution; Records of student feedback; Annual Budget; MoU with collaborating agencies; Special recognition, grants, awards, etc.; Audited accounts of the institution and the auditor's reports for the past two years; Research projects sanctioned by external funding agencies; Government regulations regarding policies and sanctions; Approvals of regulatory bodies for the programs run by the institution; Any other documents as deemed necessary by the institution / Peer Team.

Session 5: Meeting with the Governing Body, Management State Government Representative/ University Representative **-** The discussion during this meeting is to get an idea of their role, duties & responsibilities, methodology of the administrative work that is carried out by the trust and their planning for the future for the improvement of the college.

Session 6: Visit to the facilities: Central Library, Observatory, Central Instrument Facility, Controller of Exams, Sports, NCC Unit, NSS Unit, SC/ST Cells, Counseling Cell, Auditorium, Library, Computer Centre/ Labs, Guest Rooms, Health Centre, Hostel, Canteen etc. - Here the peer team visits to all the above mentioned facilities to examine that whether they meet the specified minimum standards and are up to date and in working conditions. It is to be checked if these facilities are how much useful to students.

Session 7: Interaction with Students, Support Staff, Parents, alumni **-** This session comprises of meeting with all the above mentioned to get an idea of their point of view on teaching, discipline, lab facilities, library, extracurricular activities, sports, college placement cell etc.

Session 8: Mentoring points & Exit meeting with Principal, Coordinator and the entire staff members- At the end of the day, the evaluation is done based on all the above mentioned sessions and grading of the college is done. The formal meeting of the peer team is arranged with the Principal and the complete staff of the college to share the Peer Team's perceptions and general observations about the institution, without disclosing the institutional grade/CGPA. This is not an interactive session. Chairperson enlightens on mentoring points how to increase strength of the college. A representative group of management, faculty, (Steering Committee members, Heads of Departments and others), students, parents and alumni may be invited.

III. List of NAAC criteria for university accreditation

National Assessment and Accreditation Council [2] has developed detailed set of guidelines and manuals for university and colleges (affiliated to university or autonomous colleges) accreditation self-assessment (creating self-study report - SSR) and external audit.

Figure 1. NAAC official website

According to material from [2], in accreditation of an institution, there are "32 Key Aspects under the seven criteria. Using the guiding indicators and based on the observations and assessment of the institution from peer auditors (onsite visit and the validation of SSR), the peer team is expected to assign appropriate grade point to each of the key aspect by using five point scale (0-4)." Peer auditors give certain points (scaling from 0-4) for each key aspect. These are entered to the table with all aspects and criteria and calculation is performed for each criterion (group of aspects).

Sample calculation for each of the criteria for a sample university [2] is presented in Table 1.

TABLE 1. SAMPLE CGPA CALCULATION TABLE

Criteria and Key Aspects	Predetermined Weightage (W_i)	Peer Team Assigned Key Aspect Grade Points($KAGP)_i$ 4/ 3/ 2/ 1/0	Key Aspect-wise Weighted Grade Points $KAWGP_i$=$KAGP_i \cdot W_i$
Criterion I: Curricular Aspects			
Curriculum Design and Development	50	3	150
Academic Flexibility	50	2	100
Curriculum Enrichment	30	1	30
Feedback System	20	2	40
TOTAL	W_I = 150		$(CrWGP)_I$=320
Calculated Cr GPA_I =$(CrWGP)_I$ / W_I = 320 /150=2.13			
Criterion II: Teaching – Learning and Evaluation			
Student Enrolment and Profile	10	3	30
Catering to Student Diversity	20	4	80
Teaching-Learning Process	50	3	150
Teacher Quality	50	3	150
Evaluation Process and Reforms	40	2	80
Student Performance and Learning Outcomes	30	3	90
TOTAL	W_{II} =200		$(CrWGP)_{II}$ =580
Calculated Cr GPA_{II} =$(CrWGP)_{II}$ / W_{II} = 580/200=2.90			
Criterion III: Research, Consultancy and Extension			
Promotion of Research	20	2	40
Resource Mobilization for Research	20	1	20
Research Facilities	30	2	60
Research Publications and Awards	100	2	200
Consultancy	20	0	0
Extension Activities and Institutional Social Responsibility	40	4	160
Collaboration	20	2	40
TOTAL	W_{III} =250		$(CrWGP)_{III}$=520
Calculated Cr GPA_{III} =$(CrWGP)_{III}$ / W_{III} =520/250=2.08			
Criterion IV: Infrastructure and Learning Resources			
Physical Facilities	30	3	90
Library as a Learning Resource	20	3	60
IT Infrastructure	30	2	60
Maintenance of Campus Facilities	20	2	40
TOTAL	W_{IV} =100		$(CrWGP)_{IV}$ = 250
Calculated Cr GPA_{IV} =$(CrWGP)_{IV}$ / W_{IV} =250/100=2.50			
Criterion V: Student Support and Progression			
Student Mentoring and Support	40	4	160
Student Progression	40	3	120
Student Participation and Activities	20	3	60
TOTAL	W_V =100		$(CrWGP)_V$ =340
Calculated Cr GPA_V =$(CrWGP)_V$ / W_V = 340/100=3.40			
Criterion VI: Governance, Leadership and Management			
Institutional Vision and Leadership	10	3	30
Strategy Development and Deployment	10	2	20
Faculty Empowerment Strategies	30	3	90
Financial Management and Resource Mobilization	20	2	40
Internal Quality Assurance System	30	2	60
TOTAL	W_{VI} =100		$(CrWGP)_{VI}$ =240
Calculated Cr GPA_{VI} =$(CrWGP)_{VI}$ / W_{VI} =240/100=2.40			
Criterion VII: Innovations and Best Practices			
Environment Consciousness	30	3	90
Innovations	30	1	30
Best Practices	40	2	80
TOTAL	W_{VII}= 100		$(CrWGP)_{VII}$ =200
Calculated Cr GPA_{VII} =$(CrWGP)_{VII}$ / W_{VII} = 200/100=2.00			
Grand Total	1000		2450

CGPA is computed as [2]:

$$\textbf{Institutional CGPA} = \frac{\sum_{j=1}^{7} (CrWGP)_j}{\sum_{j=1}^{7} W_j}$$

Each $CrWGP_j$ is computed from each category, i.e. criteria group of quality aspects.

For the sample university (previously presented):

$$\text{Institutional CGPA} = \frac{\sum_{j=1}^{7} (CrWGP_j)}{\sum_{j=1}^{7} W_j} = \frac{2450}{1000} = \boxed{2.45}$$

Outcome of institution (i.e. college of a university) accreditation or Status of Accreditation is presented with:

- Institutional CGPA (Cumulative Grade Point Average) = example: 2.45,
- Letter Grade = example: B,
- Performance Descriptor = example: Good,
- Status = example: Accredited.

IV. RESULTS FOR GUJARAT STATE GOVERNMENT COLLEGES ACADEMIC AND ADMINISTRATIVE AUDIT

In this section, results of academic and administrative audit for 72 government colleges in Gujarat State, India will be presented. The results are presented for the status of these colleges on April 2014.

List of criteria for Gujarat Government Colleges audit is presented at table 2.

TABLE 2. LIST OF CRITERIA FOR GOVERNMENT COLLEGE AUDIT AT GUJARAT STATE, INDIA

Criteria And Key Aspects		Maximum Score (Weightage)
Criterion 1: Academic Management		
1.1	Staff Strength	20
1.2	Capacity Building for staff	10
1.3	Grant Utilization	10
1.4	Institutional Planning & Implementation	10
1.5	Automation of Administrative System	30
1.6	Automation of Library	20
1.7	Cells, associations & add on services	50
	Subtotal	150

Criterion 2 : Academic Practices		
2.1	Human Resource	45
2.2	Teaching Learning Evaluation Processes	225
2.3	Research Output	90
2.4	Community Outreach/Extension	45
2.5	Student Support	45
	Subtotal	450

Criterion 3: Infrastructure and other facilities		
3.1	Campus Area	7
3.2	Campus ownership	7
3.3	Office Space	7
3.4	Library	15
3.5	Laboratories	7
3.6	Security	5
3.7	Potable Water facility	7
3.8	Power Backup facility	5
3.9	Washroom facility	15
3.10	Parking	8
3.11	Class rooms	15
3.12	Staff room	15
3.13	Seminar Room	15
3.14	Common room	14
3.15	Medical Centre facility	10
3.16	Sports Facility	20
3.17	Gymnasium	5
3.18	Hostel Facility	20
3.19	Transportation for students	5
3.2	Support services (Bank/PO/Xerox)	3
3.21	Canteen	5
3.22	Approach Road	5
3.23	Garden	7
3.24	Auditorium/ Assembly hall	5
3.25	Internet facility	8
3.26	Overall Maintenance	15
	Subtotal	**250**

Criterion 4 : Initiatives and Supplementation		
4.1	Use of SATCOM Programs for study	15
4.2	Quality of SAPTDHARA Activities	15
4.3	Access of Internet facility by students for study	20
4.4	Placement Activity / UDISHA Cell	25
4.5	Choice Based Credit System (CBCS)	10
4.6	Use of Library-Vanche Gujarat	10
4.7	General Knowledge Quiz	5
4.8	Alumni Association	22.5
4.9	Academic links, Collaboration & Progressive Practices	5
4.10	Other Initiatives	22.5
	Subtotal	150

For each of the specified four criteria, the peer team assessment is performed for each of the 72 colleges in Gujarat State of India.

TABLE 3. CRITERIA LIST FOR COLLEGE AUDIT

No.	Criteria	Max Score
1	Academic Management	150
2	Academic Practices	450
3	Infrastructure and other facilities	250
4	Initiatives and Supplementation	150
	Total	**1000**

Status of each of 72 colleges presented graphically is presented at graph, Figure 2.

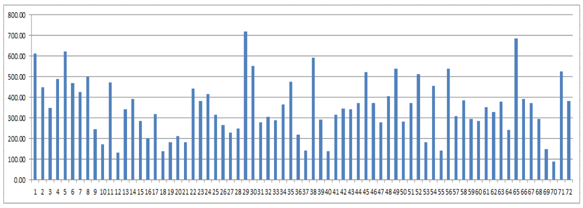

Figure 2. Graph status of each of 72 colleges from Gujarat State, India, on April 2014.

In MS Excel, there is computation for all 72 Government Colleges of Gujarat State, India, presented as summary in table 4. and figure 3.

The classification of colleges is made upon criteria:

- Grade I:

points for college are >750 points of max 1000.

- Grade II:

points for college are >500 points of max 1000.

- Grade III:

points for college are >300 points of max 1000.

- Grade IV:

points for college are <=300 points of max 1000.

TABLE 4. CLASSIFICATION OF COLLEGES IN GUJARAT STATE, ON APRIL 2014.

Grade	Number of colleges
I	0
II	11
III	33
IV	28
Total	**72**

According to previously presented grade table, a graph presents current state of State colleges in Gujarat, India.

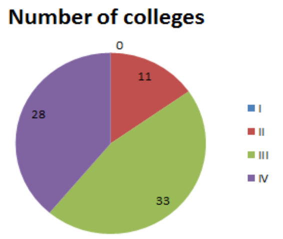

Figure 3. Graph status of each of 72 colleges from Gujarat

According to presented data related to Government financed 72 colleges in Gujarat State, it could be concluded that most colleges are in III (33%) and IV (28%) grade. Total percentage of these III and IV grade colleges is 61%.

V. CONCLUSION

Accreditation of higher education institutions is important, since the established quality assurance system enables students to evaluate colleges and choose the college of their best choice. Particularly important is aspect of the college and university to have constant status of certain quality aspects and to have the direction of the quality improvements. Government department of education, by having reports on quality and issues in educational institutions could create strategic plans and focus resources in improvement of certain criteria of quality in academic and administrative aspects.

In this paper, the current state of university criteria and evaluation of universities in India, as well as criteria for audit of colleges is presented. Particularly the results for Gujarat State of India are presented, as per results on April 2014. It has been concluded that more than 50% of colleges have less than 500 of max 1000 points in college audit. It directs Gujarat State level of management in higher education to direct efforts and resources in improvement of certain aspects of quality, in aim to increase grade for most of the 72 state managed colleges.

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THE SCHOOL PRINCIPAL AS A MANAGER AND A LEADER

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Abstract – Principals play a key role in school management. With their actions, they have influence on all school managers and establishment of relationships among them. In order to be able to achieve the set goals, principals are expected to master certain skills of management and leadership. They are also required to know how to effectively combine these two disciplines.

I INTRODUCTION

The need for educational management was created under the influence of scientific-technological and social changes. These changes required adaptation of education systems, both in terms of staff and function so as to realize plans relating to the economic aspects of the education system. Viewed economically, education system is a social activity whose degree of development each community depends on, directly or indirectly. The level of knowledge and education determine the degree of adaptation to the needs that continuously increase.

In order to successfully achieve set goals, it is essential that managers i.e. heads of educational institutions successfully manage the staff through a variety of styles. The choice of management style depends on the personality of the manager and the situation they are in. One of the essential conditions for the realization of tasks is that the school principal must be a person who will be accepted by the staff and whom they will trust and follow. In order to be accepted, they must have a sense of communication, not to use an autocratic style of management in which the staff are supposed to humbly obey their commands. At school in particular, people do not like being commanded. However, excessive familiarity, as well as excessive tolerance should be avoided as these will undermine the established discipline.

They must be familiar with psychology and possess strong psychological etiquette. This implies knowledge of the behavior of individuals as well as group psychology. It is necessary to create the environment in which employees may present themselves in the best possible light. Knowledge of psychology helps the principal better understand students as well. Therefore, it is vital to know both child psychology and developmental psychology.

Based on the above we can see the complexity of the management of educational facilities and below are presented duties of principals as managers and leaders. We will also give a brief overview of management styles that the principal can use as well as principals' leadership roles.

II DUTIES OF PRINCIPAL AS MANAGER

The principal's role is to lead and manage planning, implementation, evaluation and development of all students. This is achieved through the implementation of strategies and the use of resources received from state authorities and the community. The key factor is to increase teachers' knowledge base regarding teaching methods and techniques and application of successful practices.

Principals have a clearly defined set of responsibilities, which makes their work different from other education professionals and which are clearly defined in the employment contract. They are responsible for the overall management and development of the school. Key responsibilities of principals are [1]:

- Ensuring conditions for high-quality education for all students.
- They are the school board executives.
- Implementation of decisions of the school board.
- Establishment and management of the financial system in accordance with the law and the school board requirements.
- Effective management and integration of the available school resources.

- Adequate involvement of staff, students and community in development, implementation and control of school policy, programmes and operations.
- Providing reports on achievements of the school and its students to state authorities, school board, parents and students.
- The obligation to work in accordance with the law, rules and procedures.

III MANAGEMENT STYLES

The power of principals' impact on employees, stems from their position in the organizational hierarchy and regulations (formal authority), principals' personal qualities with respect to personality traits, professional qualities, competences and social reputation (personal authority) and authority as perceived and recognized by employees (the real authority of the principal).

Therefore, the principal has the following sources of power which can be divided into two groups [2]:

- positional power - the power provided by the organization, and is therefore also called formal power.
- personal or informal power - the power associated with personality traits.

Formal power and impact opportunities increase with hierarchical position and are expressed in the form of different types of power [2]:

- legitimate power – is derived from formal position, authority or powers of managers;
- reward power - is related to the ability and the right of the manager to give subordinates rewards and recognition.
- coercive power - is the opposite of reward power and is based on the right of managers to prevent subordinates from obtaining what they want.
- Information power – is based on the control over information.

Personal power is the primary source of the impacts of real leaders who are followed by subordinates due to respect and admiration. Real leaders and managers who wish to be successful leaders, base their impact on subordinates on different types of personal power [2]:

- Expert power - refers to competences, skills and talents of the individual.
- Referent power - is based on the personality traits of the leader which they are admired for.
- Charismatic power - is an intense form of referent power, stemming from an individual's personality, physical, or other abilities that induce others to believe in and follow that leader.

The use of different sources of power can result in different effects on motivation, attitudes and behavior of employees. The best and most lasting effects are achieved by managers who with personal sources of power influence the behavior of employees. Not only do they change the behavior, but the attitudes of employees as well. The impacts of positional power (compliance) are partially successful as it causes fulfillment of requirements with average effort. Resistance is ineffective form of impact, through which the opposite of the desired effects are achieved.

The choice of the principal's leadership style at school may be affected by a number of factors which we conditionally classified into three main groups [3]:

- Personal factors (characteristics and competences; the nature of the principal's authority, knowledge of the effectiveness of certain leadership styles, etc.),
- Factors related to the characteristics of the employees, recognition of the principal's authority, experience, characteristics and competences, level of motivation, preferences regarding leadership style, job satisfaction, etc.) and
- Situational factors: characteristics of school (size, type - primary, secondary, location - rural, urban), socio-economic characteristics of the social environment, tradition associated with the management style (level of involvement of the community and employees in supervision and decision-making); interpersonal relationships at school and the level of correspondence between general and personal goals, social status of the principal and important friendships, level of school culture and the school's values system, etc.

All major leadership styles can be divided into three main groups [3]:

- Leadership styles based on the way authority is used,
- Situational (contingency) leadership models,
- New approaches to leadership.

A. Leadership styles based on the way authority is used

There is an assumption that when assessing success it is essential to examine how managers-leaders treat their employees, and what management style they use. Based on the type of authority and the way the manager uses it when directing to execution of tasks, several major classifications of leadership styles have been made [3]:

1. According to "Human Synergistic" there are three groups of profile of the "ideal" manager. In fact, authors of the study concluded that companies are successful because constructive profiles in the management of these companies are most developed. The three profiles are also shown symbolically:

- the style of constructive (democratic) manager is presented as a dolphin,
- autocratic (aggressive) as a shark,
- defensive (liberal) as catfish.

Researchers concluded that general "profile of the ideal management style" includes behavior characteristics of all three described types of managers, but in the following ratio (55:33:12).

2. Professor R. Likert (the University of Michigan) obtained similar results who, together with his associates, dealt with the issue of successful managers for many years. According to him, profile of the "ideal" manager involves characteristics of behavior of the four leadership styles in the ratio as follows: [3]

a) democratic - 41.5% (preferred style based on complete trust in employees, and creative use of their opinions and ideas);

b) consultative-participatory - 36.4% (strong confidence, encouraging team decision-making);

c) benevolent-authoritative - 15% (patronizing confidence, partly respecting opinions, tight control);

d) extreme-authoritative - 7.7% (low confidence in the staff, the atmosphere of fear of punishment...).

B. Situational (contingency) leadership models

Situation-based approach was founded in the seventies of the 20th century, it is based on assumption that principals may be successful if in the process of directing employees towards a goal, they use the leadership style that best contributes to the expected efficiency and effectiveness in the specific situation in which the work is done. This practically means adapting a leadership style to the characteristics of an individual, group, and specifics of a problem, goals and tasks and characteristics of the work environment.

Symbolically speaking, according to this approach, a successful principal has the attitude that "it all depends", and therefore asks questions such as: Does my leadership style fit the expert team members and the situation?; Can employees give their maximum in achieving the set goals while maintaining good working environment?, Should it be insisted on responsibility based on control or responsibility based on the initiative "from below" and the awareness of belonging to a team/school?, etc.

C. New approaches to leadership

In the literature on management, starting from the mid-seventies of the 20th century, many authors tend to complement the principles that lead to a better understanding of the process of leadership in relation to the earlier theoretical approaches.

In the group of new theoretical approaches to the process of leadership, the dominant theory is the one of transformational and transactional leadership, then follow the charismatic, visionary leadership, etc.

The text below will deal in more detail with the transformational and transactional leadership as an imaginary continuum with extreme dimensions - autonomous and team management.

1. The idea of transformational leadership [3] was first introduced by McGregor Burns during the eighties of the 20th century. The initial assumption is that in the unstable conditions of rapid socio-economic change, one should use a new approach to leadership that would primarily rely on the best concepts of the above mentioned leadership theories (theory of personality traits, behavioural, situational) and develop a new preferable model of principal who knows how to create efficient work environment, in order to achieve results as well as employees' job satisfaction and who will instead of leading

employees lead together with them. In order to achieve that, a modern principal should be able to create a vision for school development, initiate changes, and affect the attitudes of employees and increase loyalty and commitment of employees.

In contrast to the earlier premise that emotions have negative effect on rational thinking and contribute to failure at work, it has been proven that emotions, if properly managed, can even improve rational thinking, to enable proper decision making and direct individuals to appropriate behavior. This creates a theoretical framework for the development of a new leadership style that gives a response to the perceived need for leaders who are emotionally stable and establish an emotional connection with employees so that they are focused on goals, which is a key feature of transformation-oriented leaders.

2. Transactional approach is [3] an innovated way of classical rational authoritative approach to the process of leadership which aims at creating commitment to achieving short-term goals of the school.

By its nature, transactional approach is primarily oriented towards actions within the established system, plans and programmes and efforts to effectively achieve the intended quality standards. In the process of transactional leadership, the principal sets realistic goals, effectively organizes the work of employees and gives them all the resources they need to achieve the set goals.

Besides the above, some authors point out other characteristics of transactional behavior and ways of influencing employees [3]:

- Continuous monitoring and management in the form of a more intensive active supervision and taking corrective measures, or occasional monitoring and taking corrective measures just in case established standards have not been met.
- Influencing employees in terms of winning them over to work effectively by means of situational rewarding - by promising rewards in accordance with the level of commitment, i.e. agreeing on the reward proportional to the efforts and achieved results.
- Instead of higher interests, transactional leadership primarily insists on personal interests and values such as honesty and integrity, responsibility and the need for cooperation in the realization of personal and common goals, etc.

Many authors point out the advantage of transformational approach over the transactional one, particularly at the times of educational reforms and significant changes in the organization of the school. In addition, the advantage of the transformational behavior of the principal is also pointed out in the aspect of humanization of interpersonal relationships and long-term success.

Transactional approach yields better results in conditions of clear demarcation of functions of school management within a wider system of educational management if the school is well organized and the lower the level of school management is. This particularly successfully maintains the balance of interdependence between productivity and employee satisfaction - the satisfaction with a job well done.

For the successful leadership, the following elements of transactional approach are especially important: situational rewarding and active monitoring particularly if employees accept more responsibility and if the objectives are clearly presented to them.

Based on the above, it follows that a successful principal creatively combines transformational and transactional approach in the process of leading employees.

IV PRINCIPALS' LEADERSHIP ROLES

Modern principal's role has changed significantly in the past few decades. Today they are required multi-tasking and changing roles depending on the situation. Each day provides new opportunities to be creative in solving problems. This creative approach means involving others in problem solving. Given the differentiation of jobs to be done, a principal must be a leader.

In the text that follows, we will present a set of roles that make principals leaders, i.e. possess "principal-ship"[4]:

- The principal as psychologist - Effective principals are accessible to anyone who wishes to express their ideas and emotions. They need to truly listen to what teachers and students are saying so as to have feedback at any time on the current situation.

- The principal as teacher - From their own personal experience, principals have insight into the challenges that teachers face in the classroom. However, they must be models for teachers who are faced with changes and thus become learners themselves. In order to successfully accomplish the role of a model, principals need to establish the knowledge base necessary to support reform.
- The principal as police officer - It is necessary to create a safe school environment and maintain it through effective conflict resolution and mediation.
- The principal as facilities manager - Although it is not the most glamorous aspect of the job, a principal's role in overseeing the physical structure of the school is crucial. A functional school is not enough, it is necessary to create better conditions as that leads to better student achievement. If striving for reforms, they need to be expressed in changes in physical conditions as well: bright and clean school, classrooms that allow for flexibility in different seating arrangement and adequate resources for both students and teachers.
- The principal as philosopher - Philosophers are often thought of as having their "heads in the clouds". But a principal's lofty perspective is essential for the life of school. The principal defines values, beliefs and cultural standards in order to create the school identity. Throughout this process it is important to involve all stakeholders.
- The principal as diplomat - The principal often needs to be a liaison with a large number of stakeholders, it is therefore necessary to have diplomatic skills.
- The principal as social worker - Many see a social worker's job as helping children who come from troubled homes. Seen in a broader context, the role of a principal as social worker also involves cooperation with foster families and other community groups in order to support students. It is also necessary to create a safe and comfortable environment in which students can grow academically and emotionally.
- The principal as mentor - The principal needs to share professional knowledge with teachers, communicate, without prejudice, yet focus on the goal and when needed advocate for employees. It is essential that the principal encourages teachers to identify and try new things that may be beneficial to students. This is important because then teachers feel no fear of failure, as they know that they have the principal's full support. Mentoring is particularly important in the process of implementing changes, especially as they are able to see the big picture. They are aware of the culture of the school and the issues facing teachers, particularly those related to reforms.
- The principal as PR director - Principals are spending more and more time working in public relations in order to ensure commitment from the parents and the community alike. It is necessary to inform stakeholders about the achievements and problems of the school. If you keep problems to yourselves, no one will know about the success of the school.
- The principal as coach - It is not enough to be a mentor to an individual, it is important to let them know that they are a part of a team that has a common goal. For the team to be effective. the principal needs to monitor the performances of the team thereby ensuring that the teams will at all times give their best.
- The principal as cheerleader - It goes without saying that employees should at any time know they have the support of principals as that promotes an effective work environment.

In order to fulfill all these roles, the key prerequisite is that principals delegate and believe in their subordinates. Not only is the principal relieved after delegation, but employees are also much more committed when performing their tasks as they are assigned certain powers as well.

V CONCLUSION

Finally, it may be concluded that in modern conditions, not only are the principals required to possess managerial and leadership skills, but they also need to know when and in what ratio to implement them. For this they need high emotional intelligence, which unlike IQ can be improved with learning and trainings. They know that no teacher is the smartest or most experienced. Therefore, they must be aware of the strength of the staff and organize them in accordance with their abilities so as to achieve goals.

It is necessary to share their authority and give teachers an opportunity to participate in making major decisions. In addition, employees must feel support when working in teams. In order for teams to be effective, they need the specified purpose, measurable objectives, the creation of norms and rules, assigning tasks and monitoring by the principal.

The principal must at all times be confident that the subordinates have a clear vision of the school as an institution. To ensure commitment to the vision, it is essential to have standards that will lead to achievement of goals. Provided that all stated requirements are met, the school will most certainly be an organized system with the principal as an effective leader at the helm.

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THE DIFFERENCES BETWEEN THE ATTITUDES AND KNOWLEDGE OF THE BOLOGNA PROCESS AND STUDENT OF ALTERNATIVE PROGRAMS IN ACADEMIA

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Abstract — The creation of the European Higher Education Area is a new specific challenge for higher education in Europe, one that depends on improving faculty development and training across Europe. The integration of Serbia and other European countries in the European Higher Education in general is subject to these challenges. To be performing the necessary changes in faculty development and the process of implementing alternative programs, university managers and policy makers need to design training plans, as well as attitudes and knowledge needs of teachers. The aim of this research was to understand the attitude of the faculty and knowledge of the changes in higher education.

I. INTRODUCTION

Higher education institutions, in some public universities are facing many constraints and challenges, including shortcomings and weak development of resources, poor management, lack of autonomy, no culture of quality, and the like.

It is necessary first to define the term "quality". The term "quality" refers to an institution's overall approach to quality assurance, which is similar to the term "quality management system" or "quality system" [1]

In the context of quality-driven scenario, changed academic universities are faced with the following causes for testing and affect their ability to implement quality assurance practices:

- Low quality of enrolled students;
- Transition from vocational programs in academic program;
- Effective implementation of the semester system
- Higher expectations and training of students;
- Recruitment and retention of quality faculty;
- Lack of staff / teacher orientation towards processes;
- Increased demand for research / output at institutional and individual levels;
- The traditional bureaucratic management faculty;
- Public funding of universities associated with their academic performances
- The growing need for accountability.

Concept of quality assurance is relatively new in the education system.

Quality assurance program consists of three main components:

- Develop criteria and standards for various quality parameters of higher education
- Development Process II capacity building to ensure the implementation of these criteria;
- Development of a system for regular internal and external monitoring of higher education institutions in terms of the status of quality criteria and quality control process.

II. EDUCATION FOR SUSTAINABLE DEVELOPMENT PROCESS

The defining quality of higher education, competencies achieved by graduates who can interpret as essential criteria. There are two political process in the education business, among other things, the development of competence: [2]

- The Bologna Process in European Higher Education

- The global process of the United Nations (UN) Decade (2005-2014) for education for sustainable development (ESD).

It is possible and mutual influence and synergies between these processes can bring new insights into the development of the concept of quality assurance in the Bologna process.

During the Bologna Process since 2005 to this day study programs, including curricula of teacher education have been developed in accordance with the two-layer system - European Credit Transfer and Accumulation System credits (ECTS) and modularization. The purpose of this study is to contribute to the development of teacher education; profiling measures comparing teaching, the plan covers the initial teacher education. The aim was to analyze and compare studies in science education as part of the education program with classes through the development of sufficiently universal target structure. The written curriculum underwent a content analysis based disciplinary panel, which covers the main elements of the curriculum and the content of theoretical studies in scientific education. The differences and similarities between the attitudes and knowledge of teachers and the application of knowledge of the principles of the Bologna Declaration, as well as by exchanging student's alternative programs.

Its aim is to modernize European higher education, to encourage the development of high quality, internationally competitive systems and support the mobility of students and the workforce. The Bologna process involves creating a European Higher Education Area within which national systems of higher education to become more transparent and transferable.

III. University of attitudes and training should respond to new challenges European higher education

The main objective of the Bologna Process is to create a "European space" for higher education that allows comparability, compatibility, connectivity between existing systems of higher education in Europe. There was aimed to analyze the different types of motivation and methods of maintaining motivation during the learning process for students and for teachers, in terms of the characteristics of the Bologna process, which is the central concept of "student-professor in the educational process."[3]

The paper analyzes the results and identifies shortcomings among the requirements of the Bologna process and the current social norms. These deficiencies can lead to the weakening and ultimate loss of motivation of the actors involved - students and professors.

Results indicate that the level of ignorance regarding changes in European higher education, as well as the feeling of resistance by many teachers. While many members of the faculty knowledge of process changes and adaptability that are important qualities, the faculty responses indicate a clear need for leadership, if they are going to be integrated into new models of learning and an adequate strategy for supremacy in their work in the field of higher education.

Results influence the quality and ultimately the sustainable development of higher education.

A. The roles of teachers and students in the process of change

One of the keys to the success of the EHEA adoption and answer teachers in new teaching processes. As part of the knowledge society roles of teachers and students are in the process of change.[4]

Teachers must be able to acquire the following skills:

- Mastering processes that create and use knowledge;
- The ability to incorporate new technology into learning;
- The ability to pour interest, motivation and satisfaction in learning;
- Ability to learn and to communicate with others;
- The ability to stimulate curiosity, creativity of students and analysis;
- Attitudes to stimulate communication and group work;
- Imagination to identify various opportunities for learning
- Moral identity.

Through a European university program - Bologna process, students need to come in and be autonomous students and the need to develop the following skills:[5]

- to learn how to learn;
- learn to work together as an effective way to acquire new knowledge;
- learn to communicate knowledge and opinions
- learn to manage their own emotions in order to achieve the fluids are at communication;

- to learn to analyze the arguments, information and evidence that will allow them to judgment and make decisions accordingly;
- to learn to be self-motivated, so that students can establish and manage their own opinions.

IV. Process in serbia

A. *How, where and to whom to?*

Implementation of the Bologna Declaration was officially started in Serbia 2005th year.

On the one hand we have the faculties that have managed to achieve the primary goal is to shorten the time to study and improve the passage of one year of study to the next.

On the other side are the faculties, which it cannot succeed, and this sharp division into a very successful and completely unsuccessful further toned fact that the 2005th year when it began implementation of Bologna, none of the fall has not been without student protests.

Incomplete information and show that any other students manage to collect 48 points (ECTS) and the statutory minimum for such a condition. Blame for this bad results probably bear all - higher education institutions, as well as professors themselves. In addition, there are voices that say that he is guilty secondary system. He recently completed analysis of the transience of the faculties in Serbia, but it is very difficult to get information for all the colleges, because it turned out that the results of many painful topics that do not want to talk. Colleges do not want to provide information about transience. Some marched law, and some do not.

“I do not think we will be better until we all realize that Bologna should be the same for all.”

The program was revised up, but some things it is impossible to simplify. Students missing work habits, making them difficult to adopt particular matter. Students on the other hand accuse professors to Bologna interpreted arbitrarily.

B. *The Bologna Declaration*

The Bologna Declaration is a key document that marks a turning point in the development of European higher education and is a free take on the obligations of each signatory country to reforming their own systems of higher education in order to create a general convergence at European level [6]

With this declaration, it was agreed his achievement coordination of higher education policy of the signatory countries Declaration terms of meeting the six basic principles during the first ten years, which are contained in the following: [7]

- Education system easily understandable and comparable academic degree with a final separation of the Diploma Supplement, in order to encourage the employment of citizens and the competitiveness of European higher education;
- The introduction of the basic system of study based on two cycles:
  - Undergraduate and
  - Postgraduate studies
- Establishing a system of so called achieved points or credit system (ETCS), as a means of encouraging student mobility
- Encouraging mobility - obstacles to the mobility of students and teaching staff to be overcome in terms of improving the possibilities of studying and education, as well as adequate support for teaching staff, researchers and administration through the recognition of their work in Europe as a whole without violating their actual status and rights;
- Promotion of European cooperation in quality assurance in developing comparable criteria and methods;
- Enhancing the European dimension of higher education; European facilities should be represented in particular in the development of curricula in higher education cooperation in mobility programs and integrated educational and research programs

According to the defined objectives of the research, we wanted to determine the extent to which students know the principles of the Bologna Declaration and the reform of the education system. It is easy to argue that reforms are implemented technically, but only assist this process and "listening" to students, we can get to the real results of satisfactory implementation of the Bologna process, as well as other positions.

Based on research 2011th year of the attitudes and opinions of students, selected survey research process, namely used a questionnaire to students.

The aim of this survey was 3 years ago and to this day is the comparability of the answers to the questions based on "Knowing the principles of the Bologna Declaration?"

The survey was conducted during the winter semester (from 24 October to 25 November 2011) to all students from 1 to 3 years and in all directions at a technical high school of professional studies in Kragujevac.

In the survey were asked nine questions, of which one question is related to the system of knowledge of the principles of the Bologna Declaration.

Like this, the students responded 2011.

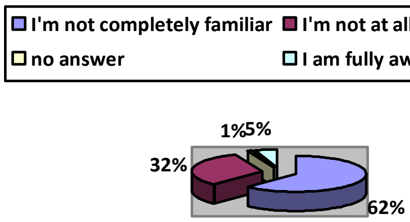

Figure 1. Knowledge of the principles of the Bologna Declaration in 2011

Next poll, which was conducted a survey conducted this year in the summer term (from 24 March to 24 April 2014) was conducted on all students from 1st to 3rd year and in all directions at high Technical School in Kragujevac.

Also in the survey was asked nine questions, including one question related to system knowledge of the principles of the Bologna Declaration.

Here is how the students responded after three years in the same directions at the same university on the knowledge system of the Bologna Declaration

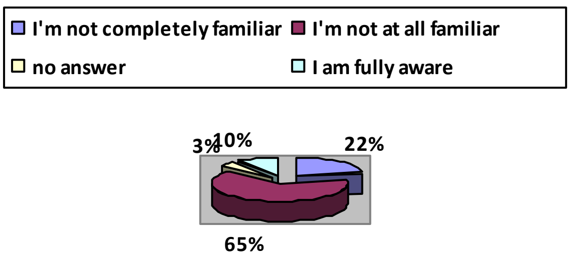

Figure 2. Knowledge of the principles of the Bologna Declaration in 2014

In accordance with the results of research based on one of the available survey questions on highly technical school of professional studies comparative analysis came to the conclusion that students are either "generally familiar" with the Bologna process, or "not fully aware" of the Bologna process. In addition to the three years since the last survey changed nothing, except that it has increased the percentage of students who "are not at all familiar" with the principles of the Bologna Declaration.

About it, I came up with the idea to conduct the survey at the University of Kragujevac and a large population of students and the high academic studies.

C. Results of the implementation of the Bologna Process at the University of Kragujevac

A survey on the implementation of the Bologna process was carried out at five colleges and the University of Kragujevac (Faculty of Economics, Faculty of Engineering Sciences, Faculty of Science, Faculty of Law and Faculty of Medicine), and we evaluated the students in 1150, the second year of study.

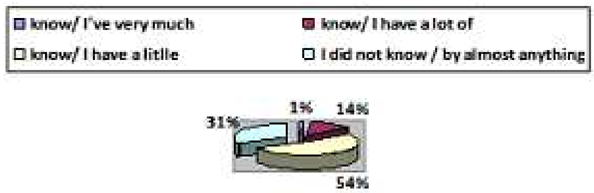

Figure 3. The level of familiarity with the setting of the Bologna Process typos

The results shown in Figure 3 shows that the majority of students surveyed second year at the University of Kragujevac, 85% of them in enrollment in the study was poorly informed about the Bologna Process "knew little" and "I knew almost nothing." Less than 15% of the students were familiar with the Bologna process.

In Table 1, it can be seen from what sources the 2nd year students informed of the Bologna process. The results show that student as the source of his information about the Bologna process most frequently cited informal discussions with colleagues, family, public media. A large portion of the students reported that the information on the Bologna process learned in Student Services or through the web page of the Faculty. With the offered sources of information, under something else, the students usually respond to information about the Bologna process gets into a conversation with teachers in the classroom, through the faculty, in a brochure or your own experience.

Table 1. Means of information on the Bologna Process

The way information on the Bologna Process	percentage
Professional counseling in schools	3,14%
Visit Employment Service	1,02%
At the university parades id anima faculty	13,59%
On the web site of the University and the Ministry of Science, Education and Sports	23,20%
The Student Services faculty in the college website	41,31%
Over Ad student organizations and cooperatives	10,17%
Through public media	63,59%
In informal conversations with friends, colleagues more years of study, family members, acquaintances who are experts in education	70,61%
something else	7,21

Figure 1 shows the percentage of responses to the question whether the Bologna process improved the quality of the study, as the figure shows the largest number of students considered that the changes caused by the Bologna process led to poor quality studies, and 31.61% of the students think that they yet the changes have led to partial improvement of conditions of study.

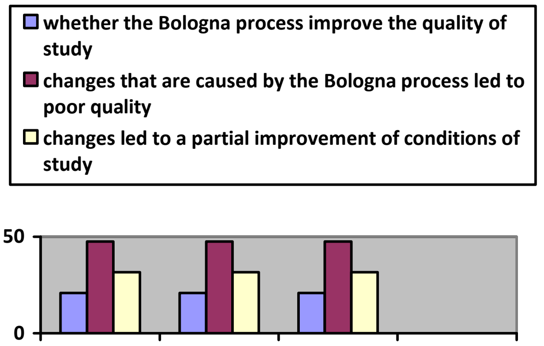

Figure 1: Level of quality improvement study due to the Bologna process

Table 2 shows what the other students think that the positive changes in the quality of the study due to the Bologna process. As Strongest marked change of tested students preparing for the exam easier to cite the introduction of one of courses, and the introduction of continuous monitoring of progress in learning. In the category of something, other students usually state that there is no positive change in the quality of the study, it is easier to complete the study, but it was better before classes. It also noted some positive changes, such as mobility, higher exam results, passing the exam does not depend on time, but the knowledge of students, exam registration via the Internet and the like.

Table 2. Positive changes in quality study

Positive changes in quality study	percentage
The innovative study program	13,59%
The ability to satisfy personal interests	30,50%
Better information on the objectives, contents and obligations under the various courses	13,03%
Wide use of modern approaches to teaching	27,45%
The increased availability of teachers outside the classroom and better communication with students	15,90%
The increased availability of different sources for learning and exam preparation	11,65%
Easier preparing for the exam introduction of one courses	40,76%
The introduction of continuous monitoring of progress in learning	35,49%
Efficient organization of teaching and examination periods	7,39%
The introduction of student evaluation of teaching and use the results to plan improvements	10,91%
something else	8,60%

Table 3 shows the students' opinions about the expected positive effects of the Bologna process. The highest percentage of respondents sophomores believes that the Bologna process to enable easier recognition of our diplomas abroad to continue their studies or employment (44.55%). Other consequences of the Bologna process, which are specified in the student category are something else that students will complete their studies with less knowledge, to extend these studies to reduce the number university level educated person. Also given are the positive effects of the Bologna process as an example of a short period of study and meet the demands of the labor market.

Table 3. The consequences of the Bologna Process

The consequences of the Bologna Process	percentage
Increasing the availability of study for all who want it on the basis of their ability	7,58%
Increasing efficiency study	26,99
Facilitating employment after graduation	6,47%
Better preparedness of graduates to engage in business	6,38%
	30,50%

Facilitating student exchanges with foreign universities	
Facilitating the recognition of our diplomas abroad to continue their studies or employment	44,55%
something else	7,21

Table 4 lists the most common student answers the question "What are your expectations of relating to the Bologna process and the general improvement of the quality of study is not currently filled?"

Table 4. Most often, these expectations related to the Bologna Process, which have not been fulfilled

The cause of failure to meet the expectations of the Bologna process
Poor and speeding the implementation of the Bologna Process
Lack of motivation, lack of interest, and poor awareness of teachers and assistants, the faculty
Lack of financial resources (lack of adequate space for study, teachers and assistants)
Poor organization of the Bologna Process
Too many students and too few classrooms, the teacher - there are no conditions for teaching
Lack of communication with students
The unwillingness of the system to change
Big difference between college-no mobility
Too many students in directions
Slow running in the Bologna Process I, too fast introduction of Bologna
No adaptation of professors and faculty Bologna Process
lack of creativity
Preparedness curricula to the Bologna Process

In Table 5 are the most common causes of failure to meet the expectations of a student who had linked to the Bologna process.

Table 5. The cause of failure to meet the expectations of the Bologna process

The most frequently mentioned expectations of the Bologna process, which had not been met
Too little field and practice
Poor organization exams (overlapping terms)
Choice of electives (too few, weak selection, the inability enrollment courses from other faculties)
Excessive load of students (tasks, colloquium, programs)
Lack of student mobility (among universities in Serbia, international mobility)
ECTS credits are not aligned with the weight of the Faculty
Poor communication professor-student (openness)
Unavailability of different sources for learning
Lack of teaching assistants and professors, too many students
Poor working conditions (too small classrooms, too small cabinets, etc)
Exams continue to have the greatest weight and contribute most to the oceans regardless of essays, project work, colloquiums, etc.
There is no work in small groups
Indefinite conditions for enrollment in the following year
No mentoring
The Bologna process is not implemented equally in all faculties
Too small exam results and more years
Study programs are not aligned with the Bologna process
Students do not learn for the sake of knowledge but for points
Insufficient field and practical training
Poor organization of exams (overlapping terms)

Table 6 shows the comments, suggestions and questions students interviewed in connection with the application of the Bologna process.

Table 6. Suggestions, comments and questions

Suggestions, comments and questions
Better organize the exercises, more laboratory exercises and practical work
More frequent use of modern methods in teaching
Introduce monitoring of the implementation of the Bologna Process
Why not has a module of a foreign language and literature us in a foreign language?
First it is legally implement the Bologna process, and then practically, because now we have a quasi-Bologna process.
You should accurately determine the rules of study because it is not right that anyone Bologna adapt themselves to studying shorter and much less know
Tight schedule laying exams and exams
Reduce teaching groups, too many students enrolled per year
The Bologna process is too hard implemented, teachers are not trained in the Bologna Process
Teachers are not sufficiently informed about the Bologna process, the management faculty is poorly informed about the implementation of the Bologna process
Students should receive timely information
Terms of study should be matched to all colleges
Prescribe literature on Log In Resend confirmation
What are the academic titles when we finish university?
First it is legally implement the Bologna process, and then practically, because now we have a quasi-Bologna process.

V. CONCLUSION

The European Union is going through a sound system reform of higher education, as well as the adoption of the paradigm of lifelong learning. The establishment of the credit system as a basis for university academic measure means a common European academic unit that will simultaneously provide uniformity and homologation European university programs. These programs are no longer to be taught traditionally and in a way where the student plays the content teachers and tested through examinations. The system is allowed to introduce new tools to investigate the ability of students with the skills and values.

In our sample, it was observed that the process changes have not borne fruit and are not successful in the interpretation and implementation of the information. As mentioned in the interviews, most respondents said that a lack of information in the process and its implementation and formulation stages. Anyway, it turned out that the Bologna process is properly applied.

The results showed that the aim of the Bologna process in terms of student and teaching staff mobility is implemented (minimal request). While there are many foreign universities that are successful in implementing this goal, however, our universities have not yet been able to implement an appropriate target.

Process is not yet complete; it should be evaluated once, when the process is completed to compare the results. The study consists of a university. The sample can be increased by including other universities that have occurred in the Bologna process.

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THE PROCESS OF RECRUITMENT FOR MANAGEMENT AND ENGINEERING PROFESSION: COMPARATIVE ANALYSIS

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Abstract - The paper presents the comparative analysis of the empirical research results about the processes of recruitment for the management and engineering profession in Serbian society. The following aspects of the recruitment process have been examined: social origin, and motives for management and engineering studies. Furthermore, the authors have analysed students' plans for the future. The sample of the survey represented 255 management students on their final years at 4 universities and 200 engineering students on their final years at three universities. Data were collected using the survey method and their processing was conducted using the statistical method.

I. INTRODUCTION

Recruiting for profession implies a social context, which deals with selecting individuals according to professions. In the first place this relates to processes of selection which act on the level of the global society, in a way that individuals of different positions in a social structure are more preferred or are more `pushed `or, on the other hand, they are stopped from going into certain professions [1].

Recruiting for profession is a very complex process influenced by a whole set of social circumstances:

First, recruiting for profession is determined by educational systems in some global societies. Types of educational systems differ according to the degree of institutional equality or equal possibilities for all children for education and social mobility through the educational system. According to this, the degree of educational system`s openness (which is a product of historical development) presents a basic element of social context in which processes for recruiting for certain professions are being performed.

The second element that affects recruiting for profession is not related to the educational system`s type, but to the existing social stratification. Regardless of the openness of the educational system and it being equal to all children (free education, for example), researches show that the existing stratification, despite its great social mobility, always maintains.

The third element that affects recruiting for profession includes prestige and status of certain professions in the society. The social position of the profession, which is determined by material awards that professionals get in their work, the amount of power they possess and the reputation they have directly influence the young people when choosing their future life calls.

Over the last decade, there is a constant growth of the faculties and studies of management in Serbia, as well as the growth of the interest among young people for such studies. On the other hand, young people's interest in engineering studies, i.e. engineering profession considerably declines in Serbia. The statistical data of this growth and decline have motivated authors to research empirically the features of recruitment process for managers and engineers in contemporary Serbian society.

II. METHODOLOGICAL FRAME OF RESEARCH

The objective of this research was to examine the features of recruitment process for managers and engineers in contemporary Serbian society. The following tasks have resulted from such an objective:

- the analysis of the statistical data concerning the growth of the number of faculties and study programs of management and the growth of the interest among young people for this profession
- the analysis of statistical data which points to the decreasing trend of young people's interest in engineering university studies
- the analysis of the social background of the students recruited for managerial and engineering profession

- examining the motives of the students for choosing managerial and engineering profession.

Data for this research have been collected by analyzing statistical series concerning the number of the faculties of management and study programs and the number of the enrolled students in the period from the foundation of the first faculty of management (1994) until today. In addition, statistical series concerning the number of the engineering faculties and study programs and the number of the enrolled students have been analysed. A poll was conducted with a standardized questionnaire. The sample of the survey represented 255 management students on their final years at 4 universities and 200 engineering students on their final years at three universities. The received data were processed by the following statistical methods: Chi-squared test, T-test and the variable analysis. Chi-squared test was used for analyzing nominal data; T-test was used for testing statistical significances of the arithmetic means between two groups of respondents, while variable analysis was used to test the significance of a large number of differences between arithmetic means.

Finally, the received results were compared to the results of similar research conducted in the region and abroad.

III. Research results and discussion: Indicators of recruitment process for managerial and engineering profession in contemporary Serbian society

A. Young people's interest in management and engineering studies in the period of transition

The first faculties of management in Serbia were founded in 1994. During the school year 1994/95, only 562 students were enrolled to the first faculties of management, which was a small percentage of the total student population in Serbia (0, 4%). In only 12 years since the first faculties of management, higher education institutions and study programs appeared in Serbia, the number of faculties and higher education institutions of management has risen dramatically. In school year 2006/07 there were 52 faculties of management and higher education institutions with 34715 students that was 14.5% of the total student population of the country. [2]

The first graduate students of management, 265 of them, appeared in 1997. With more faculties of management, higher education institutions and study programs, there was the growth of the number of graduate students of management, and so in the next 10 years, that number became 25 times larger and in 2007, there were 6789 graduate students of management.

Young people's interest in engineering studies, i.e. engineering profession is presently considerably lower as comparison with the period of socialism. In the academic year 1987/88, the number of 95.423 students studied at 83 engineering universities in SFRY, which represented 43,4% of the overall student population in the country. Over the past ten years the number of students in Serbia has continued to grow and in the academic year 1997/98, 142 universities and colleges counted the total of 182.209 students, whereas by the academic year 2006/07, the number of students increased to 238.710 at the total of 272 universities/colleges, which means that the number of university/college students in the last decade has increased by 31%. [2]

However, the number of students at engineering universities in the observed period grew more slowly. To be more precise, in the same period the number of engineering students increased only by 339 students, which represents an increase by 1,2%. The share of engineering students in the overall student population also dropped. In the academic year 1997/98 the share amounted to 16% which corresponded to the share from the academic year 1938/39 in the Kingdom of Yugoslavia, whereas in the academic year 2006/07 it amounted to only 12,4%. At the same time, the number of engineering universities increased by 10 (in the academic year 1997/98 there were 25 engineering universities and in the academic year 2006/07 there were 35 of them in Serbia) [2].

It is interesting that similar findings emerged from the survey about young people's interest in engineering studies in Greece. This study [3] has shown that young people's interest in engineering studies had been considerably higher in the 1970s than it was at the end of the 1980s, i.e. after Greece had joined the European Union.

B. The social background of the students recruited for managerial and engineering profession

The research results show that in the transitional society young people from all social layers are recruited into managerial profession. Fathers of 24.4% of students are businessmen, and there is the same number of daughters and sons of workers, fathers of 18.5% of the students have finished high schools, while 12.6% comes from the families with high education; 8.7% are children of managers, and the least percentage of them, 2.8% comes from the agricultural families. This information shows that managerial profession is perceived as a channel of social mobility.

The research has shown a heterogeneous social background of the future engineers. The fathers of 35% of the respondents are experts with faculties or colleges, 24% of them have fathers who work as experts with secondary schools, while fathers of 29.5% of the respondents are workers. However, the educational levels of the parents differ at different groups of students regarding the types of engineering profession that they are studying. The most high-educated fathers have electrical engineering students (46.4%), while civil-engineering students are mostly children of the workers (28.8%). However, it is noticeable that technical and engineering students come from relatively lower social classes.

Similar results were received in several other studies conducted in the 1960s in some western countries. According to one study, a significant percent of undergraduate engineers in Great Britain come from the middle and the working classes: 36% of the questioned students have fathers who are experts (white colour) and 22% have workers (blue colour) [4]. Several studies regarding engineering students in America also show a significant degree of recruiting from middle and working classes: 44% of the fathers of engineering students on North Western University are experts [5], while 50% of engineering students at the University of California come from a working class [6].

C. The motives of the students for choosing managerial and engineering profession

Besides the fact that young people who have chosen faculties of management are characterized by heterogeneous social background, they are also characterized by different motives for the choice of their studies. A large percent (85.4%) of the management students that have been questioned have been motivated by internal values such as: \`interests for manager work\`, \`I believe I have a talent to organize and manage other people\`, \`managerial profession offers possibilities for creativity and creation\`, \`I think that manager job is dynamic and suitable for my personality\`, and \`the possibility to be useful to the society\`. The external values such as \`the possibility to go abroad\`, \`money\`, \`safety\`, and \`prestige\` motivated 14.6% of the students.

Although the majority of the students said they were motivated by internal values while choosing a faculty, we have received different results to the question \`What do you expect from managerial profession\`. Generally speaking, internal values such as a wish to improve the business success of the company (12%), expectations to do innovative and inventive work (11%), expectations to be able to contribute to the country's development (5.7%) and expectations to determine company's future (4.9%) can be found in the answers of 33.6% of the students. On the other side, external values such as expectations of good salaries (6.1%) and social prestige (6.1%) can be found in 62.4% of the students. A characteristic feature is that nobody mentioned making a successful private business using his own managerial knowledge.

Engineering students are also characterized by different motives for the choice of this profession. Even with students at engineering faculties it was shown that a larger number of the respondents (74.5%) were motivated by inner values like \`the interest for the area of technical science that I am studying\`, \`Engineering profession offers possibilities for creativity\`, \` Engineering work is a combination of theoretical and practical knowledge\` and \` The possibility to be of use to the society\`. Outer motivation like the possibility to go abroad, money, security were aroused by a smaller number of engineering students (20%).The answers of the whole student population in question organized according to different engineering faculties gave the following results. Inner values motivated electrotechnical students most (74.8%), then machine-engineering students (66.6%), and finally, construction-engineering students (63.4). In addition, vice versa, outer motivation was most common with construction engineering students (31.7%), and then with machine engineering students (22.7%), and finally with electrotechnical students (20.7%).

When we have asked technical engineering students \`What are your expectations of engineering profession?\` we have gained the results that are similar to the ones of the management students. The students expect from the engineering profession first to get jobs and to have appropriate incomes (39%), but also to have the opportunity to do inventive and innovative work (20%). It is interesting that only 4% of the students said that they expect to enter into the managerial teams. More than a half of the construction-engineering students expect great income and more than a third of them the opportunity to start their own businesses. A good income is a dominant motive with the machine engineering students, but in a smaller degree than with the previously mentioned students (40%), followed by inventive and innovative work (20%), and the third place (18%) occupies the possibility to contribute to the country\`s development with the engineering knowledge and to start their own businesses.

Electrotechnical students less than the other ones (38%) expect great income, but more than the other two groups of the students expect the possibility for inventive and innovative work.

Researches on this subject conducted in other countries have also shown similar results. In the study on students` motivation for the choice of the engineering profession in 11 American universities, 38% of the students have chosen this profession because in this way they are ` given the chance to earn a lot of money`, 52% emphasized ` the opportunity to be creative and original`, 28% have chosen ` the possibility to be of use to other people` [7]. The other study on American students (135 colleges and universities) who have chosen engineering for their profession, has shown that 25% of them have mentioned `money` as the factor, 26% `the possibility to be original`, and 7% mentioned `people` as the reason [8]. In Great Britain the similar study has shown the following: 32% of the students have chosen engineering because of the `money and great opportunities`, 19% said that it is the `opportunity to be creative`, 13% said that their reason is the fact that engineering profession is a `combination of theory and practice` [9]. The research on working students at two London Polytechnic colleges has shown the following: 36% of them expect `better paid jobs` from engineering profession, 10% ` safer jobs`, 16% `interesting jobs`, and 9% a job with a higher social status [10].

IV. CONCLUSION

Research results about recruitment processes for managerial and engineering profession show several important facts.

Considering recruitment, there is a drastic growth of interest for management studies among young people. Statistical data show that, since the foundation of the first faculties of management almost two decades ago, there has been an explosion of interest among the students for the faculties of management, which led to the foundation of more faculties for this profile.

In the society of transition, young people from all social layers are recruited into managerial profession, which confirms the thesis about managerial profession as an important channel of social mobility. Besides the fact that young people who have chosen faculties of management are characterized by heterogeneous social background, they are also characterized by different motives for these studies. Although, while choosing the faculty, students were mostly led by their internal values, we cannot say that external motives were not present. Heterogeneous social background of management students and different motives for the choice of their profession present aggravating circumstances for the socialization process, and therefore require more work of their professors in the area of socialization for the profession, especially regarding homogenizing this future professional group.

When talking about engineering profession we can conclude that the heterogeneity of social classes among engineers largely contributes to high dropout rates of the profession due to a less social solidarity. The diversity of motives that encourage students to enter the engineering field creates difficulties for the profession in two ways.

First, the existence of different values that relate to the engineering work reduces the sense of solidarity among the engineers.

Secondly, putting values such as money, prestige and safety at the first place presents problems for this profession.

Outer motivation is in contradiction to the inner values such as the possibility to be creative and to connect theory and practice. Inner values are more connected to the commitment to the profession than outer ones. Social heterogeneous recruiting of the engineers with different values according to which the profession is chosen presents even more serious demand for professional socialization during and after the period of formal education, than the social homogeneous background [9].

The characteristics of the recruitment for both managerial and engineering profession such as heterogeneous social background and different motives and work values for choosing this profession can in the future interfere with processes within professional cohesion among members of a profession and slow down the processes of professionalization. In other words, research has shown that more heterogeneous social background of the young people entering a certain profession leads to the intention of leaving the profession. Homogenous social background involves cohesion among profession members and this reduces the possibility of losing members of a certain profession [11].

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IMPORTANCE OF INFORMATION SYSTEMS IN DECISION-MAKING

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Abstract - The paper defines the concept and importance of information systems in terms of decision-making. Most companies see information systems as an area of strategic importance. Information systems are relationship between control and executive function and when they were formed, they made available to the controller subsystem. Information systems have archive to process and transform data into information or knowledge.

I. INTRODUCTION

Information systems in logistic are presenting area of strategic importance. Information systems are relation between managerial and executive functions. They have purpose to process and transform data into information or knowledge. Uses of information technology in business systems are for supporting in business processes and activity of organization, decision-making and strategic in realization of competitive advantages.

All process are starting and finishing with decision. In operating system, when needs to make a decision, there are continued process of collecting, storing, processing and sending data. Process of decision is including identifying problems, selecting a solution, solution design, preparation, and decision itself.

System is a set of related elements that are clearly separate entities with certain behavior, which is subordinated to the functioning of each element of mutual interest. Important features of the system are: a set of elements, relation between the elements and interactions with the environment, the arrangement of elements in the structure, arrangement, organization with a clear role in contributing to the goals of the elements of the whole, attributes as properties of elements, structure, and functioning of the system as a whole, the characteristics of the system as a whole (static and dynamic), aside from the whole environment, the function (function rules, law) behavior - a series of conditions, processes, input / output target[1].

II. DEFINITION AND FUNCTIONS OF INFORMATION SYSTEMS

Information system is very important in business and it expand big progress because information system include control and executive functions such as information formed the basis of business data available to the control subsystem.

Business system presents any economic entity. Each operating system consists of three subsystems: executive subsystem, commanding subsystem and information subsystem [2].

The information system is a subsystem of the organizational system and is considered one of the components of the infrastructure. The information system can be defined as the arranged collection methods, processes and operations for the collection, storage, processing, transmission, and distribution of data within an organization, including the equipment that will be used for that purpose and the people who are involved in these activities. The information system is a system in which the elements are to each other and the system as a whole with the environment associated information flows [1].

Business information system is primarily used to support decision-making at all levels - operational, tactical and strategic.

III. TYPES OF INFORMATION SYSTEMS

According to the type of services provided: systems for general-purpose computer systems for the storage and retrieval of data, message switching systems, systems for managing physical processes, control systems and warning systems for transaction processing [3].

Historical development of generations of information systems is:

- Non-automated information systems - used resources processing, data carriers, the documents, the processing is not unique, and sometimes it does not always perform the same way, the data are not formatted and highly structured tasks to be solved are often not fully defined, are significantly present oral information flows, which are variable and unstable, many decisions are made based on verbal information and experience or based on incomplete and often outdated information, subjective factors can significantly affect the flow of data and obtaining results, there is duplication of effort in data processing when creating a report, processing is slow, make mistakes and so on.
- Automatic data processing - the use of computers for data collection and for registration data, classify, edit and update data, a variety of computing and summarizing, printing reports. Relate to activities that are not fully understood and well described, whose processing is regulated by the laws and regulations of the organization.

AOP systems consist of specific applications that include some functions or organizational units. Advantages: systematization of collecting and storing data, it introduces a general nomenclature and unique identification system, speeding up the collection and processing of data , increasing the quality of information , reports and systematized way of reporting on individual organizational and managerial levels .

Disadvantages: neglected systematic approach boils down to the design of the program and organization of the data (the goal is not data processing, but also increase the efficiency of decision making based on good and timely information), separate applications - data redundancy.

- Management information systems - the focus on information and its use in decision-making, provide information quickly and in a format that is tailored to the needs of decision-makers, giving statements to make decisions with structured decision problems (intermediate level of decision-making in the organization - problems that can be accurately determined in advance the final solution, which the information is required to obtain it, and the algorithm of solving it), are interrelated subsystems that make up a single unit (subsystems related to vital functions of the real system, is a logical and technological rounded units that are in the implementation can be treated independently).
- Executive information systems - provide analytical information about the current state of the organization and projections of the future, and are intended for high-level management.
- Decision support systems - provide decision support in unstructured and poorly structured problems, depend on external data (which may be unreliable), problem solving is based on knowledge, provide support to all levels of decision making, but also support vertical information flow and integration of information used in a variety of managerial and organizational levels (particularly important for higher levels), facilitate the synthesis of information from individual sub-systems for strategic decision making, the ability of relations between different functions in different organizational units and an understanding of its impact on the organization. It consists of a database, model making and special software to integrate them and allows users to use these models.
- Expert systems - mimic the work of experts, developed by applying artificial intelligence techniques. They describe the knowledge and decision rules experts. Problem: how to obtain the knowledge of experts, how to present knowledge on the computer, as based on the knowledge obtained extract solution of specific practical problems. They consist of knowledge base, inference mechanism, and specialized databases (database of facts) explanation of the mechanism and user interface. Historical development of information systems can be divided into four periods, based on the types of information systems at the time. These are:
- Information systems for data processing (DPS - Data Processing Systems).
- Management information systems (MIS - Management Information Systems).
- Information Systems for Decision Support (DSS-decision support systems).
- Expert Systems (ES - expert systems)[3].

Historical overview of the development of computerized business information systems are presented in Figure 1.

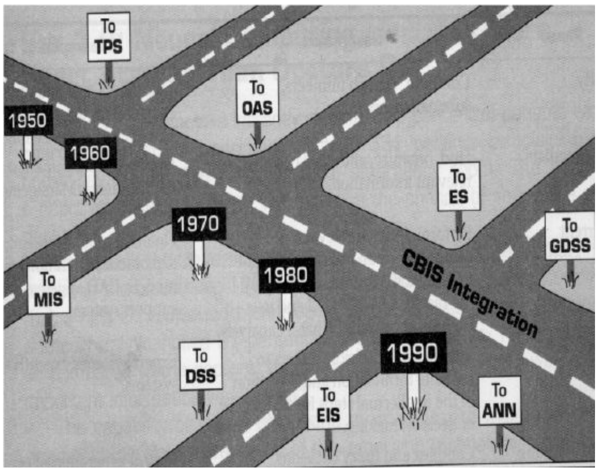

Figure 1: Historical overview of the development of computerized business information systems

IV. Components and activities of information systems

Every information system is a system integrity and harmony among its key components that perform certain activities. Figure 2 is a model of the information system; the systems approach shows a conceptual framework, the most important component and system activity. The system collects, arranges, and includes input data into the treatment process, organize, store and maintain data in the database, and the organized and stored data, derived information to the end users of the system.

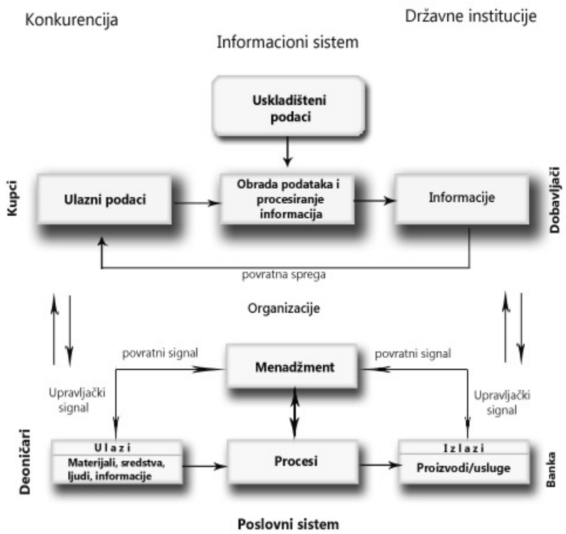

Figure 2: Model of information system

The model also shows the relevant relationships and explains the crucial link between the basic components and activities of the information system. It can be said that there are four key concepts implicit in all kinds of information systems (O'Brien , 1999 P.43):

- People, hardware, software, data and computer network consists of five main groups of resources any information system.
- Human resources include specialists and users of IT (Information Technology), hardware resources include computing devices and media, software resources programs and procedures, resource information database and knowledge and resource network communication media and computer networks.
- Resource data transform processing activities in various information products for different end users, and
- Information processing involves activities: input, processing, output, storage and control.

Login as a resource of knowledge is an activity that the data of a business transaction procedures, preparation and entered into the system. End users of the information system resulting data include, edited and written media such as the original document, or write directly to electromagnetic media computer system. Enter the data is transferred to the machine-readable media, such as magnetic discs , recorded in the database, stored , maintained and used in the treatment process [5].

Data processing in information processing activity: computation, comparison, sorting, summation, classification, and many other operations. Within this activity, the data is read from electromagnetic media, organize, analyze and manipulate with them, to convert the information needed by users . The data in the database, in order of their quality, subject also to continuous maintenance and updating and adding new data, deleting and changing existing ones.

Output of information products in different shapes and different content is an activity that aims to meet the information needs of different user profiles: managers, experts, and technical staff. The most common information product messages, reports, documents, graphics, visualizations, which can be presented to users through a variety of output devices. Users want information products that have appropriate quality. Information that is not so important, are not received on time, are difficult to understand, and the like, are of great value and usability for users. Users want information of higher quality, that is, information products which it features , attributes and quality make it desirable , useful and relevant information to meet user requirements.

Storing data is a key component of the activity of an information system. Data and information constantly remain organized in a certain way, a desirable quality and recorded on electromagnetic media for later use. Data and information in modern information systems organized as a database.

The control system performance is also very important activity information systems. Control input, output, processing and storing of data or information, is provided appropriate feedback on the state, the processes and the quality of these activities. Feedback must be monitored and evaluated by the system from the perspective of established performance standards under continuous alignment to the quality of information products was satisfactory and acceptable to users.

V. THE CONCEPT OF DECISION-MAKING

Decision-making is a key planning activities. This is important because through these activities leads to a number of different decision that direct the organization. The goal of this activity is to create a decision - Intellectual instrument that is the basis of directing the organization and to take all actions to regulate the behavior of the organization [5].

Decision-making is divided into:

- Reactive and proactive decision-making.
- System and intuitive decision-making.
- Individual and group decision making.

In the last decades of the twentieth century, devoted significant attention to the decision-making styles. This is understandable considering that the styles are making a significant impact on the results of the decision process. The most important decision-making styles are:

- First direct style of decision-making.
- The analytical style of decision-making.
- Conceptual style of decision-making.
- Behaviorist style of decision-making.

While the process of making comprising the steps of

- Identify the problem.
- Determining the cause of the problem.
- Preparation of solutions.
- Evaluation of solutions.
- Selection of solution.
- Preparation of implementation of decisions.
- Evaluation of the effectiveness of the decision.

VI. BUSINESS SYSTEM

Business system can be broken down into a number of subsystems and each subsystem continues its subsystems, and so on. This process is called decomposition of the process, and allows us to analyze the functioning of the organization. The advantages of the decomposition are the following:

- Each subsystem has its own goal, which is aligned with the goal of higher-level system, which achieves convergence and coordination of activities through coordinated goals within the system as a whole,
- The system as a whole is more than the simple sum of mean subsystems.
- When it comes to information systems, most of the authors are based on the automatic processing of data and definitions are usually lists the components, activities and characteristics of the information system. Starting from the systemic approach, an information system can be defined as an arranged set of methods, processes and operations for the collection, storage, processing, transmission and distribution of data within an organization, including the equipment that will be used for that purpose and the people who are involved in these activities. Under the automated information, system means a system whose equipment involved and the computer. Of course, in such systems, a process cannot be automated, but still have to be performed manually or with the direct participation of the people [6].

Information system can be seen as a factory for the production of information. In this factory, the people engaged in routine and creative part of the work, analysis and definition of problems and making decisions. We use scientific methods and procedures to investigate, describe and solve tasks and the computer as a tool for the implementation of solutions. Computers are usually used to solve quickly and accurately tasks that can be formalized and described that can be given to algorithms solutions.

VII. INFORMATION SYSTEMS IN BUSINESS SYSTEM

Information system allows the selection of the optimal solutions in decision-making and reduces the risk and uncertainty in joining the international exchange and division of labor by detecting the legality of international and national markets and the business environment. In order for a business system to define your goals and direct their activities to achieve them, it is necessary to have a system of information, which provides the necessary inputs for the normal functioning of the business. The harmonization of market conditions with the capabilities and skills of the business system is a primary requirement for planning objectives, policies and strategies as well as the development of appropriate plans and programs of the business system [6].

The information system provides not only the information for the planning , execution and control, but also performs a variety of other creative and technical tasks that are performed in the classical system of organizational functions of planning and control and thus introduce significant changes in the organizational structure and management system.

VIII. CONCLUSION

Today, it is imperative that organizations, whether they large or small, possess and build information systems based on computer and telecommunications to support decision-making, whether it be on its strategic and operational level. What is the job of management based on continuous decision-making; these systems are a tool in their hands to guide the organization towards achieving the goals. The degree of development of hardware, software and human resources of such systems, and of their quality in the collection, processing, storage and use of data and information depends on the success of business.

Since all information systems used today in all spheres of society, the most important information systems are used for production management in enterprises. The importance of the information system corresponding to the importance of material production is at the present stage of development of human society. We have witnessed an intensive development of information technology. The fastest growth was recorded in the industry of microcomputers and software development. It has contributed significantly to the parallel development of new technologies and industry orientation to the use of computers in their business. Today information is through science, innovation, technology transfer, "know how" and "show how" very important component of economic development. The use of information technology significantly reduces production costs, increase competitiveness and profitability of the company of course.

For savings in energy and raw materials can be said to be relatively small compared to the savings that can be achieved in the field of management , control, records, accounting, purchasing, sales, marketing and other operations . In addition to the computerization of the production process, more information is itself used as a commodity. It should be noted that it is not so much talking about the new information, but a radical improvement of the way in which information is distributed to end users. This is a pre-selected information, whose message has significant practical value, while the time required for access to this information is very little.

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INFORMATION QUALITY IN BUSINESS LOGISTIC SYSTEMS

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Abstract - The fact is that the quality of information in business logistic systems is based mainly on timely, accurate and reliable information on logistic processes, activities and systems. In order to achieve efficient quality management, it is necessary to manage one unique system that will encompass all identifications, gathering, processing, distribution and presentation of relevant information and data.

I. INTRODUCTION

The quality of information provides a significant advantage to the enterprises and companies, which base their business on fast informing and high quality and precise information. The right information, in the right time and in the right place provides the opportunity to react timely and adequately to strict market demands, not only in production, but also in commerce.

II. THE QUALITY OF INFORMATION

Three influential markings of information quality are:

- Providing timely information, which is, holding the right information that is based on making a proper decision.
- Information accuracy, or in other words, the greatest precision possible when it comes to information.
- Effective communication of the information, or the efficacy of mediums available to announce the information.

The main problem that managers face is acquiring the right information needed to make a decision. Three main reasons for that are:

- Logistics managers do not always have the information needed to make efficient decisions. One of the main advantages that a company can possess in the process of making decisions is information. Managers do not know how to or will not determine which information is needed. Many of them simply do not appreciate the vast benefit gained from a correct evaluation of their need of information and the evaluation of sources from which these pieces of information could be attained. The first step in developing an information system, which should be created in order to help the management in making decisions, is establishing a connection between the management's need for information, and the sources of the information. However, there are still many companies, which have not determined their need for information, which, as a result, brings them to making inadequate decisions [1].
- The staff in charge of collecting information gives the logistics manager the things they believe are necessary, or the things they believe are suitable or more profitable. Nevertheless, the information system does not provide the manager with the needed information either. This is contrary to what a manager of logistics really needs. Such system should be able to provide the most suitable and necessary information for some non-logistic purposes [2].
- Logistic managers should have more knowledge of information systems and running these systems. Many of them could benefit from a better understanding of managing logistics and business in general. The information is „somewhere around here„ but inaccessible or unavailable for logistics. The information is, so to say, „buried„ in the information system of another functional area and can be hard to reach, if it can be found at all [1].

1. Accuracy

- The information must be accurate;
- Without accurate data, the manager cannot make good decisions. However, we have to realize that not the most precise information and data needed to make the best decisions are always available;

- Traditional data processing is rarely adapted to logistic decisions because even today many companies use systems for making expense reports and control systems that are fairly outdated and are different from those in competing environments; [2]
- The expenses are associated to marketing, finances, accounting and production, and therefore the most of integrated logistics expenses are hidden among these. This means that many logistic managers have invested a great portion of their capital into equipment and systems in order to make activities in the fields of storage, transport and supply control easier. As a result, some companies have drastically reduced the work force expenses within the overall logistics expenses. If companies were to continue to allocate overall expenses on the basis of direct work hours, then the expenses will not completely be of help to the management when making decisions; [2]
- The need for information of the whole company and its functional parts, and not only the demands for external reporting on various industries and regulatory groups, need to lead to considering inside accounting. It is of high priority that the company establish separation of the needed data for inside and outside purposes;
- A cyclic or periodical system of expense reports will contribute to the accuracy of the information and data discover the sources of possible errors in entries, and supply records.
- This is the way error sources are researched, the errors are corrected, and the management is continually briefed on the causes, by which significantly greater information accuracy is achieved [2].

2. Effective communication of the information.

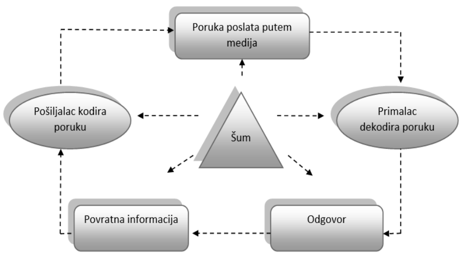

Figure 1: Model of communication process

The information needs to be efficiently announced in order to be of use to the managers. The announcement should be in the language of the future user. This means that the manager needs to communicate correctly so that the recipient can decode the messages correctly. If not, the reception will be difficult. In addition, communication is sometimes limited when people ignore unexpected information, and therefore this is sometimes indicated as selective reception. Communication can be done only if the information is in coordination with the person's values and if it responds directly to the decisions of the management, which needs to make the decision. Successful communication requires being familiar with the things the user can observe, expects to observe, and what he plans to do with what he has heard of. If the announcer misses any of these goals, the announcement of information will be difficult. On the diagram we can see how the communication process occurs (Figure 1) [5].

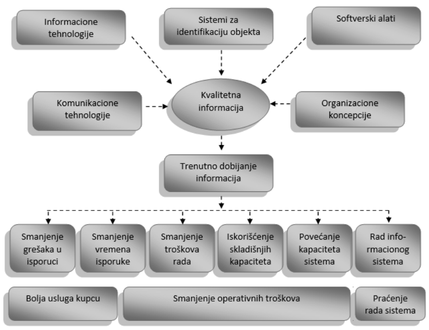

Figure 2: Model of high quality information

Return information or feedback is one of the key elements of successful communication because it is mainly a two way process. The significance of giving high quality feedback (Figure 2) is even more frequently emphasized in business communication. It is necessary to make a point of this and the important role it plays in the quality of the learning process. The basic principles of successfully composing and understanding feedback are similar in all situations, whether it is business communication, the education process, or a conversation with friends and family.

The organizations should present a complex system in which people act in accordance with the work equipment in order to achieve the purpose they united for [2].

Logistics studies the flow of materials, energy and information within and out of the business system from the source and ending with the delivery of finished products to the customers.

Management represents directing and maintaining the managing of effective and efficient usage of available resources in order to achieve the desired results.

III. PROPOSED QUALITY METRICS

• Authority or Verifiability

Refers to the expertise or granted the status of official sources. We take into account the reputation of the author and publisher. When dealing with legal and government information you need to take into account whether the source of official information provider. Confidentiality refers to the ability of the reader to verify the validity or accuracy of the information [3].

• Scope of coverage

It refers to the extent to which the source of researching the topic. We take into account the period of time, geography or jurisdiction and coverage of the resource associated with that or narrower topics.

• Composition and Organization

Refers to the ability to link resources and present more accurate information, the content and the way it is organized. That is the message you need to convey.

• Objectivity

Refers to bias or opinion expressed manager when interpreting and analyzing facts. It includes power of persuasion, opinion on the same information from another point of view as well as the reason for providing this information [3].

• Integrity

1. Respect for the moral and ethical principles (accuracy moral character);

2. Is the information is complete or partial.

• Comprehensiveness

1. A large volume (if this information is enough to cover or include too many facts);

2. Is the information easily understandable and to the point;

3. Insurance (if covers or provides protection against loss).

• Validity

Refers to the degree of validity and apparent truthfulness that carries this information.

• Uniqueness

It refers to the fact that there is some unique information. As much as it is the uniqueness of information relevant measures also mean not only the point of origin and information, but also the manner in which it was presented [3].

• Timeliness

Timeliness refers to the information that was current at time of publication. You should always pay attention to who is the source of publication and the date and time of this publication [3].

• Reproducibility (preferably to be used when referring to the instructive information)

Refers to the documented methods. Are they still valid and can be applied to the same set of information in order to achieve the result.

IV. THE ROLE OF INFORMATION IN LOGISTICS

The flow of material goods is always in connection to the flow of information:

- Material goods do not have their own intelligence that would be directed to the realization of their transformation in space and time.
- The flow of goods can only be set in motion by introducing information on transport paths, relocation goals, dynamics of planned rides etc.
- Process control requires information on location and status
- Decisions influence information in connection with:
- goals (that need to be achieved)
- sizes (which mark the effect frame as a limitation which cannot be influenced)
- possible alternative actions and
- Consequences of those alternative actions.

V. READINESS AND ABILITY TO EXCHANGE INFORMATION

The readiness to exchange information can be enclosed by following factors:

- Engaging in information exchange
- Form of information exchange

- The ability to exchange information can be enclosed by relevant factors:
- Technology
- Public
- Overtness

VI. INFORMATION SECURITY SYSTEM (ISO 27000)

The main goal of ISO 27000 series standard is providing confidentiality, integrity and availability of information to interested, authorized parties, through establishing adequate information protection mechanisms. The interested parties are clients, employees, business partners and society in general [4].

Unprotected information systems are susceptible to various threats such as computer-supported frauds, sabotages and viruses. Threats can be internal and external, accidental or malevolent. A breach of information security can lead to unauthorized access, theft, damaging or losing valuable information [4].

Implementing security systems gives clients and business collaborates the persuasion that the information is dealt with responsibly and that it is used and distributed professionally and safely.

The advantages of 27001:

- competitive advantage;
- reduced risk of damage and loss of information, and therefore reduced expenses;
- in accordance with current legal regulations;
- greater trust from clients, employees, associates, institutions and all interested parties because they know that their data is safe;
- responsibility of everyone on all organizational levels for the safety of information.

VII. PROGRESS OF INFORMATION

Logistics in general has a number of definitions. Todays flow of information more resemble a flood than a supply of information that will serve its purpose. A recent study by Delphi Group shows that 37% of all executives daily spend more than two hours searching for the right and needed information. Many executives spend up to five hours of their work time on reading messages whose numbers can go up to a hundred and fifty per day. It is estimated that every year 800 MB of data is generated per capita, on a world population level of 6.3 billion. These examples indicate how important it is to provide efficient technologies for managing the flow of relevant information. Technologies that separate significant from insignificant information and thereby reduce the time spent searching for the information are not only of technical, but rather economic importance [5].

VIII. CONCLUSION

The quality of information in business logistic systems would not be a significant problem if information itself were not a dynamic object that is hard to control and that can be viewed from a vast number of aspects. For a news reporter, the news of yesterday practically does not exist, while for a historian a newspaper article from a couple of decades ago can carry valuable information. Information always has to be perceived in a user-information pair because, depending on the interests and views of the user, the information changes its meaning, or in other words, its usage value. Aggregation of information also carries new information within, but again its meaning varies from the users' point of view.

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INCIDENTAL VOCABULARY LEARNING THROUGH READING. A SYNTHESIS OF THE RESEARCH AND BASIC ASSUMPTIONS IN THE LITERATURE

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Abstract - The purpose of this article is to analyze the place and the role of incidental vocabulary learning through reading. It is a synthesis of the research and basic assumptions in the literature. Researchers interested in incidental vocabulary learning are concerned with the role of context nor merely in lexical guessing, but also in lexical acquisition. In recent years, many studies have focused on the ways in which L2 learners use context incoming to grips with unfamiliar lexical items.

I. INTRODUCTION

In recent years, many studies have focused on the ways in which L2 learners use context in coming to grips with unfamiliar lexical items (see, for example, Haastrup 1991; Huckin, Haynes & Coady 1993; Nagy 1987; Nagy & Herman 1985; Schouten-van Parreren 1989). Some studies have been primarily concerned to investigate the extent to which context helps the guessing of word meaning, whereas others have focused on the impact of inferring word meaning in context on lexical acquisition (cf. Singleton 1999: 157f). Researchers interested in incidental vocabulary learning are concerned with the role of context not merely in lexical guessing but also in lexical acquisition. The general argument is that L2 vocabulary must be acquired without 'special teaching'; this is identical to the argument adduced by K.Nelson (1981, in Singleton 1999: 159) in relation to LI vocabulary acquisition, namely that the amount of vocabulary that is assimilated far exceeds any reasonable assessment of the capacity of 'special teaching' (cf. Singleton 1999: 159).

II. MAIN RESEARCH ISSUES I N THE FIELD OF INCIDENTAL LEARNING

In a comprehensive review of the literature on incidental vocabulary learning, a first distinction between findings based on LI research and findings based on L2 research can be made. With reference to this L1-L2 distinction, three main research areas in the field of incidental vocabulary learning can be identified:

- Research into incidental vocabulary acquisition and vocabulary acquisition through interaction and instruction;
- Research into lexical guessing from context; and
- Research on L2 vocabulary acquisition in the context of (intensive and extensive) reading.

A. *Research into incidental vocabulary acquisition and vocabulary acquisition through interaction and instruction*

Researchers focusing on incidental vocabulary learning are concerned with the differential effects of 'incidental' as opposed to 'intentional' learning, attempting to find a solution to the long-standing question of whether incidental learning is 'better' than intentional learning. Concerning the distinction between incidental vocabulary learning and direct vocabulary instruction several aspects such as the distinction between high- and low-frequency words, the concept and role of consciousness and attention, or the number of exposures needed to learn a word incidentally come into play. While traditional studies of incidental vocabulary learning involve learners being told just to read for comprehension, recent twists to the incidental vocabulary learning concept have included more demanding tasks beyond reading such as looking up new words in dictionaries for comprehension (Laufer & Hill 2000) and recalling and retelling what is read (Joe 1998). Thus, studies of incidental vocabulary acquisition also discuss the role of dictionary usage as well as the role of glossing and its effects on vocabulary learning (e.g. Hulstijn 1993; Knight 1994; Laufer & Hadar 1997; Laufer & Hill 2000).

Incidental learning and direct vocabulary instruction should not be thought of in terms of better/ worse or either/ or, but they should be rather seen as complementary. As Ellis (1994b) or Nation and Waring (1997) illustrate, some aspects of vocabulary are best learned or retained after having been explicitly taught, while other aspects can be best retrieved after having been guessed from context. This implies that maximum results can be achieved if an attempt is made to combine the benefits of both methods. Explicit teaching, for example, can be a very good introduction to a word; after this, the context encountered while reading can lead to new knowledge of its collocations, additional meanings and other knowledge levels. In addition, repeated exposure from reading will help to consolidate the meaning(s) first learned.

Moreover, explicit teaching is probably essential for the most frequent words of any L2 since they are prerequisites for language use. The learning of these words cannot be left to chance but should be taught as quickly as possible. In contrast, less frequent words may be best learned by reading extensively since there is simply not enough time to learn all words through conscious study (cf. Ellis 1994b: 1-32; Nation and Waring 1997: 6-19). In addition to the distinction between high- and low-frequency vocabulary, the individual's learning objectives in terms of proficiency level aimed at determine which approach -incidental learning or direct instruction - turns out more effective. If someone needs to achieve only small to moderate proficiency in the language without any time pressure, then the natural approach would seem to be quite reasonable. In contrast, if learners need to use a language for challenging purposes such as reading advanced, authentic, academic texts and, moreover, have only a limited amount of time for acquiring the skills needed to carry out the task, then some form of explicit instruction is suggested in the literature. However, it seems to be generally acknowledged that a combination of the two - that is incidental learning through reading and systematic vocabulary instruction - appears to be a more successful approach than simply learning through context alone or depending exclusively on direct instruction (cf. Coady 1993: 4f; Coady 1997a: 287f).

B. Research into lexical guessing from context

Underlying this line of research is the assumption that the vast majority of words in LI come from extensive and multiple exposures through use rather than direct instruction therefore, vocabulary learning in a second language should follow the same route (Coady 1993). Research into lexical guessing from context mainly focuses on two aspects: how do L2 learners use context in coming to grips with unfamiliar items presented in context, and how can contextual inferencing lead to vocabulary learning. The following areas have been investigated:

- the amount of vocabulary learning (e.g. Parry 1991; Horst, Cobb & Meara 1998; Knight 1994; Nagy, Herman & Anderson 1985; Shu, Anderson & Zhang 1995; Swanborn & de Glopper 1999);
- the rate of vocabulary learning (e.g. Haastrup 1991; Cairns, Co wart & Jablon 1981; Nation 2001; Hulstijn 1992);
- the retention of word meanings inferred from context (e.g. Fräser 1999; Haastrup 1991; Cairns, Cowart & Jablon 1981; Jacoby, Craik & Begg 1979; Craik & Lockhart 1972).
- the optimal conditions for successful guessing or the factors affecting guessing; and
- the individual variations in the learners' approaches to guessing from context.

Apart from the role of guessing (and learning) from context in general, there is increasing interest in developing and providing useful guessing-from-context-strategies. Many studies have focused on the question of how teachers can help learners to learn from guessing from context (e.g. Morrison 1996; Jenkins, Matlock & Slocum 1989; Pany & Jenkins 1978, 1982; Pany, Jenkins & Schreck 1982; Buikema & Graves 1993; Fukkink & de Glopper 1998). Most of the studies on training of guessing from context are research-comparing training of guessing words from context and learning words from direct teaching, mainly in an isolated manner such as in word lists. Further areas of incidental vocabulary learning that have been investigated recently are the role of attention-drawing activities, glossing and dictionary use in vocabulary acquisition and instruction (e.g. Swanborn & de Glopper 1999; Laufer & Hill 2000; Watanobe 1997; Hulstijn 1992).

C. Research into L2 vocabulary acquisition in the context of reading

Studies of guessing from context have demonstrated that there are high correlations between vocabulary knowledge and guessing skills on the one hand, and between reading skill (Herman, Anderson, Pearson and Nagy 1987), reading comprehension, verbal IQ and guessing skills on the other. This suggests that an alternative to a direct focus on guessing skills would be a more general focus on improving reading skills. Since there are specific aspects to guessing that are not necessarily included in general reading proficiency, a focus on guessing could be an effective way of getting competent readers to gain more vocabulary knowledge from context.

Research on L2 vocabulary acquisition in the context of reading has primarily focused on two aspects: firstly, the analogy between LI and L2 reading processes and the implications for L2

Vocabulary learning (i.e. what could be transferred from LI research on reading to second language vocabulary acquisition); and secondly, the amount and rate of contextual vocabulary learning through extensive reading (e.g. Herman, Anderson, Pearson & Nagy 1987). More recently, other factors have also attracted attention, such as the role of memory and rehearsal. Last but not least, a major issue is vocabulary size and successful reading, that is, the question whether there is a kind of vocabulary threshold for reading comprehension and thus successful guessing (e.g. Daneman & Green 1986) (cf. Nation 2001: 245).

III. CONCLUSION

Research on incidental vocabulary learning provides rather mixed results, with positive as well as negative evidence, with findings and conclusions that partly contradict each other, thus leading to confusion and only 'vague' implications for L2 vocabulary instruction, without offering any clear explanations, but putting forward assumptions that suggest a "trend" rather than an "absolute rule" for L2 vocabulary acquisition and instruction.

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THE EFFECTIVENESS OF SONG LYRICS IN MOTIVATING STUDENTS IN ACQUIRING VOCABULARY

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Abstract - Vocabulary is regarded as an essential part of language learning and teaching; because of this, a lot of attention is paid to how to teach vocabulary efficiently. Learners need to understand a big part of the vocabulary in the target language in order the language to be comprehensible and in consequence useful for acquisition. There are many different methods and techniques used in teaching the target vocabulary to learners of English as a second or foreign language. A very fun and interesting way in teaching vocabulary is using song lyrics. This kind of classroom teaching aid is really exploiting and it can be done through a variety of activities, starting with pre listening, while listening and after listening activities.

The objectives of this study are: 1. To identify whether using song lyrics motivates learners more in learning the target vocabulary; 2. To investigate whether song lyrics help learners acquire the target vocabulary easier; and 3. To explore whether learners perceive this vocabulary teaching technique as funnier and more interesting compared to other techniques? Data was collected in Basic English Skills classes, at the South East European University in Tetovo, Republic of Macedonia, during the academic year 2013. A total number of 85 students participated in the study and the data was analyzed using quantitative and qualitative methods.

I. INTRODUCTION

Learners of English as a foreign Language face many challenges and difficulties during the process of language acquisition. Those challenges and difficulties are due to the differences among the learners' mother tongue (L1) and the foreign language (FL).

The learners are faced with all the aspects of the target language and the four language skills, and learn all these things parallel. Besides grammar, another aspect of the language which represents a challenge to them is learning vocabulary. Although there are many ways to present vocabulary in the classroom, sometimes it is difficult for teachers to decide what method or technique to use.

However, with all the resources at our disposal, we use different ways and see what learners enjoy most, what motivates them to get involved in the lesson, what is fun yet effective. Motivation has a crucial role in anything that learners undertake, the same applies to learning a foreign language, and thus, learning all the aspects of that language.

Vocabulary learning is of vital importance because it is the very vocabulary that enables the learners to communicate in the target language. It is the words that the learners use to convey a message in the target language. We want to make the process of acquiring vocabulary a pleasant experience; we want to create an atmosphere where students are willing to take part in their learning, enjoy the process and yet benefit of it as much as possible.

One such way is using music in the classroom. Using song lyrics to teach vocabulary is a fun and effective way. The learners are relaxed, stress free, they enjoy listening to the song and still learn the target vocabulary. This is a win-win situation. The learners have fund and learn, and the teacher achieves his/her aim for that particular lesson. The lesson where song lyrics are used, are organized well and start with pre-listening activities, they go on with e while listening activity, and end with an after listening activity.

II. LITERATURE REVIEW

Concerning teaching and learning vocabulary scholars, recognize two strategies: The direct vocabulary teaching strategy and the incidental vocabulary teaching strategy. The earlier is associated with the translation method, whereas the latter is associated with the communicative approach to language teaching.

The incidental vocabulary teaching strategy mostly takes place by reading, without having the primary intention of learning vocabulary. Along these lines Richards & Schmidt (2002) as cited in Ahmad (2011:67) claim that “Incidental learning is the process of learning something without the intention of doing so. It is also learning one thing while intending to learn another.” Moreover, the direct vocabulary teaching strategy has to do with the tasks, activities and exercises prepared and organized by the teacher, with the intention of achieving a specific goal, and learning the assigned vocabulary in the target language. Using songs in teaching is part of the direct vocabulary teaching strategy.

The direct strategy has shown to be more effective, this is supported by Goff (1981:263) who argues that ``There have been empirical studies from the 1930s to the present whose findings indicate that the direct teaching of reading vocabulary is a superior manner in which to develop this knowledge with children.`` Accordingly, Holmes (1934) and Gray and Holmes (1938) as cited in Goff (1981:263) came to the conclusion that “ the direct method is significantly more effective in this respect than are incidental procedures like independent reading.”

Although there is not a significantly high number of studies which relate music and its effects on language teaching, using music in language teaching, and in our case in vocabulary teaching, has shown to be effective. One thing, which is for sure, is that using music in the language classroom aids students to be more attentative and pay more attention to what happens in the classroom. Correspondingly, Falioni (1993:104) argues that “The addition of music to the foreign language classroom as a teaching method may be a way to focus students’ attention, and produce a more committed learner” In order to have more committed and attentative learners who pay attention to the lessons and are focused, teachers need to motivate their students. A way to motivate students in terms of using music to teach vocabulary is to use modern songs, which they like and enjoy. One recommendation from Nambiar (1993) is that we use pop songs in the classroom, because according to him that motivates the language learners. “Songs deal with the whole realm of human emotions and students are often willing to sing a song in a foreign language even if they do not fully understand the meaning of the words” (Nambiar,1993:336).

Engh (2013:117) argues, “Motivation is multifaceted and concerns both the affective states and attitudes that impact the amount of effort a learner expends to acquire a new language.”

It is the teacher who motivates the learners through the variety of materials, activities and exercises that he/she prepares for the students. It is once more made clear that motivation is divided into two types: intrinsic and extrinsic. On one hand, intrinsic motivation mostly depends on what is going on in the classroom, the activities that are being used, the tasks that the learners are asked to complete. On the other hand, extrinsic motivation depends on other things than the teacher, it is closely related to the family, friends, society, etc. (Harmer, 2007)

The material presented in the classroom and which is aimed to be taught and learned, sometimes seems to students difficult to grasp. This is so because the new things we are presenting in the classroom may seem isolated, but if presented by songs they are perceived differently by the learners. Along these lines Falioni (1993:101) claims that "The new structures that may seem isolated or out of context in pattern drills, are seen in a different perspective when they are part of a song" Some scholars, such as Bartle (1962) and Whitaker (1981) see songs as a way of introducing not only vocabulary but grammar too, because students revise the grammar without the intention of doing so. They also claim that the language learners find it easier to express themselves through the music than the language being taught. Bartle (1962:11) says that “some songs lend themselves to the incidental revision of grammatical points or of verb tenses. Songs are a definite advantage in memorization of phrase constructions. They are more easily learned and tend to ‘stick’ longer than straight-out grammatical examples” Whitaker argues that “A student may often relate to and express himself through a country’s music more readily and easily than he can through its language” (1981: 4).

III. METHODOLOGY

This study was carried out at South East European University (SEEU), in the Language Centre (LC) in with pre-intermediate level students (Level 2). A Questionnaire and two quizzes were used to gather the data.

A. The Research questions of the study are:

a) Does using song lyrics enhance learner motivation to learn the target vocabulary;

b) Do song lyrics help learners acquire the target vocabulary easier; and

c) Is this method funnier and more appealing to the learners, compared to the other methods to teach and learn vocabulary?

IV. PARTICIPANTS

The participants of this study are 85 pre-intermediate level students, studying at different departments at South East European University. The participants are aged 18-35 years old, male and female. English is their second or foreign language.

V. PROCEDURE

The participants of this study were presented the vocabulary lessons using songs and song lyrics, with the accompanying activities, such pre-listening, while listening and after listening. The exercises they were given after the song had ended varied, such as match the word with the definition, match the words with the pictures; fill in the blanks, etc.

After five vocabulary lessons were presented to the students, we gave the students a questionnaire that they were required to fill in. Then, we gave them a quiz. The quiz contained 30 questions, multiple choices, true false and fill in the blanks with words from the list. The questionnaire and quiz results were analyzed. The analysis of the noted questionnaire and quiz answers led to the following results.

VI. RESULTS

As far as the first research question is concerned 'Does using song lyrics enhance learner motivation to learn the target vocabulary?' The questionnaire results showed that the learners were much more motivated by using songs and song lyrics in the classroom than by using other methods and techniques to teach vocabulary. Vocabulary requires revision and songs give the students that opportunity. They can listen to the song as many times as they want, and thus the vocabulary will be learned and be remembered. The students said that they were motivated because they felt relaxed, they were not under stress or pressure, and they enjoyed the activity. 86% of the participants in the study said that they felt motivated to participate in the lesson and try to learn the vocabulary. 95% said that they enjoyed the experience, whereas 89% claimed that they felt relaxed.

The second research question 'Do song lyrics help learners acquire the target vocabulary easier?' is associated with the quiz results. The quiz results showed that the usage of songs in the classroom was a success, in terms of helping the learners acquire the target vocabulary. The majority of students had very good results in the quiz that was given to them at the end. 76% of the students answered all the quiz questions correctly, which is something very positive. There were 9% of the students who had up to 5 mistakes, and there were 8% of the students with up to 10 mistakes, and 7 % of the students with more than 10 mistakes.

The third and last research question 'Is this method funnier and more appealing to the learners, compared to the other methods to teach and learn vocabulary?' the answers in the students questionnaire revealed that this method was funny, and it was very appealing to them. They loved the experience, and were willing to participate in the lesson and learn the vocabulary. 96% of the students involved said that this method was very interesting and that they were interested to follow what happens in the classroom and learn. 79% said that they thought it was a fun way to learn, and that this method was very appealing to them.

VII. CONCLUSIONS

As it has already been mentioned earlier, there are two main strategies to teaching vocabulary, the direct strategy and the incidental one. The direct strategy is directed by the teacher, and by the activities prepared by him/her. There is a specific objective, which is aimed to be achieved by the end of the class. The incidental strategy mainly happens by reading, and the main aim is not learning vocabulary.

Using songs in the classroom is part of the direct vocabulary teaching strategy. The teacher prepares the materials. It starts with e pre-listening activity, followed by the while listening activities and the after reading activities. This study was concerned with the effects of song lyrics on motivating students learn the vocabulary presented to them. Motivation is a very important aspect of learning that is why teacher must enhance it by any means available. Using songs and song lyrics showed to be an effective way to enhance learner motivation to learn the target vocabulary, keep them focused in the lesson, while they are actively participating in their learning, enjoy the experience and have fun.

To sum it up, among the many ways to motivate students to learn the target vocabulary is to present it to them using modern pop songs, which they are familiar with and enjoy. The learners will love the method, they will be motivated to learn, they will have a good time in the classroom, and yet the teacher will achieve his/her goal. This method is time consuming, the teacher must prepare the activities, but it is worth it, because it works in enhancing learner motivation in acquiring vocabulary.

VIII. Recommendations for further research and limitations of the present study

The recommendations for further research would be to include a bigger sample of participants in order to have results that are more reliable. Another approach could be used with the same study. To use this method with higher proficiency students and see whether these results apply to the other groups of students as well.

The limitations of the present study are the limited number of students. Only level 2 (pre-intermediate) students were involved in the study. There was a limited time to carry out the study.

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THE WORDS YOU NEED: TARGET VOCABULARY TEACHING STRATEGIES TO BASIC ENGLISH SKILLS STUDENTS AT SOUTH EAST EUROPEAN UNIVERSITY

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Abstract - Vocabulary is the part of language which requires most of the attention, because it is a very important aspect of any language, especially of the target language, in our case English. It is the vocabulary knowledge that enables the language learners to understand others and express their opinions with the intention of communicating in the target language. However, to succeed in learning the vocabulary, learners need to apply different learning strategies in order to find out the meaning of new words. At South East European University teachers decide about the target vocabulary from the course syllabuses. We were interested in finding out which vocabulary learning strategies are mostly used by students, which work best, and which help students acquire the target vocabulary with ease and motivation. The objectives of this study were the following:

- **To investigate whether the target vocabulary meets the learners' needs and requirements for a specific level;**
- **To find out which vocabulary learning strategy is the most effective and most commonly used by students at SEEU;**
- **To investigate what vocabulary teaching activities/exercises trigger students interest in learning the target vocabulary;**
- **To analyse what are some ways to make learners use the target vocabulary outside the classroom.**

The study was conducted at SEEU, Language Centre. The participants in the study were 100 Basic English Skills (BES) students, different levels, all non-native English speakers, from different national backgrounds.

I. INTRODUCTION

Vocabulary is the most important part of a language. It is the words that enable the foreign language (FL) learners to communicate in the target language. Teachers around the world try to use different methods and techniques to teach vocabulary. However, the process does not stop here. Another very important thing is how the learners learn and acquire vocabulary. This study is particularly interested in finding out what vocabulary learning strategies do the learners of English as a foreign language (EFL) use at the South East European University to learn vocabulary.

Many different scholars as in [5], [7], [2], [4] discuss the importance of vocabulary learning and teaching, the strategies used and the difficulties encountered and faced by the learners.

This paper is focused on the vocabulary learning strategies used by the learners, and what strategy works best and is more effective. The opinions will be supported by scholarly arguments and findings.

II. LITERATURE REVIEW

Teaching English as a foreign language (EFL) includes teaching all the aspects and skills of the language, grammar, vocabulary, speaking, and reading, writing and listening. Different methods and ways are used to be successful and to achieve the learning objectives. However, the words, i.e., the vocabulary is the largest aspect of the language, it is the vocabulary that enables the learners to speak in the target language, to be able to produce writing, to listen and understand what is said, to read in foreign language. Furthermore, as in [6], the author claims that "Vocabulary is a part of every language skill and therefore improving vocabulary learning and teaching will contribute reaching the goal of communicative competence." We are not suggesting that grammar is not important, of course it is, but as for being able to send the message across to the listener, one needs words.

Baker 2002, in his book titled “The Atoms of Language” recognizes the importance of vocabulary in foreign language and learning and claims that “Learning vocabulary is perhaps the largest and most laborious aspect of acquiring another language.” [1]. The importance of vocabulary is not only emphasized in the acquisition of a second or a foreign language, it is also of crucial importance in the mother tongue. Learners of any language keep learning new words during their whole life. Along these lines, as in [3] is discussed the importance of vocabulary and said that “Vocabulary learning is central to language acquisition whether it is a second, or a foreign language. Even in a learner’s mother tongue, there is an incessant learning of new words and new meanings for old words.”

Once the importance of vocabulary is explained, the vocabulary learning strategies are defined and explained.

According to [11], “Research on learner strategies in the domain of second language learning may be viewed as a part of the general area of research on mental processes and structures that constitutes the field of cognitive science”. Wenden goes on and lists the questions that had led to research on the learning strategies, the questions are the following:

- “What do L2 learners do to learn a second language?
- How do they manage or self direct these efforts?
- What do they know about which aspects of their L2 learning processes?
- How can their learning skills be refined and developed?”

As in [7], it is argued that “it is useful to make a distinction between direct and indirect vocabulary learning. He characterises direct vocabulary learning being a situation in which learners do exercises and activities, such as word building exercises and vocabulary games, focused on the vocabulary.” As the name itself implies, in direct vocabulary learning the aim it to learn the vocabulary through a variety of activities, whereas in indirect vocabulary learning the aim might be something else, but as a result vocabulary acquisition takes place. Furthermore, Nation “continues that if the amount of unknown words remains low in messages, considerable vocabulary learning can occur even though the learner’s attention is not fully directed toward vocabulary learning.”

According to [10], the vocabulary learning strategies are defined and claimed that “vocabulary learning strategies are basically actions made by the learner in order to help them to understand the meaning of a word, learning them and to remember them later.”

Language learning strategies mostly focus on learning vocabulary, hence, the vocabulary learning strategies are the most known among language learning strategies. Along these lines

In [8] it is argued that "training second language learners to use learning strategies concentrates mainly on learning vocabulary. They also point out that vocabulary learning strategies are used most frequently and are probably the most well-known type of language learning strategies.”

There are some features of the language learning strategies as described in [9]. Those are the following:

- “Contribute to the main goal, communicative competence.
- Allow learners to become more self-directed.
- Expand the role of teachers.
- Are problem-oriented.
- Are specific actions taken by the learner?
- Involve many aspects of the learner, not just the cognitive.
- Support learning both directly and indirectly.
- Are not always observable.
- Are often conscious.
- Can be taught.
- Are flexible.
- Are influenced by a variety of factors.”

Carter and McCarthy claim that “learning vocabulary effectively is closely bound up with a teacher’s understanding and learner’s perception of the difficulties of words and therefore the role of the teacher must be taken into account also in vocabulary learning.” [2]

As Carter and McCarthy claim, it is of critical importance to include the teacher in vocabulary learning. For the vocabulary learning to be effective the teacher must be part of the learning, because the teacher understands the difficulties that learners go through..

III. Methodology

Data was collected in Basic English Skills (BES) classes at South East European University in the academic year 2014. After the data gathered, the qualitative method was used to analyse the data. The students involved in the study were given a questionnaire, so were the 20 teachers who participated in this study.

This study answered the following research questions:

- Does the target vocabulary meet the needs and requirements of the learners for a specific level;
- What is the most effective vocabulary learning strategy and most used at SEEU;
- What vocabulary teaching activities trigger learner' s interest in learning the target vocabulary;
- In what ways can we make our students to use the target vocabulary outside the classroom?.

A. Participants

The participants involved in the study are 100 Basic English Skills (BES) students, all non-native English speakers, from different national backgrounds. The study also involves 20 teachers teaching BES, the teachers will be given a questionnaire where they express their experience with the vocabulary learning strategies and their opinions of what works best.

B. Procedure

The teacher explained the vocabulary learning strategies to the students involved in the study, and asked them to think about which strategy they used when they learn vocabulary. But, at the same time, the teacher used different vocabulary teaching strategies, to see which triggered the students' interest the most. Then, the students and teachers were given two different questionnaires. The answers of those questionnaires led to the following results.

IV. Results

Relating to the first research question 'Does the target vocabulary meet the needs and requirements of the learners for a specific level' it must be said that the target vocabulary for the whole semester is decided beforehand in agreement with all the teachers teaching at the Language Centre (LC) at South East European University.

To this question 88% of the students claimed that it met their needs and requirements, 7% claimed that they would use some more vocabulary, whereas 5% said that the existing target vocabulary was too much. It turns out that the majority of the students is pleased with the % target vocabulary, and that the 7% who want more are probably high proficient students, and the 5% who think it is too much are low-proficient students. The analysis of the teacher questionnaire showed that 20 teachers involved in the study agreed that the target vocabulary met the learner's needs and requirements for a specific level.

Second research question 'What is the most effective vocabulary learning strategy and the most used at SEEU'. The analysis of the results showed that the most effective vocabulary learning activities are: Match the word with the definition (92%), multiple choice exercises (88%), match the word with the pictures (97%), and fill in the blanks (82%).

The teachers' questionnaire showed that these are the most effective vocabulary teaching strategies, teachers use these strategies and claim that these have shown to be successful.

Research question three 'What vocabulary teaching activities trigger learner's interest in learning the target vocabulary', the teachers questionnaire results showed that learners like a whole variety of vocabulary learning strategies. The learners are intrigued by the match the word with the definition activities, and then make sentences with the words (78% of students), match the word with the pictures (for level 1 and 2) (91% of students), have the same effect and make students want to learn the vocabulary. For higher levels (3 and 4) the multiple choice activities (56%) are the ones which trigger learner interest. The song lyrics (89% of the students) also showed to be very effective for all the levels.

Last research question 'In what ways can we make our students to use the target vocabulary outside the classroom', the teachers gave a variety of answers regarding this question. The teachers (18 of them) said that homework is a very effective way of making students use the target vocabulary outside of the classroom. Ask the students to write sentences using the target vocabulary taught that day in the classroom. Make them write paragraphs/ essays related to the target vocabulary (13 teachers). Ask them to post in a discussion forum in Libri (Learning management system used at SEEU).

V. CONCLUSIONS

The vocabulary learning strategies are very important for the learner and for the teacher too. It is all the activities that learners undertake to learn the target vocabulary. Vocabulary being a very important aspect of any language, it enables the language learners to communicate in the target language. And as such, it is highly important to use different strategies to teach and learn it. There exists a high variety of methods and techniques to teach vocabulary, but at the same time there are plenty of ways how to learn vocabulary depending on the learners' different learning styles. As far as the vocabulary learning strategies are concerned, in terms of which are used more at South East European University, it turned out that learners use different ways to learn the target vocabulary, such as: match the word with the definition, match the word with the picture, match the opposites, multiple choice exercises, fill in the blanks and many others. Teachers use different ways to make the learners use the target vocabulary outside of the classroom for the only purpose to remember it easier. They use homework as a primary means for that, they ask the students to write paragraphs and/or essays where they use the vocabulary.

The target vocabulary foreseen by the syllabi meets the students' needs and requirements, which is very important.

All in all, vocabulary teaching and learning is the most laborious aspect of the language, therefore the focus must be on using different strategies and assist students in acquiring the target vocabulary, and be able to use in communication, which is the ultimate purpose of many language learners and teachers.

VI. RECOMMENDATIONS FOR FURTHER RESEARCH AND LIMITATIONS OF THE STUDY

The recommendations for further research include having more time in disposal, and having a bigger number of teachers participate in a study. As far as the limitations are concerned they include not having enough time at our disposal in order to carry a more in-depth study, and the limited number of teacher participants.

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THE IDEAS OF LEN MASTERMAN AS PHILOSOPHICAL AND METHODOLOGICAL BASIS OF MEDIA EDUCATION

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Abstract - The article examines the ideas of Len Masterman, a prominent British theorist of media education who greatly influenced the development of modern media education.

In the XXI century, the world is unimaginable without the media (print media, television, cinema, radio and the Internet). Over the past fifty years, media have become an integral part of human life. It must be admitted that in the new millennium media significantly influence the development of the rising generation and its worldview, which inevitably leads to increasingly intensive development of media education movement originated in the 1960s in UK, Canada, USA, Australia and other leading countries.

Application and implementation of new information technologies make the intensive development of media education more and more urgent in the modern world. An influential international organization UNESCO has been supporting the development of media education over a decade. It defines the term as follows: "Media Education deals with all communication media and includes the printed word and graphics, the sound, the still as well as the moving image, delivered on any kind of technology; enables people to gain understanding of the communication media used in their society and the way they operate and to acquire skills in using these media to communicate with others; ensures that people learn how to 1) analyses, critically reflect upon and create media texts; 2) identify the sources of media texts, their political, social, commercial and/or cultural interests, and their contexts; 3) interpret the messages and values offered by the media; 4) select appropriate media for communicating their own messages or stories and for reaching their intended audience; 5) gain, or demand access to media for both reception and production. Media Education is part of the basic entitlement of every citizen, in every country in the world, to freedom of expression and the right to information and is instrumental in building and sustaining democracy. While recognizing the disparities in the nature and development of Media Education in different countries, the participants of the conference "Educating for the Media and the Digital Age" recommend that Media Education should be introduced wherever possible within national curricula as well as in tertiary, non-formal and lifelong education [5].

British scientist, Professor Len Masterman is a prominent figure in the foreign media education that significantly influenced the development of modern media education. L. Masterman is the author of numerous works on the theory of media culture and media education. In addition, he is a consultant to the Council of Europe and UNESCO in the field of media education.

L. Masterman is the founder of critical thinking theory in media education. American Philosophical Association (APA) defines the term "critical thinking" as "the process of purposeful, self-regulatory judgment. This process reasoned consideration to evidence, context, conceptualizations, methods, and criteria" [6].

Russian scientist A.V. Fedorov believes that "the theoretical basis of this theory is most likely the theory of media as an "agenda" where the media are represented as "the fourth power" which spreads behaviors and social values among the heterogeneous mass of individuals" [1]. According to L. Masterman the main purpose of media education is to teach the audience to analyze critically media texts, to disclose the manipulative impact of media and navigate in modern society's information flow [2]. L. Masterman believes that due to the information glut it is necessary to teach pupils and students to understand and analyze the perceived information, to give them the idea of the mechanisms of their influence on the audience and their consequences, thus developing students' critical thinking in relation to media production. Since one-sided information broadcasted by the media can be distorted it is important to teach the audience to identify "the difference between the well-known facts and the facts that need to be checked; reliability of the information source; biased judgments; vague or ambiguous arguments; logical inconsistency in the chain of reasoning, etc." [2].

Undoubtedly, only prepared audience is able to adequately perceive and analyze information received, to resist the manipulative influence of the media, to formulate its own thoughts about media texts.

L. Masterman believes that media texts are the product of conscious activity and therefore it would be logical to designate at least four areas for further study: 1) who is responsible for the creation of media production, who controls the media? 2) how is the desired effect achieved? 3) what is the value orientations of the world created this way? 4) how does the audience perceive the world? [2]. This suggests the conclusion that the British scientist considered it necessary to focus attention on the development of the audience's critical thinking.

L. Masterman thinks that media education is to study the works of media culture. The scientist wrote, "It necessary to develop new dialogic ways of working in which teachers and students could continually learn from one another as co-investigators and co-participants" [2]. Media education "should be aimed at developing students' understanding of the functioning of the media, the use of expressive means, a mechanism to create "reality" and its understanding by the audience" [3]. According to [3], the purpose of media education is "critical autonomy", in other words the ability to independent argumented critical judgment of media texts.

It is worth mentioning L. Masterman's principles of media education [3]:

- Media Education is a serious and significant endeavor. At stake are the empowerment of individuals, especially minorities, and the strengthening of society's democratic structures.
- The central unifying concept of Media Education is that of representation. The media mediate. They do not reflect but re-present the world. The media, that is, are symbolic sign systems that must be decoded. Without this principle, no media education is possible. From it, all else flows.
- Media Education is a lifelong process. High student motivation, therefore, must become a primary objective.
- Media Education aims to foster not simply critical intelligence, but critical autonomy.
- Media Education is investigative. It does not seek to impose specific cultural or political values.
- Media Education is topical and opportunistic. It seeks to illuminate the life-situations of learners. In doing so, it may place the "here-and-now" in the context of wider historic and ideological issues.
- Content, in Media Education, is a means to an end. That end is the development of transferable analytical tools rather than an alternative content.
- The effectiveness. of Media Education can be evaluated by just two criteria: the ability of students to apply their critical thinking to new situations, and
- the amount of commitment and motivation displayed by students.
- Ideally, evaluation in Media Education means student self-evaluation, both formative and summative.
- Indeed, Media Education attempts to change the relationship between teachers and taught by offering both objects for reflection and dialogue.
- Media Education carries out its investigations via dialogue rather than just discussion.
- Media Education is essentially active and participatory, fostering the development of more open and democratic pedagogies. It encourages students to take more responsibility for and control over their own learning, to engage in joint planning of the syllabus, and to take longer-term perspectives on their own learning.
- Media Education is much more about new ways of working in the classroom than it is

about the introduction of a new subject area.

- Media Education involves collaborative learning. It is group focused. It assumes that individual learning is enhanced not through competition but through access to the insights and resources of the whole group.
- Media Education consists of both practical criticism and critical practice. It affirms the primacy of cultural criticism over cultural reproduction.
- Media Education is a holistic process. Ideally, it means forging relationships with parents, media professionals and teacher-colleagues.
- Media Education is committed to the principle of continuous change. It must develop in tandem with a continuously changing reality.
- Underlying Media Education is a distinctive epistemology: Existing knowledge is not simply transmitted by teachers or "discovered" by students. It is not an end but a beginning. It is the subject of critical investigations and dialogue out of which new knowledge is actively created by students and teachers.

It should be noted that some principles have obvious similarities with V.S. Bibler's concept of "the dialogue of cultures".

Here L. Masterman highlighted the following key concepts: denotation, connotation, genre, selection, nonverbal communication, media language, naturalism, realism, audience, institution, construction, mediation, representation, code / encoding / decoding, segmentation, narrative structure, sources, ideology, rhetoric, discourse, subjectivity, etc. [3].

Later on L. Masterman began to define his paradigm as "representational", indicating that it implies "understanding the ways the media represent reality as well as the used technologies and ideologies, which is necessary for all citizens and future citizens in democratic society" [2].

Speaking of the selective approach in media education targeting the best works of art L. Masterman wrote that the very notion of "selectivity" has both positive ("select the best") and negative ("unjust exclusion") meanings. The scientist observes that the above-mentioned exclusion of tastes and preferences of the majority of students is still widespread. It means the preference of "serious" tastes of media teachers and the exclusion of very popular media products preferred by children. Nevertheless, despite all attempts to develop the selective approach in relation to mass media products their preferences remain unchanged [3].

L. Masterman explains that it is impossible to develop the selective approach based on some criteria of assessing the quality of media products because there criteria simply do not exist. The same media text can be assessed quite differently depending on the culture, political views, the society and many other factors [3]. However, L. Masterman does not totally refuse to consider the problem of the artistic value of media texts within the framework of media education. But the researcher believes that media educators shouldn't focus on these issues because the main goal is "the development of understanding media text: how and for whose benefits they are created; how they are organized, what is their meaning, how they represent reality and how these representations are read by the audience" [2].

L. Masterman is convinced that despite the differences educational, political, media and cultural systems the fundamental goals, objectives and prerequisites of media education have much in common in different countries. In spite of all the differences, over the past decade there has been a significant mutual cross-cultural fertilization of ideas within media education movement. Thanks to modern means of communication, the rapid spread of ideas around the world has become possible. The British scientist emphasizes that all the differences in media education systems are superficial, that is why it is necessary to find contact points, which could contribute to the successful development and consolidation of actions of the world's media education movement.

According to L. Masterman, first of all media educators around the world share the view of the need to promote, support and sustain democratic structures wherever they exist. L. Masterman emphasizes the important role of educational and media systems that may either support or threaten democratic values. "These are powerful national systems which can either empower or domesticate us, which can address us either as citizens or as consumers, which can provide the information and awareness necessary for the functioning of an effective democracy, or which can treat us principally as a "mass", available for political and commercial manipulation". "The development of widespread literacy skills has always been seen as a necessary prerequisite of successful democracy (without it, democracy is positively dangerous), so it is clear that media literacy skills are essential to the democratic health of contemporary media-saturated societies" [3].

. L. Masterman gives priority to the following objectives of media education: "the extension and consolidation of existing approaches to media literacy; the development of critical approaches to the techniques of marketing, public relations, sponsorship and a host of other promotional techniques which now saturate the media, and have rendered the old distinctions between advertising and programs virtually obsolete; the defense and production of those spaces where we, as democratic citizens, can speak to one another without commercial or government interference, the defense and transformation of public service media systems" [3]. In addition, we fully agree with L. Masterman that media education is able to solve all those problems, which are becoming more and more urgent in today's world of information technologies

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TREND INTERACTION BETWEEN PEOPLE - INTELLIGENT SOPHISTICATED CONTEXTUAL ENVIRONMENT

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Summary - Smart phones are becoming every year more and more powerful, their performance is significantly improved following the arrival of each generation and to create a realistic assumption that the application and supporting all be personalized and responsive to the needs of man as a user with a view to adapting the environment to be more efficient and quality. This paper deals with the concept of contextual computing.

I. INTRODUCTION

In the coming years, society will increasingly move toward contextual computing, based on the idea of M. Weiser still in the early nineties, and later defined by Schilit, Adams and Want. Always available computers, able to feel the objective and subjective aspects of the situation increases users' ability to timely consider and act on the information, a description of the environment and the personal experiences of the past. It is a new sophisticated sixth sense guide [8].

Mobile devices with GPS providing location-based services, thus creating a catch that phone users gather information on the direction of movement and the analysis of data the user can find out all about the environment, (where there are hotels, hospitals, gas stations, stores and etc.) [7].

Modern and sophisticated electronic devices, consumer electronics today have processors with multiple cores that run at clock speeds above 2.4 GHz. The memory capacity to store data temporarily exceeds 2 GB, while memory for permanent data storage has a capacity of several tens of GB. The consumption of these mobile devices is 0.5 W / h of use. Connecting generic information (from sophisticated electronic devices) in the network most commonly used wireless sensor network protocols based on IEEE 802.15.4, although used in the wireless sensor networks with protocols based on Bluetooth Low Energy. Connecting to larger devices permanently connected to a power source using the wired or wireless connection using a protocol based on the IEEE 802.3 (Ethernet) and IEEE 802.11 (WiFi).

The miniaturization of electronic components and new technologies for the realization of nano devices in the millimeter dimensional environment. Technological capabilities have led experts to develop a large number of functionalities of today's consumer electronics devices, from only controlled machines, multimedia, multimedia communications, GPS navigation via smart house control and automation systems, to sophisticated medical devices and applications as part of decision support systems (Decision Support Systems) or expert systems. Many manufacturers declarative advocate for careful design of the device in terms of its functionality. The timing of new versions of modified or completely new device is shorter. All dynamic production insufficient attention to contextual networking environment to user even when emphasizes ease of use and quality of user coupling.

Although the trend of increasing number of functionalities continues, particularly in the area of mobile devices, which have become sophisticated communicators with increasingly complex software applications and tools are increasingly in the professional community raises the question of where is the extent to which users will, by definition, accept new sophisticated devices. Habits of the average user of sophisticated consumer electronics are as follows:

- Users constantly use their smart dialer, the speed of driving and the like.
- Keep checking the web site, e-mail, social networks and become the obsession of many users.
- Attention is directed to the virtual world, ignoring the actual real life and its measurable physical parameters.

Today's devices, the first place we think of smart communicators encourage this behavior of users. Devices more user-managed his time and attention instead to be served are in line with the rhythm of his daily life. Global sales growth of consumer electronics devices , where an increasing share of a mobiledevices shows that today the main consumer of the individual , not the social group companies or family household [5] .

The basic resources of the individual in today's hectic pace of life was his time and emotional energy, experience an environment that is becoming disordered stochastic and complicated for human treatment. Manufacturers of new sophisticated consumer electronics devices need to pay more attention to each user, so that applicative functions have the possibility to personalize the properties of the user, its activities and its environment, or other devices with which it comes into contact [10].

If we look from the perspective of users of the limited resources at their disposal (time, attention, concentration, mood, etc.), then the emergence of new devices consume an additional amount of these resources. Optimizing user resource may be of great importance in the future development trend may even be more important than the optimum use of internal resources of the device, such as processing speed, processor time and memory, which is all over. Unfortunately, the human resources are the biological organic and all smaller due to the increasing workload of the human brain, and on the other side of the resource consumer electronics become more sophisticated.

Optimal use of resources a user may be required in the field of computer science context (context -aware computing), with a more concentrated study of the essence of the area, a precise definition of their basic aspects and application to the field of sophisticated consumer electronics.

Contextual Computing allows you to create applications with a sophisticated appreciation of the context of use. Context, by definition, is the physical environment of the system and the user (time, user activity, location, gender, age, occupation, desires, etc.) as well as the emotional state, the previous activity, usual activities, favorite mode, user personalized settings. Based on the collected parameters of context can determine the parameters of concern for the created application and include these findings in the form of additional inputs to the operation of the application. In this way it is possible to set the new functionality of sophisticated consumer electronics devices so that they are in sync and harmonious with the user as a kind of superior personalization [1].

Recent research in this area stand out differentiation detection device context and their functionality , users and their activities - noting that domain, and Domains Users are mutually coupled but the domain user is not determined by the domain of the device. In order to satisfy users, applications and services to be automatically adapted to changes in context.

This adjustment is called contextualization. Contextual adaptation involves changing the current state of the entities in the environment: people, places, things and devices. In order to simplify the decision-making mechanism, choose only those entities that are of interest to the user interface and the target application. Conditions entities is nothing but: current location, time, current activity performed and the desired settings. The platform is considered to be contextual if it is able to comprehend, interpret and use information about the context in order to adjust its functionalities that context. Research in this area are considered important contextual component in efforts to computer technology invisibly integrated into the environment of users.

Changes occurring in the business world and technology (mobile, social, and analytical changes, context- aware computing, cognitive computing and cloud computing) question the previously accepted ideas about what we provide information technology. Companies that have emerged on the Internet with new aspirations when it comes to innovation, but also to make progress using information technology. Mobility forces companies to rethink their business models, which are closely related to cloud computing, mobile applications and services [2].

Fast and scalable services focused on the needs of consumers are present and influencing the market of business services much like cloud computing affect the use of information technology. Application Programming Interface Application Programming Interface (API) provides business services and API’s economy is in the making. Companies that now have API strategy, companies that are straight 90's did not have a web strategy.

II. PLATFORM FOR THE DEVELOPMENT OF CONTEXTUAL FORM

The main objective in the area of contextual computing is to find the best abstract model of contextual architecture platform. A common feature of most abstract model is a layered architecture of contextual platform, which usually consists of four levels:

- level network
- intermediate level,
- the application level,
- level user interfaces.

The level of network

Connecting to common network resources, allowing the collection of information about the context, the crucial requirement that is implemented at the network level. In order to connect using different network protocols. The basic requirements of the network protocol specified in the most current research include the following:

- Initialization and control communication between two points.
- Create a temporary mobile network low power mode for connecting a large number of small devices and
- Automatic identification devices in the network.

In order to connect sources of contextual information in the network most commonly used wireless sensor network protocols based on IEEE 802.15.4 standard- although it used a wireless sensor network protocols based on Bluetooth in. Given the diversity of potential sources of contextual information in terms of protocol to connect to a contextual platform, and conditional on the establishment of a single network, the proposed mechanisms for connecting to heterogeneous network conditions. Level network also includes the definition of sensor components as a source of information about the context and define their interfaces with contextual platform. Each sensor component must satisfy the requirements set by the contextual platform, in terms of supported standards, and service. Sensor components can be divided into three major groups:

- Physical sensors;
- Virtual sensors and
- Logical sensors.

The physical sensors are the most widely used group of sensors to be used in the framework of the platform contexts. These are special devices that collect physical parameters of the environment and inform the contextual platform on these parameters.

Virtual sensors provide information about the context of the various services or applications. This includes, for example,analysis of applications running on the computer, user activity on the computer analysis used data from the Internet.

Logical sensors use contextual information to come from one or multiple sources (physical and / or logical sensors), concluding on the basis of this information. Logical sensors conclusions derived on the basis of information already collected that are saved in the database.

Distributed network architecture is usually set up in the mid-level contextual platform. Given the large number of different architectures secondary level, we classify them into six categories:

1. Information - agents;
2. A reflective medium level;
3. The space decorated tuples;
4. Metadata;
5. Adaptive intermediate level and
6. OSGI environment.

Intermediate level

It consists of intelligent agents who independently collected information about the context of the network layer. The conclusion is implemented on the basis of that information and knowledge are stored in the database of the intermediate level. Agents can be located at different spatial remote locations, where information is collected using a local network level. Great attention was paid to the development of applications using mobile agents in a mobile environment on different platforms. Mobile informants in the implementation of the mid-level change the location but keep the algorithm and prior knowledge.

Application level

For example, contextual applications for use in intelligent environments in healthcare, such as offices and hospitals that serve the medical staff to facilitate and enhance the work, and to improve the treatment of patients. Contextual application can create a detailed report on the progress of the operation, following the patient's condition, activities and movement of personnel, and the use of instruments. Access to this information after the surgery can be used to test the effectiveness and training. Contextual application that monitors the health status of patients at a distance, providing assistance to the emergency assistance for the organization and timely intervention. Also, it is possible to implement applications that provide insight into the current state (activity) of the medical staff, so as to minimize unwanted interruptions by other colleagues in the critical moments of work or applications that show the patient's records in a manner suitable for the medical staff that comes into rounds.

Also, distance learning can be improved by using contextual applications, so that the content and intensity of lessons based on skills, location, available time and interest of trainees. Reading the available topics and answering questions after each lesson shows students' interest and hence performs and evaluating them.

Contextual applications for use in an office environment, have primarily aimed at increasing the productivity of employees. For example, an application may have to reduce the number of outages employed by other colleagues, telephone, or announcement from applications on the compute. A good example of such an application is the application, the Sun, which was introduced in 2006 by then mobile operator MOTEL. This application was recording all the actions of his officers and even managers on the basis of pre- quantified definition in weight and time sense Evaluates performance and thereby stimulate good quality work [6].

An important application of contextual applications found in expert systems for decision support (decision support systems), which are intended to large number of indicators help managers make the best decisions concerning their business system [3].

Contextual applications for use in communication systems include communications clients equipped with contextual features, applications for mobile devices and applications for recommending communication services. Applications for mobile phones are commonly faced with the problem of selecting the best technology connection or access point, in order to maintain continuity of service, and for this purpose use contextual information such as location, characteristics of available access points and the like.

Applications for trade and marketing contextual extensions allow the assessment of user interest in buying a particular product, in this sense, allowing the optimization of marketing strategies in order to better reception of the product by the user [4].

The level of user interfaces

The way users interact with contextual platform can be explicit, when users enter information into the system using a user-interface that is provided for it and that is familiar to users, or implicit, when the interaction is performed indirectly, through sensory components. Explicit way of interaction is usually done using the screen, often sensitive to touch, which are part of the mobile devices that users manipulate (mobile phones, PDAs and tablet PC, etc.). There are traditional ways of interaction such as voice commands and sound notifications, the classic computer interfaces or other interfaces such as atypical light indicator, giving the action by hand gestures or body movements [9].

Contextual platforms tend to minimize the visibility of interactions with users, so it is used only implicitly interaction, but it is often necessary to monitor system operation and system configuration by the user. In some intelligent environments, users sometimes use user interface for directly assigning an explicit command from the device.

One of the main problems in the research of graphical user feedback in terms of contextual platform is the need to display the same content on different screens of different qualities, resolutions, and performance. In order to solve this problem have been proposed multimodal user interfaces [6].

III. CONTEXTUAL USER INTERFACE

Survey of user interfaces leads to the fact that there are three major directions of research in different areas of contextual user feedback; the paper presents the following classification contextual user feedback:

- Coupling with interchangeable modes, supporting multiple modes which can be changed on the basis of information provided by the contextual platform.
- Assistance interfaces, based on the information they learn and predict user actions to assist and automate actions.
- Couplingtransparent integrated in the user interface and tend to be invisible to the user.

The interface with interchangeable modes based on the edit mode and looking user interfaces, usually depending on the detected user activity. Mobile Application allows setting different situations (work, in class I at the concert, meeting, etc.) based on parameters such as time and GPS location, and define the mode in a particular situation. The concept of those interfaces allow the regime to create user interfaces that changes modes based on changes of location and / or activity of the user, which is used in mobile applications. An example is the implementation of a system for automatically adjusting the profile of the mobile phone depending on previous usage patterns using fuzzy logic [11].

Assistance coupling usually coincides with the definition of adaptive user feedback, which is almost exclusively related to the coupling of tracking user behavior and prediction of his actions and interests. A large number of adaptive user feedback is used for commercial and marketing purposes, the selection and presentation of information to the user that are consistent with his previous behavior and interests. An example of this is the search engine Google, the search results is a user in the order that is consistent with his profile and habits, which was concluded on the basis of previous user behavior.

Field of consumer electronics

Development in the area of contextual platform is usually a general type; refer to the algorithms, methods and techniques of detection and communication contexts, with a little look at the feasibility of their use in the consumer world. Today , consumer electronics devices including personal computers , mobile phones and tablets, GPS navigation devices , digital cameras and camcorders, MP3 players, audio equipment, television sets and video players, recorders, numerous devices for household and similar.

Personalize these devices and increase their mobility represents also an unstoppable trend. Technical and technological requirements that are placed in front of consumer electronics devices are numerous, and are conditioned simultaneously and regulations in the area where the sale , as well as market demand. The requirements for low power consumption are a natural for mobile devices from the perspective of a relatively low capacity of today's batteries, so this is what the market demands. On the other hand , during the strong campaign for global energy savings and increased user awareness of energy consumption of household appliances,with a goal of reducing global energy consumption and thus reducing harmful substances in its manufacture.

Race manufacturer to offer consumers an increasing number of new functionalities of the device is getting stronger. By reducing the size of integrated circuits and their extremely high integration, and the emergence of SoC (System on Chip) components, many electronic devices are given the central processor and memory subsystems, enabling the increase in the number of functions that a device has. It contributes to a trend of digital convergence, which means the unification of information technology, telecommunications, consumer electronics and entertainment industries, i.e., all consumer electronics devices tend to have access to the network through the download and share multimedia content, communicate with other devices and the like. All these requirements make certain barriers to communication protocols that are available.

The main criterion for the success of consumer electronics devices is its acceptance by the users. The impression that the device leaves the user in terms of the complexity of use, compatibility with user needs and innovation in relation to the competition, is more important than the actual, measurable quality and value of the device. The complexity of life is often one of the strong reasons for rejecting the device and its failure.

Contextual applications for mobile devices

Contextual applications for mobile devices are important from the standpoint of consumer electronics, with respect to the share of mobile devices in consumer electronics. The second reason is simple personalized mobile devices, and their affiliation to, a fact which points directly to the user context and provides implementation of contextual applications. There are mobile applications for the Android operating system, which allows automatic setting of the profile based on the current position of the phone (Intelligent Profile) and the GPS location of the user (Profile Rules). These applications are very simple, and rely on simple sensory inputs from the level of the network (accelerometer, network location service), and the rules set by the user, to determine the profile and activate the given user action (changing phone settings such as ring tones and ringer volume, vibration on / off WiFi connections, etc.) [8].

A general conclusion regarding contextual applications for mobile devices in the consumer electronics that are in most cases based on ad- hoc solutions, with only partial and weak implementation of an extensible functionality contextual platform. The need for a unified approach to the problem of implementation of contextual applications for mobile devices, through contextual platform and related software interfaces is very pronounced.The analysis of contextual user interface in consumer electronics includes:

- Interfaces for natural communication and
- Interfaces for argumented reality.

Interfaces for natural communication based on the use of natural attributes of human communication, such as speech and gesture, to manage contextual platform. At the network level, the speech recognition using the microphone arrays, while the recognition of user gestures using cameras, and optical cameras and stereovision method, or an infrared camera with a Time-Of-Flight approach (Microsoft Kinect).

A large number of user interface to argumented reality intended for mobile devices, and it does so in an application that displays video recording built-in camera, through which the question graphical interfaces for different purposes, which is „augmented" captured the scene, and she adds additional contextual features.

The general trend that is present when creating a contextual user interface to consumer electronics is a certain amount of sensationalism that accompanied the presentation of the product. This causes a very high consumer interest in the publication of a particular device or application, as the interest of reducing the intensity proportional to sensationalism which the consumer was initially exposed.

IV. CONCLUSION

Smart phones are becoming every year more and more powerful their performance is significantly improved arrival of each subsequent generation [2].

For this goes ever faster processors that power mobile devices, a larger screen with excellent resolution and more advanced cameras that will soon fully fit side by side with digital cameras . But even such a powerful mobile phones without optimal applications (that follow), they become useless very quickly. The need for some or certain types of applications for mobile phones differ from each user individually. It's never been easier to download and manage applications, it is sufficient to access the Google Play Store, where you have a registered account with a mobile phone or computer and part of the search key in the desired application or a keyword of interest to the user. [12]

Finally, the need to propose to the type of Android application is dependent on the needs and interests of the user. Some apps are universal, i.e. facing the majority of smartphone users (which is the key to the success of their popularity). Measure the success of consumer electronics devices is considered to be its acceptance by the user immediately after the sale, and continuity of sales and development. From the above it is clear the complexity of the implementation of a user interface to consumer electronics which are in most cases crucial to the acceptance of the device by the user. As Bill Gates once said "There is a tendency to overestimate how much things will change in two years and underestimate how much there will be many changes in 10 years"[7]. Within ten years, contextual computing will be the dominant paradigm in technology.

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WORK WITH GIFTED STUDENTS IN TEACHING OF TECHNICAL AND IT EDUCATION

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Abstract - The time in which we live is characterized by great changes and advances in technology and science. Teaching Technical and IT education aims to prepare pupils for life and to enable them to work and operate in technically developed society. Commitment to a particular technical discipline depends on the preferences of pupils, his knowledge and talent, and to a lesser extent, the equipment cabinet and access to teachers who lead and direct the work of pupils. Bearing in mind the right knowledge pupils, aptitude and talent, we can say that some pupils stand out as particularly capable, advanced and gifted. Detection and identification of gifted pupils is a complex, professional and ethically responsible task, and it is necessary to pay a lot of attention.

I. INTRODUCTION

The scientific study of gifted children and youth began in the early 20th century. Questions regarding this study can be summarized into two basic groups: the issue of identification and education issues. Educational work should be so planned and organized to allow their children to express their maximum potential. The school is considered one of the key factors to support the development of talent. Any work with gifted pupils in school means defining this category of pupils and their choice on the basis of certain indicators. The question is how to select the pupils with whom we look for talent?

For gifted children and young people develop their capacities, they need a stimulating and motivating environment. A gifted pupil should not be neglected, because in that case his talent not enough to develop or be totally lost. The school is expected to attitude toward gifted pupils does not reduce the resolution of individual cases, but to develop a system of measures to regulate the status of gifted pupils.

The education of gifted children is becoming a problem in the framework of mass education. Earlier in the education of gifted individuals were major opportunities for harmonization requires the abilities of pupils, but significantly reduces the spread of education and opportunities. In such cases, gifted pupils have special preferences for certain areas, but are usually not involved in the right way, bored in class, become apathetic, indifferent, or even unsuccessful. On the other hand, excessive involvement leads to fatigue, neurosis, insecurity and loss of self-esteem.

II. IDENTIFYING GIFTED PUPILS

One of the most interesting, but least understood problems of the educational process are gifted pupils, ie. pupils in a particular activity, or more, achieving above average results. What is talent? Who can believe that talented? How to identify? What are the problems facing gifted pupils? What organization of the educational process fits the needs of gifted pupils?

Large number of schools are faced with the problem of early identification of gifted pupils and organizations working with them. Identification of gifted pupils is a long process, which includes an analysis of the whole pupil, which means it can not be based on a single indicator, for example. knowledge test, which results in our schools, unfortunately, are crucial for the evaluation of talent.

Besides them, also used various tests to measure intelligence quotient, tests of creativity, checklists for assessing talent. None of these instruments can not accurately answer that whether a pupil is gifted or not, and therefore, with their application, require daily supervision and monitoring of pupils. Because of the different areas in which the pupil can verify the identity of a gifted, used many sources of information, ie, different criteria for detection and identification of gifted pupils, depending on the understanding and definition of giftedness [6]:.

The process of identification of gifted pupils has two phases: detection and identification of gifted pupils kind of talent. Ivan Koren says the difference between these two terms: "Conceptually, discover meaning only indicate gifted pupils, and identify means to establish his identity, ie. establish a set of properties that have, the type and extent of his talent. In the process of discovering more involved teachers in the identification process to include counselors, psychologists, and other experts" (Koren, 1989).

Important task for teachers is to appropriate communication with all pupils achieve an atmosphere of joy for learning, experimenting and accomplishments in realization of their ideas and thoughts. It is essential that the teacher opened up as much space in the classroom for the creative expression of pupils to be able to determine the pupil's demonstration of talent. Unfortunately, we still do not have clearly defined indicators of giftedness in pupils, not enough teachers trained for the task, and no clearly defined strategy of the category of gifted pupils [3]. Request for detecting and identifying giftedness is based on the idea that there are certain properties that make the talent that they unared data and determined "[5]:.

III. CLASSIFICATION OF AREAS OF GIFTEDNESS

They are very rare gifted individuals whose talents occurs in all areas of human activity. Most often excel in one, and only sometimes in several different areas. Facts are different classifications of those areas, but for practical purposes the cheapest one that classifies talents according to their abilities, which are understood in a broad sense, the six areas:

- General Intellectual Capacities of: a high degree of intelligence, wealth, vocabulary, curiosity, enthusiasm for new ideas, the ability of abstraction and logical reasoning, quick and accurate observation, the ease of setting up a hypothesis, a good memory and learning so easy.
- Divergent thinking, originality and flexibility, then the independence of thought, ingenuity, imagination, openness to new experiences, originality of ideas, frequent improvisation, preference for complex tasks, risk appetite, avoiding conformity, positive self-confidence, a distinct sense of humor, etc.
- Specific academic abilities: good memory, a highly developed capacity for understanding, erudition and enthusiasm for the content of their particular interest, a technique of rapid acquisition of knowledge and skills, a great fund of information from the Project area of personal interest.
- Abilities of leadership and management: social and other skills, primarily readiness to accept responsibility and the consequences of decisions made upon the ability of good judgment, expressed eloquence, easy adaptability to new situations, high expectations of self and others, expressed a sense of organization and cooperation, emphasized self-esteem and the tendency of domination.
- Artistic skills: the ability of imagination and perception, good motor coordination, flexibility, propensity for artistic impression, strong feelings and a desire to create original works in music, acting, dance, literature and visual arts.
- Psychomotor skills: precision movement, good coordination, skill in motor skills, dexterity in various athletic disciplines, good handling skills, a high level of physical energy, etc. [4].

IV. GIFTEDNESS IN TECHNICAL AND COMPUTER EDUCATION

Course objective of Technical and computer education in elementary schools is to ensure that all pupils acquire basic linguistic, technical and computer skills and to progress towards the implementation of appropriate standards of educational achievement, to be able to solve the problems and tasks in new and unfamiliar situations, to express and explain their views and discuss with others, develop motivation for learning and interest in the subject content., and to familiarize pupils with the technical - technological advanced environment, acquire basic technical and computer skills, develop technical review, the technical work culture. Tasks subjects were able to create a variety of content through various forms of work and teaching of technical and educational purpose, goals and objectives of education and the aims of technical and computer education to be fully realized [1].

Technical creativity of pupils is carried out under the existing program in the form of free technical activities, in the form of sections, which according to the type of interest of pupils and teachers formed in schools and work with a fund of one hour per week. Commitment to a particular technical discipline depends on the preferences of pupil, his knowledge and talent, and to a lesser extent, the equipment cabinet for technical education and vocational orientation and training of teachers who guide and support the work of pupils.

Results and goal one year of working with pupils in free technical activities of the project to be implemented by the pupils or groups of pupils. This project should go through the forms of evaluation stages of the competition taking place for each school year. Competitions and festivals work of pupils should, as a rule organized at all levels, from school level to the competition. Thus, to achieve coverage of all pupils who participate in extracurricular activities, taking into account the different levels of pupils' knowledge in specific technical areas. Selection of pupils for work in free technical activities should be based on three levels:

- The interest of pupils - primarily select all pupils who are interested in a particular area. A large role in fostering pupils' interest in a particular area is the teacher, who with their knowledge and personal engagement directs pupils to specific activities related to specific technical areas.

- The level of knowledge - a condition for the achievement of technical creativity should be the level of pupils' knowledge, so that the latter choice made on the basis of knowledge of the matter. A lot of pupils are not prepared to use a variety of information to collect and selects learns and perfects it, so that later results scarce and solutions known. Such pupils would be directed either to other forms of work, or to vex definition of tasks that are able to meet.

- Problem-solving skills - The pupil should demonstrate the ability to specifically solve practical problems by applying acquired knowledge, which is one of the goals of working with gifted pupils. Working with these pupils need to be intense, complete and requires extensive work by teachers. This provides individualized instruction, tailored to the intellectual abilities of the pupils. Only in this way can lead to results that will be the foundation for future pupils' interest in technology.

V. EXTRA CURRICULAR TECHNICAL ACTIVITIES

The structure of the educational work in elementary school and includes activities of pupils as part of extra curricular activities. Available technical activities are the most advanced forms of pupils' activities during free time. Activities are organized into sections and youth clubs technicians in or out of school, in cooperation with appropriate community organizations. Main tasks, which are realized through the activities of youth clubs technicians, encouragement and promotion of scientific - technical and labor - technical creativity of youth, as well as their routing to dealing scientific - technical disciplines, contribute to raising the level of general and technical culture in the broadest sense. The wealth of content that young people can engage stems from the diversity of the scientific - technical disciplines: information technology and operational technology, automation and robotics, electrical engineering, electronics, energy, telecommunications engineering and technology, architecture and construction, environmental protection, traffic engineering and technology technical - technological systems, a multi-disciplinary work, photograph, film and video creation.

Originality, innovativeness and technical creativity in competitive exhibits and defense contractors most valued, which reduces their mediocrity at festivals technical activities. Extracurricular activities (clubs) have a very important role in the development of interests and preferences of pupils during his free time. The requirement is that pupils engage in this work in its commitment to meet their interests and preferences. Through extra curricular activities pupils expand and deepen their knowledge, develop skills and abilities, express and nurture their creativity, enhance self-esteem and develop a sense of cooperation, teamwork and mutual respect. Preparing pupils for competitions, or other event is just one part of free activities . For the personality of pupils within the non-teaching process, the unity of education on which to build our schools, the education component is of special importance [2].

Education involves teaching and learning, skills and habits, the process of training figures to be in practice and life in general serving acquired knowledge. This knowledge must be functional. Pupils take part in competitions with models and models with mandatory testing for individual competitive discipline. Sometimes the models and conceptual models and realizatorski at a very high level. It should be noted that the competition involved pupils from which it came under additional classes or sections, these are pupils who have the aptitude, knowledge and skills in specific technologies and techniques. Most often these are pupils who demonstrate above-average results in the classroom. This creates a positive atmosphere among the pupils for detection, creation and creativity, as higher requirements appropriate to the age, but not so much the level of knowledge and skills of pupils, acts as a disincentive for research and study.

Mentors who work with gifted pupils on how they need to take special care and to work on their professional development, monitor changes in science and technology as just become a role model to young people in modernizing and understanding of new technologies. Therefore, in the course of assessment of pupils in the competition should be particularly oriented to finding answers that explain what is most important and the target functional, which makes this solution or significantly better at understanding the role of components or parts of the model or models and the like. Basis in the one model of preparing pupils for the competition is a multidisciplinary treatment of themes that connect a number of areas and facilities. Also, this mode allows better resolution of issues and would significantly contribute to achieving better pupil outcomes.

The performance of the pupils in extra curricular activities are:

- no classical type of classes,
- individuality of pupils in opting for solving specific problems,
- striving for practical verification of the theory through demonstration and experimentation,
- mentoring.

VI. CONCLUSION

For most pupils giftedness is equated with ability. For their parents talents, in addition to capacity, including the high achievement, and teachers with the skills and achievements added and creativity. The first picture of the child's parents and gain significant their assessment of the child's talent, but here is necessary and caution. Ambitious parents tend to exaggerate the highlight of what their children know and can do. Modest parents, out of fear that something does not change and is "broken", saying: "My child is good at this and that, but I do not know if it's talent."

The next person responsible for discovering talented child is a teacher and, later, all of his teachers. The most important task for teachers and parents is not enough to recognize certain talents, but more to their children, or that the largest possible number of children, the opportunity to, through school learning, express and develop their interests and abilities. In more recent work, it is proposed to leave the testing for the selection of talented and committed to testing in order to determine the function of the obstacles that prevent development. Best measurement of performance indicators and identifying giftedness of children by supporting their interests.

Talented (and all the other children) have to learn in school that knowledge is important, but not sufficient for creative production, the existing knowledge is not final, but that it should be critical to verify that he can contribute. Children should learn to love, to believe in their own abilities and the need to develop an awareness that wealth is a gift, but does not give the right to others underestimate, belittle or ignore. Finally, children need to understand that creativity is real only if it is implemented, manifest, if shown somewhere. Everything else can be a fantasy, wishful thinking or unfulfilled ambitions, and the final account with them and life - a source of frustration and conflict with the environment.

The purpose of working with the technical talent to work with pupils who stand out with their interests, success and ability to approach scientific work and methods, as well as to update their knowledge beyond the curriculum of the school getting to know the information about the latest developments in science, current scientific research problems and achievements in engineering and technology. To work with gifted pupils should be provided with appropriate experts in the areas that pupils take in their work, cutting-edge teaching methods, especially problematic work, interdisciplinary approaches, and material conditions. Our work is most often derive from the fields of science and technology with respect to didactic principles with respect to the age of pupils. As a rule, work individually or in a group - a team in which each pupil works part of the project for which he choose. Working with technical talent is not developed, although this activity has many reasons to become a concern not only the school but also the wider social environment. The establishment of centers for technical talent resolved to a host of problems in the field of organization, space, equipment, personnel and funding.

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CHARACTERISTICS OF ONLINE CURRICULUM AND ITS GROUNDING IN CONTEMPORARY LEARNING THEORIES

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Abstract – In this paper, we adopt the definition of online learning as learning that occurs when the advantages of the online environment are employed, such as synchronicity, connectivity, interactivity, collaboration and multimedia, as well as placing students at the center of teaching and learning. We pinpoint the emergence of unjustified simplifying of the process of online learning, as well as underestimating the capabilities of technology to optimize the learning process in an online environment. We emphasize that the focus in online education should be primarily on the development of curricula designed specifically for the online environment and that technology is only a means by which a curriculum is put into practice. In order to optimize online learning so that the goals of learning are achieved as effectively as possible, it is necessary to design curricula in which learning theories and principles of instruction in an online environment are implemented. In this paper, we discuss the characteristics of the online curriculum and the factors that shape it. We analyze the components of the online curriculum, as well as the application of modern learning theories in its design.

I. INTRODUCTION

In order for effective online learning to occur, it is necessary to exploit the strengths and potential of online environments, and these are, according to Curtis and Lawson [1], connectivity and asynchronicity, as well as the interaction, collaboration, multimedia and placing students at the center of the learning process [2]. According to McNeill, the main features of online environments, asynchronicity and connectivity, promote higher-order learning, i.e. learning that includes synthesis, analysis, evaluation and creativity [3]. Asynchronicity encourages reflection because it gives students time to think thoroughly about the topic. The possibility to connect with others easily and quickly along with the interdependence of participants in the learning process encourages collaborative learning which is believed to positively influence the adoption and retention of knowledge [4].

According to Yelland et al., online courses are often created hastily, haphazardly, with the aim to implement more technology, but without sufficient consideration of the learning process [5]. A transition to online learning has to be accompanied by evaluation of new pedagogical theories and models that will be adapted to new online contexts. It is necessary to change the way we observe learning and pedagogical principles that we apply in order to ensure that lasting learning occurs that leads to the acquisition of operational and creative level of knowledge. This new learning is compatible with the framework of media literacy. Media literacy pedagogy is based on four principles that good learning environment should include. These are:

1) Practice in a particular context (immersion experience)

2) Direct instruction (systematic, analytical and conscious understanding)

3) A critical look at things (interpretation of the interconnectedness of certain events with the social and cultural context)

4) Transformed practice (transferring the processes of thinking and interpretation of phenomena to new contexts) [6].

As we have already pointed out, in order for online learning to be effective, it needs to be systematically developed through an appropriate curriculum. Jovan Đorđević defines the curriculum in a very broad sense as a systematic structure on the basis of which the process of learning is organized [7]. The same author considers the curriculum in terms of its five components: students and society, goals and objectives, content, methods of transmission (including technological aspects) and evaluation. The curriculum includes objectives, content, methods, resources, organization and control [7]. In literature there is a debate about whether online curriculum should be different from the traditional curriculum and how it should look. According to Schneiderheinze, it is necessary to consider the need for a curriculum designed specifically for the electronic environment [8]. Our assumption is that, given the differences that exist between traditional face-to-face learning and online learning, which arise from the different characteristics of the environments in which they take place, it is necessary to create a special curriculum for online training programs. This curriculum should reflect the specific characteristics of online environments and online learning and thus increase the efficiency and quality of such learning. In order to emphasize the differences between the elements of the traditional and the online curriculum and hence the need for creating a curriculum specially created for online educational programs, we will compare these two types of curricula by analyzing them from the perspective of their five components: students, goals and objectives, content, modes of transmission and evaluations.

A. The Student

Differences in students' characteristics to be taken into account when designing both types of curricula are prior knowledge and experience, ability, motivation, personality types. However, different student characteristics should be taken into consideration when designing traditional and online curricula. For example, one of the characteristics of students that should be taken into account in online learning is the ability to use technology. In other words, when creating the online curriculum, content should be organized and displayed in a an intuitive way for students, especially when we are not able to provide students with timely assistance in the use of technology and provide them with appropriate training. The way to approach motivation in online learning is specific due to the fact that a student is under the watchful eye of the teacher who pays attention to the declines in motivation and adjusts instruction to further motivate students. In online learning this has to be compensated in other ways. Self-motivation skills and confidence of students in using technology influence the success of students in online learning, and these qualities should be fostered in situations of online learning [9]. The manner in which the online student learns is different when compared to traditional learning situations. For example, the difference is in the way of communication, and hence collaboration. Face-to-face communication is usually replaced by written synchronous and asynchronous communication. The differences between collaborative learning face-to-face and online collaborative learning include a lack of cycles of opposing opinions and explanations that are believed to characterize quality face-to-face discussions [1]. The significant presence of planning activities in online group interaction is associated with communication constraints imposed by the lack of proper tools to interact in real time and also represents a difference between the face-to-face interaction and asynchronous online interaction (ibid.). Online curriculum should include strategies to compensate for the shortcomings posed by online media.

B. Learning objectives

The objectives of the online curriculum can be very similar to those of the traditional curriculum in terms of acquiring certain knowledge, skills and habits. However, when creating the online curriculum the compatibility of online learning media (its main properties are asynchronicity and connectivity) with the so-called "21st century skills" should be exploited as much as possible and the focus should be on the acquisition of these skills:

- Solving problems through cooperation. Working together to solve a problem that involves the creation and exchange of ideas, knowledge and resources to achieve a goal.
- ICT literacy (the ability to effectively use ICT in the learning process). ICT literacy includes the ability to learn in digital networks and through digital means, for example a social network [25]. The objectives of the traditional curriculum are achieved through the interaction of students with the content, other students and the teacher. The objectives of the online curriculum are achieved in a similar way, but in online learning the nature of the process is different. Content, aims and tasks in online learning are not something new and revolutionary, but they are moved to the new online environment. What is revolutionary is the media through which students are exposed to content and through which they communicate and collaborate with both the content and other participants in the learning process.

It should be noted that in many online learning systems students choose their own learning goals and desired outcomes, and perform the operationalization of goals by choosing goals and outcomes out of those offered by the software. In the non-adaptive systems where the goals and outcomes are pre-defined, goals must be clearly layed out to students. The objectives of the online curriculum, just as in a traditional curriculum, should be instrumentalized, i.e. the results that students need to achieve should be clearly defined so that assessment can be made of whether students have achieved these goals. What should also be determined is the methods of this assessment [10].

C. Instructional methods

Certain methods are more preferable for the online learning than others. The online curriculum should include methods that encourage the so called *deep learning*, i.e. learning which leads to the acquisition of applicable operational knowledge and creative skills, as well as the development of critical thinking skills. These are primarily methods of collaborative learning and problem solving methods [2].

Ronteltap and Jurelings discovered in their experiments that when students learn by solving practical problems, they interact with others more and are more active in learning. A mixture of deep learning, learning through collaboration, critical thinking and learning by solving problems through appropriate methods that promote such learning, enables effective online learning [11].

When we talk about how to transfer content, technology comes into consideration as a very important factor in online learning. When creating a curriculum one should take into account the possibilities of technology for the optimal provision of successful learning. Methods of transferring the content are still based on the traditional methods in the classroom, but they have moved to the online environment and have taken an altered form. For example, the conversation method most often occurs in the form of text messaging. The new medium raises new problems, such as a lack of cycles of opposing opinions and explanations [1], which should be taken into consideration when designing the online curriculum.

In order to promote higher-order thinking, online learning must create challenging activities that enable students to connect new information with old information, acquire meaningful knowledge and use metacognitive skills [12]. Therefore, it is the strategy of instructions, and not so much the technology that affects the quality of learning. It should therefore be noted that the focus in the field of online learning should be primarily on the development of curricula designed specifically for the online environment and that technology is only a means by which a curriculum is put into practice.

D. Evaluation

In the traditional classroom teaching the teacher performs evaluation. The feedback that the teacher receives about how and if the students understood and adopted information is weak and rarely available [10]. The online learning technology provides the ability to monitor student behavior and the results of their learning and therefore provides timely feedback to both students and the facilitator. This feedback improves learning, but also the design of the course and the instructor's pedagogical work. Feedback in adaptive systems of online learning enables the design of steps in learning based on student performance and behavior in the previous step. This is called formative evaluation. In addition to the formative evaluation, online learning covers summative evaluation of learning and the effectiveness of instruction and curriculum design as a whole at the end of the course. Evaluation takes place in several relationships: teacher-student, student-teacher, student-elements of the curriculum. In other words, all elements of the learning process are subject to evaluation.

E. Content

In online learning the main actors are the student, content, and technological media of instruction. The teacher is not physically present and can no longer supervise the teaching in the same way as in the classroom. The teacher becomes a facilitator who supports the learning process, and students acquire knowledge through interaction with the content. Therefore, in online learning organization of content in a logical system structured to optimize the learning process is essential.

Khan defines the following guidelines [13]:

• When presenting content one should strive for clarity, the use of graphics (icons, buttons, images) and multimedia (video, audio, text).

• Instructions should be clear so that there is a sense of continuity (that is, each new unit builds on the previous).

• Content should be of high quality in terms of web usability. Some of the features of quality content are brevity and easy scanning ("one paragraph - one idea" rule).

II. APPLICATION OF CONTEMPORARY LEARNING THEORIES IN ONLINE LEARNING

Bearing in mind that online learning itself puts students at the center of the learning process and that it is part of a broader paradigm that is based on communication and collaboration free of time and space constraints, it can be said that, by its nature online learning is largely compatible with the idea of active learning promoted by today's information society. Online learning provides opportunity for the application of learning theories that are focused on correcting the shortcomings of traditional teaching and learning. Next we consider these modern theories of learning and how they can be used in online learning.

When creating a curriculum, it is important to be familiar with theories of learning, as well as the optimal ways of learning in an online environment. In this paper, we will present contemporary education theories of learning and teaching that are considered most important in the field of online learning.

A. Application of andragogy in online learning

Online learning is particularly suitable for the application of andragogical learning theories: andragogy of Malcolm Knowles [16], the theory of transformative learning and the constructivist and constructionist theory. The reason is that the understanding of the nature of learning in online learning and adult education largely overlap. The focus of both is on self-directed and constructive learning.

Eight andragogical principles applied in the creation and implementation of online curriculum are:

1. Students get prepared for learning in the online environment
2. A climate favorable for learning is established.
3. A mechanism for joint planning is created.
4. Students are involved in identifying their own learning needs and learning goals.
5. Students are involved in the process of planning of the learning experience– from choosing goals, contents to instructional methods.

B. Application of transformative learning theory in online learning

Transformative learning theory is an andragogical theory that has been less applied in designing online curriculum, but it is very significant nevertheless, especially for the educational function of the curriculum. It was created by Jack Mezirow [17]. This theory is a combination of constructivism and cognitivism in an attempt to explain how adults learn. Transformative learning involves critical thinking, which transforms the beliefs, opinions, attitudes and emotional reactions that make up our mental patterns, and transforms the way we interpret reality [17]. Mental patterns are formed from experiences, feelings, education of the individual and their established positions. When existing mental schemata do not allow a person to solve a problem, it is said that a person is experiencing a crisis and they need to change the lens through which they see the reality. A person may choose to reject the new information and refuse to change their mental schemata or to begin to rethink, to review their existing mental schemata, and modify them so that they become broader, more flexible and discriminatory. The process of changing mental patterns, questioning assumptions, expectations, values, attitudes and acceptance of different points of view enables transformative learning. In transformative learning the key processes are critical thinking and questioning [17].

The theory of transformative learning can be applied to the online curriculum so that it includes the dilemmas and crises that encourage students to modify existing mental schemata, map concepts, that encourage dynamic and progressive evaluation, social learning, variability, research, conflict and humor [18]. Transformative learning requires a change of perspective and awareness about why our existing ideas hamper our thinking and the way we understand and experience the world around us [17].

Online learning experience should lead to changes in the student's thoughts, feelings and actions. This experience will dramatically and permanently change the way students interact with the world around them. This can be achieved through debate, discussion and critical questioning. Strategies should be implemented that enable students to gain alternative perspectives, different from the ones they had at the beginning of learning. Learning experience forces students to leave their secure positions and to face some unsolved issues and thereby test their view of reality [19]. The theory of transformative learning promotes the following principles of learning that can be applied to online learning:

- Learning should be an active process. Students should perform meaningful activities that promote complex thinking operations and personalization of meaning.

- Collaborative learning should be encouraged.
- Students should have control over the learning process.
- Students should be given opportunities for reflection.
- Students should be encouraged to critically think about the phenomena.
- Learning must be meaningful for the students. Students should have the ability to choose tasks and projects in which they will be able to apply and personalize information.
- Learning should involve interaction with others because interactions have a stimulating effect on learning [20].

C. Application of theories of constructivism and constructionism in online learning

The most prominent theories applied in designing online curricula are theories of constructivism and constructionism. According to these theories students learn best when they connect what they learn with their inner world, with their mental models, and the best way to achieve this is to get into a stronger interaction with the content. This is best achieved when students create the content themselves [20].

Learning therefore gives the best results when you create and publish messages, projects, tasks, etc. that other people will see. Then the student invests more effort, inspects what he does more and thinks about it, supervises his or her work, which increases learning [20]. The process of learning is more intense and therefore more effective because students are active participants in the process of interaction with the content. Interaction with the content consists of its interpretation, exchanging views with other participants and content creation as a response to the existing content.

Theory of constructivism in online learning is achieved in the following ways:

• In the online forums, students can discuss the contents and share them.

• Through wikis as jointly created pages suitable for group work and other types of joint negotiation of meaning.

• Through glossaries as jointly created lists of definitions that allow for easier understanding of the content and facilitating communication between students who interpret the content.

• Databases provide participants with the opportunity to enter and access media of any type.

The curriculum is a living creation that is constantly changing, building and updating on the basis of interaction with content created by teachers and content created by students. The content created by one student affects what will be created by students that interact with that content. This is the theory of social constructionism. Content and its meaning are determined by the participants of the communication, the way they interpret the content and react to it.

In online education there is a tendency towards constructive learning, in which students have the opportunity to construct their own meaning of the information presented to them during the process of online learning. Learning becomes a more meaningful activity than the traditional notion of learning where the content is usually something that comes from the outside, which is predetermined and fixed, the same for all. In the process of learning, which is a joint creation of people who participate in it, learning becomes relevant, creative and individualized. The burden is no longer on the teacher who is expected to adapt the content to students, but the students themselves individualize the content, sometimes even by creating it themselves.

The constructivist learning theory is realized in online learning by applying methods of collaborative learning. The originator of the theory, Piaget, says that the process of learning is an active process and consists of constructing knowledge, instead of its adoption [21]. Individuals learn through interaction with the world around them and develop knowledge through social interaction rather than through independent research. Brookfield agrees that collaborative process promotes initiative, creativity and critical thinking skills. When students learn collaboratively they have the opportunity to broaden and deepen their learning experiences, test new ideas by sharing them with the group and receive critical and constructive feedback [22]. Conrad and Donaldson argue that activities that require students to interact encourage the exchange of ideas and thus promote deeper thinking [23]. Johnson & Johnson argue that where there is interdependence between people, they achieve more as individuals, invest more effort, get more social support and a greater sense of self-esteem than in the competitive and individualistic environments [24].

III. CONCLUSION

Online environment is more open, i.e. more flexibile when compared to the traditional classroom, and this fact should be reflected in the curriculum. Modern society is a society of knowledge and information. It is a society of rapid change caused by the staggering advance of technology. All spheres of society are getting more tecnologized, more and more areas of human activity (including teaching) are shifting to the online environment that reduces time and space constraints. The idea of learning "anytime, anywhere" is very tempting for the modern man, and will increasingly be seen as a necessity. We need to design the curriculum as a systematic, rational structure, based on which the learning process is organized in such a way that it meets the needs of modern man, and contributes to his development. When creating a curriculum we need to rely on the contemporary paradigm of learning which is based on modern learning theories, such as the theory of constructivism, andragogy and transformative learning. Learning is being relocated to a brand new, virtual environment with its specific laws and it is not possible to just apply to online learning the knowledge about learning and methods of instruction from the traditional classroom. It is necessary to study the characteristics of online learning and curriculum design in the light of new findings about the specific nature of online learning and online learning environments.

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TEACHERS' ADVANCED TRAINING OF TECHNICAL EDUCATION AND COMPUTER SCIENCE

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Abstract - This paper presents the importance, reasons and opportunities for advanced training and professional development of teachers of technical education and computer science in the country and the region. In addition to this, the ways and forms of advanced training of the teachers are defined, with particular emphasis given to the professional development of teachers in order to achieve better effects during the teaching process.

I. INTRODUCTION

Technical education and computer science as a subject that is taught in primary schools in the Republic of Serbia has its evolutionary development from manual labor when it was considered as a skill, to modern computerised classes with elements of modeling and simulation. As part of this course, areas such as transport, graphic communications, information technology, constructor modeling, technology of the material, energy, architecture, civil engineering, mechanical engineering, robotics, electronics, electrical engineering, etc. are taught.

Engineering, technology and computer science are prone to rapid change that can not be taught unless the teacher professionally trains themselves, following the lectures, magazines, seminars and conferences in the particular field of professional interest, both domestic and international.

Bearing all this in mind, respecting the curriculum, teachers of technical education and computer science, being aware of the fact that this course provides an opportunity for every student to progress and develop their potential within the field of interest, attend seminars and training depending on the area of interest.

II. TERM : ADVANCED TRAINING OF TEACHERS

Advanced training of teachers of technical education and computer science takes place over the three basic forms of learning :

1.Formal education (pre-school, primary. secondary and college/university education),

2.non-formal education (training programs, seminars, courses) and

3. informal education (communication with other people, reading vocational journals, etc..).

Professional development of teachers is particularly important in the preparatory period and making the first steps into the work in the field when the exchange of experience and knowledge combined with the knowledge acquired in school are of special importance.

The areas in which the teacher can professionally develop are pedagogically-psychological and methodological, as well as specialized expert skills and knowledge relevant to the subject of technical education and computer science.

The roles that a teacher can have in their advanced training and professional development are:

- Presenter / lecturer / conducter**,**
- second participant and
- organizer.

Advancement in career through the acquisition of titles may contribute to the strengthening of motivation, rising in the quality and development of the system of evaluation and self-assessment of the teachers, as well as the schools in general.

III. FORMS OF ADVANCED TRAINING OF TEACHERS

Teachers of technical education and computer science have the option of external and internal advanced training. External professional training include participation in seminars, conferences, meetings of professional sections/councils and societies of teachers of technical education and computer science at different levels - school, municipal, district and national, as well as taking part in the summer and winter schools and professional conferences and forums which can be of both domestic and international character.

Using the platform of e-learning , teachers have the option of online advanced training that is increasingly being used due to the conveniences of financial nature,as well as for the comfort of attending courses in time and space that is suitable both to the teacher and the seminar participants .

The school subject: technical education and computer science is of theoretical and practical nature with a number of practical exercises that are demonstrated through both constructor modeling , and using the computer, as well.

Teaching technical education and computer science is realized through the workshops with tools , as well as in the classrooms equipped with computers, projectors and electronic boards. Teachers, using video clips and simulations, can clearly explain their students the numerous technological methods of processing materials in industrial plants from their own working environment. This is especially important if we take into account the fact that , due to the students' and teachers' safety, for each visit to an institution as well as for taking students out of the school environment, written parental and school principle consent is needed. .

Information and communication technology (ICT) leads to an increase in the efficiency of learning , depending on the content and amount of the knowledge and ability of its users . Educational computer programs are increasingly being used in the classroom, particularly in the modernization of schools, but also in the training of the teachers how to apply it in the work with their students , which leads to the need for educating not only the students but the teachers also.

Professor Mladen Vilotijević (2005.) says that the new role of the teacher demands the change and enrichment of the functions of the school of the future where there will be two groups of student (student-student and student- teacher). [7]

The teacher gets the role of the organizer, co-worker and the knowledge manager where they plan the change of the work organization and the existence of flexible models of teaching that will take different amounts of time and that will better meet the growing needs of the audience in relation to the education and age .

This could be another indicator of the need for advanced training of the teachers , especially when one takes into account the current concerns of a large number of countries in which there is a significant teacher abandonment of their profession , and thus the loss of teacher expertise necessary for the achievement of quality education for the next generation of students.

IV. FEATURES IMPLEMENTING ADVANCED TRAINING OF TEACHERS

Examples of the application of various forms of advanced training of the teachers of technical education and computer science in practice are really numerous, starting with the implemented classes to the participation in various competitions and projects within the educational system of the Republic of Serbia. Teachers usually display their newly acquired knowledge and information by organizing numerous forms of internal advanced training within the school as an institution in which they are employed.

Within the school in which they work, the teachers of technical education and computer science have the opportunity to exchange the ideas from the realised class preparations, to organize exhibitions of students' works, to demonstrate how the models, programmes etc. function and many other things. It often happens that teachers of technical education and computer science, by participating in competitions, festivals and exhibitions of both domestic and international character, share their experience with other colleagues, thus exploring the optimal solutions not only for their students but also for the school and the community in which they live.

V. PROFESSIONAL DEVELOPMENT OF TEACHERS OF TECHNICAL EDUCATION AND COMPUTER SCIENCE

One of the reasons for the advanced training of the teachers of technical education and computer science could be their professional development and career advancement. In some countries, it is resolved through mentoring younger colleagues who have just started their career. In addition to this, another very important reason should be taken into account, that be the improvement in the terms of finances, which may be reflected in the wages of teachers , and in this way to regard and provide even greater motivation to ambitious teachers.

Professional development is a complex process that involves continuous development of teachers' competencies in order to better the performance as well as to improve the development of children and students, and their achievements, too . Personal plan for the professional development of teachers is also based on the self-assessment of the level of the competence development in the profession of each teacher individually .

Techical education and computer science teacher systematically monitors, analyzes and evaluates their educational work, competence development, their progression and professional development and keeps in a certain form the most important examples of their practice, advanced training and personal professional development plan called portfolio. This type of systematized documentation teacher shows on the request of the school principle, school pedagogyst , educational counselor and councelor - external collaborator for review .

Bearing in mind that advanced training is very complex and that the issues of selecting high-quality forms designed for the teachers of technical education and computer science is very important, it follows that the existence of competent and expert committees, and their greater commitment not only on the level of the facility itself, but also on the larger grounds is of great importance .

VI. ADVANCED TRAINING OF THE TEACHERS IN THE NEIGHBOURING COUNTRIES

OECD is a unique forum in which governments of the thirty democratic states work together to cope with the economic, social and environmental challenges of globalization. Most countries, in their concern for the efficiency of the work of the teachers, realise that the roles of the teachers are changing, and that they need new skills in order to meet the needs for the knowlegde of different groups of students, and to collaborate more efficiently with the new types of staff in schools and other organizations. Education ministers from OECD countries have set a goal in their countries, which is based on improving the quality of learning, which would be obtained only if high-quality teaching is provided.

Common in all curricula of our neighboring countries and further, is the following [16]:

- 1.Technical education and computer science is considered an important means of education,
- 2. students are introduced into the world of work, technics and technology,
- 3. students develop skills and working habits,
- 4.are preparing for life, work, and the use of leisure time,
- 5. pre-professional briefing and guidance is performed and
- 6. technical thinking and creativity is developed.

One of the aims of technical education and computer science is the contribution to the technical and technological education and upbringing of the students, forming a creative personality, acquiring technological knowledge, skills and habits, and training for applying it all in the field of work, learning and everyday life.

Educator Development Program (EDP) as a regional program for training of educators sponsored by the International Development Agency of Canada (Canadian International Development Agency-CIDA) are implemented by Universalia Management Group and the University of Calgary and they have been providing the support to the educational reforms in the Balkans since 2001. The program includes the development of skills of teachers , strengthening the capacity of the planning, implementation and evaluation of continuous professional development, and strengthening of the institutions that manage educational reforms.[6]

The aim of all this is to encourage the lifelong learning, as well as the professionalization and modernization of the educational system. The process of advanced training affects the environment in which it develops, empowering teachers and schools as learning organizations in which both teachers and pupils acquire knowledge, and teachers, in addition to this, develop a professional culture. [6]

In Serbia, in particular, the three factors of cooperation are expressed, these be the state, the school and the teacher individually, which, when united, make an important contribution to the management of the process of professional development.

In 2001, the countries of European Union (EU) adopted strategic objectives of education and training in order to discuss concepts such as standards of the teaching profession, the education of future teachers, their induction and continual advanced training. The main objectives of the European Union are related to the improvement of the quality and efficiency of education and training systems in the EU, facilitated access to the education and training systems, as well as opening up education and training to the outside world. In this case, teachers become members of the team, work outside the classroom, collaborate with community members, parents and colleagues from home and abroad .

Obligatory advanced training, methods of regulating absence from work for training, implementers of the program and its contents, become the strategic objectives of the education and training of the members of the European Union. Most countries provide approximately 20 hours per year for advanced training and professional development, but there are examples such as Latvia, where it is 12 hours per year, and Liechtenstein, with 42 hours per year. In Slovenia, Spain, Portugal, Bulgaria and Poland, there is an opinion that the training is not obligatory, but is necessary to make progress in teacher's professional career. In the Netherlands, around 10 % of annual working time of teachers is estimated for advanced training, which amounts 166 hours, whereas in Sweden it is 104 hours per year. [6]

In Finland, a country that is often mentioned for significant achievements in the fields of education, professional development programs depend on the Ministry and local employers. In Serbia, the Institute for the Advancement of Education is in charge of this, and it accredits programs and conducts monitoring and evaluation of progress made in implementing the programs in accordance with the standards. In Romania, universities, pedagogical colleges, vocational training centers, as well as NGOs are in charge of this, while in Lithuania and Slovenia there are school principals that are significantly responsible for the development of teacher competencies in accordance with the educational objectives.

The most common advanced trainings of teachers are related to the deepening of knowledge in information technology, teaching methodology, management, school development, special needs, multicultural education and conflict resolution.

VII. Research Methodology

A. Scope of the research

The scope of the research is advanced training and professional development of teachers of technical education and computer science. As it is stated in the theoretical part of the paper, professional development is of particular importance for professional advancement and career development of teachers and the educational system of the state. Through numerous research papers and discussions with the colleagues in the same profession, it may be noted that teachers of technical education and computer science take part in a number of programs of advanced training so they meet the legally defined requests.

B. Problem of the research

This survey reveals what it is that motivates teachers in technical education and computer science for advanced training, as well as what it is that affects their professional development and career advancement in the best possible way.

C. Purpose and character of the research

The aim of this research is to determine if the teachers of technical education and computer science take part in the advanced training, as well as how this professional development is determined by the financial and personal factors. Due to the small number of survey respondents, this research belongs to a small, micro research which, since it studies teaching practice, is empirical.

D. Hypotheses

The main hypothesis is:

- The teachers of technical education and computer science are motivated in terms of advanced training and professional development.

Auxiliary hypotheses are:

- Financial factors affect the professional development of teachers of technical education and computer science.
- Personal/subjective factors influence the professional development of teachers of technical education and computer science.

E. *Tasks of the research*

Research tasks are:

- To determine the attitudes of the teachers of technical education and computer science in terms of advanced training and professional development;
- To determine the attitudes of the teachers of technical education and computer science in terms of financial factors that support professional development;
- To determine the attitudes of the teachers of technical education and computer science in terms of the personal factors for professional development;
- To find out what factors motivate the teachers of technical education and computer science for advanced training and professional development.

F. *Population and the research sample*

This research is conducted on 30 teachers that are active and regular members of the Professional Section of the teachers of technical education and computer science in Zrenjanin. It is important to note that the teachers who took part in this research have different length of service, from beginners who have not taken the exam for teaching licenses yet to those who are facing retirement.

G. *Methods and techniques*

In conducting the research, the survey is used. "The survey(poll) is, in the educational research, the process in which the subjects are asked questions about the facts of scientific interest in pedagogy, and which are known to the subjects, or questions regarding the subjects' opinions. The subjects respond to them in writing "(Mužić 1979, p.262.).

The survey consists of three parts: the questions, that are in the middle, the column named "Important" which is on the left, and the column named "True", which is on the right.

The column "Important" consists of four levels:

1 - not important,

2 - of little importance,

3 - important,

4 - very important.

The column "True" consists of four levels:

1 - false / not present,

2 - to a lesser extent true / present,

3 - to a greater extent true / present,

4 - true / present in full.

After an introduction to the survey and reading the questions, the teacher gives the answer, depending on their own views and experiences, by filling in the left (important) and right (true) column. The survey is conducted at the meeting of the Professional Section of the teachers of technical education and computer science in Zrenjanin, after introductory remarks about the goals and objectives of conducting the survey.

VI. CONCLUSION

Every teacher of technical education and computer science, as a part of the educational system of the country, should have the opportunity to continue their education to the highest level of qualification in order to develop their competences and acquire professional development. The benefit of the advanced training of the teachers of technical education and computer science is reflected primarily in the results of the students, the quality of knowledge, presentation of the mastered curriculum and their engagement in regular classes, as well as in enrichment classes and extracurricular activities.

Being witnesses of the fact that even in the financilly stable and rich societies certain period of time was needed to raise teachers' competence and to modernize the educational system, as well as taking into accout our life cicrumstances, the process shouldn't be stopped but the new opportunities for avoiding the inconviniences should be looked for.

In most countries, teachers must financially contribute to the costs of transportation, registration fees or purchases of course materials for accredited professional development programs. The exceptions are Chile, Sweden and Scotland, where teachers bear no financial costs, and many countries provide the possibility of scholarships for research and further education [6].

New tendences of creating teachers of modern times require greater involvement of an individual in terms of professional development, with particular highlights on the creativity and innovation in the teaching process in order to achieve a greater interest and a higher level of knowledge of the students.

When analyzing the influence of personal/subjective factors on the professional development of the teachers of technical education and computer science, it should be borne in mind that there exists a group of teachers, of the so-called "put-to-sleep" motivation, that are not inspired by the desire for the changes in the work, considering them hard and unnecessary .

Colleague support in the acquisition and implementation of the new knowledge into practice is a very important personal motivational factor, so, with the development of the professional culture of teachers and work subjects of the school, a lot could be achieved regarding strengthening the motivation for advanced training and professional development.

An important fact regarding the professional development of teachers is their recognition of the fact that changing yourself, which is not even a little painless, results into obtaining positive effects in the learning process of education. Because of all this, advanced training and professional development of the teachers of technical education and computer science should be seen as a long-term and continuous process, and the real needs of both the teachers and school as an important segment of the educational process, should be taken into account.

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E-LEARNING THROUGH KHAN'S EIGHT-DIMENSIONAL FRAMEWORK

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Abstract - Electronic learning or e-learning is a relatively new concept and is still differently defined in literature sources, especially in pedagogical practice. Letter "e" is accepted as a prefix for activities based on electronic infrastructure, giving them a modern technological meaning. General educational needs of digital society, concept and dimensions of e-learning can be considered through 8 dimensions according to framework established by Badrul Khan. This paper will adress the key questions of e-learning through the framework of Khan, with the goal to create support to teachers and other factors included in educational process in Serbia, while taking into consideration educational, technological and other specificity of this area.

I. INTRODUCTION

E-learning presents innovation in teaching, not only for the students, but also for the teachers, principals, instructors, trainers, administrators, technical and support staff, that is the whole educational institutions. It indicates a metaphor for belonging to the age of information and communication technologies (ICT), so the expressions such as e-government, e-health, e-learning, are becoming accepted in Serbian language as well.

Children, now pupils of elementary, secondary schools and faculties are often called "the digital generation". They were born after the informational evolution. They grew up, formed habits, learned, built an attitude in the era of high speed, multimedia and non-linear information, 3D interface, touch displays, virtual reality environment, parallel worlds. It can be said that the teachers are "guests" in their era, and for them it is much harder to adapt. Teaching limited to school benches, walls and frontal teacher position is in complete contradiction to things children find interesting and where they can find motivational trigger for class work, so they slowly alienate from school and fail to understand the value of real learning and knowledge.

Enormous motivational potential, metaphorically contained in one letter "e" is the power that teacher and school can turn to "their benefit". Implementation of e-learning is no longer a question of "wanting", but becomes a pedagogical duty, because it can lead to another threat that brings uncontrolled use of new technologies and that is misapprehension. Children who spend countless hours in front of computer often uncritically adopt content from the Internet as truthful and lose connection with the real world. Typical examples are aggressive computer games where children, especially at younger age, lose consciousness about danger, cruelty and injury level. This is exactly where maybe the most powerful argument is, about necessity of strong teacher influence on guiding students towards teaching content and educational development, by changing teaching methodology, accepting and integrating e-learning in everyday teaching process.

II. ICT IN SERBIA

Intensity of computer use with children is shown in many researches. According to data from Statistical Office of the Republic of Serbia for 2013 [1], on the sample of 2400 households in Serbia, 75,7% owns a computer (Belgrade 67,1%, Vojvodina 64%, central Serbia 55,1%). Number of Internet connections has increased from 18,5% in 2006 to 55,8% in 2013. According to this data, progress is huge, but we are still at the bottom among european countries. 84% of participants said they use computer every day; among them, users aged 16 to 24 are the most intense with 96%. Intention to use Internet in educational purposes was present with 66,5% participants.

These results clearly indicate that Internet has cleared its path in te last 7 years, and his use ad exploitation is widely accepted with people, especially younger population. Research worldwide show the same trends and it is useful considering them on micro levels. According to Oblinger's research [2], teenagers spend approximately 3,5 hours a day in front of computer, and 94% of them use it for learning and research and believes it helps them in school. One of the statements of participants stands out, and is motivation for this paper, answering on question how seriously he takes ICT with: “It’s a part of my world.”

In the research conducted in 2014 on Technical faculty “Mihajlo Pupin” in Zrenjanin about habits of Serbian adolescents with informal computer use, following results were gathered: based on acquired data, the structure of informal computer use was formed; only 12,89% participants spends less than an hour a day in front of computer, and 23,91% spends more than 3 hours. Most of them, 178 or 76,47% stays awake until midnight on working days, a 5,39% even then after 2 a.m. On weekends, 78,3% stays awake after midnight.

Activities they perform are: listening to music 84.47%, playing games 43.17%, watching movies 64.6%, looking at pictures 54.35%, visiting social networks 87.89%, and other 21.74%. Without clear goal 21,74% surfs the Internet, and 54,66% stated that they surf to study. When it comes to social networks, most of the participants stated that they prefer Facebook, 97,8%, then Twitter with 28,93%, Instagram 29,87%, Ask.fm with 14,47% and other 20,44%. Comunication services they chose are: Facebook 88.05%, e-mail 74.85%, Skype 61.64%, Messenger 31.33%, Viber 32.39% and other 15.09%. Answer to question whether they surf during classes on mobile phones indicates that 50,94% do not, bu the other 49,06% use phone “under the table”.

III. E-LEARNING

E-learning is present in teaching practice for over two decades, and it relates to learning with use of ICT. At this technological point e-learning is leaning on computer with additional devices, digital television, laptop, tablet computers, mobile phones, wireless connection, interactive boards and other. Communication means servicing users through e-mail, social networks, android application, systems for collaborative learning. E-learning also means distance learning, through intranet and can be considered as component of flexible learning. When learning is in real time, it is called on-line learning. When distributed on mobile devices such as mobile phones, laptops and tablets, it is called m-learning. Mobile learning and learning through web are two subcategories of e-learning [5].

Methodically speaking, e-learning includes numerous strategies, actions and techniques that support process of multimedia learning, where individual exchange of information and acquiring knowledge are happening. This learning is enriched with electronic technology, carried out with adjusted methodical actions, realized in a way to enable acquiring skills and knowledge for modern working environments.

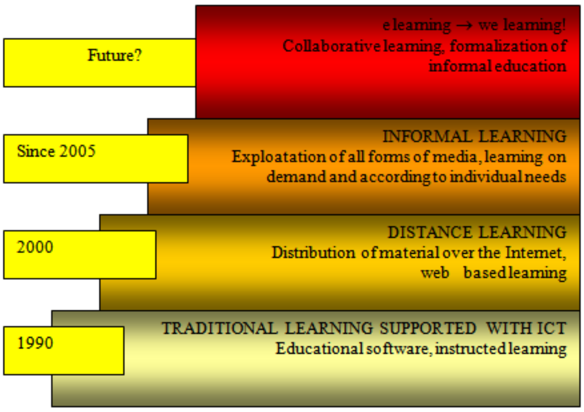

Figure 1. Evolution of e-learning [5]

E-learning is an innovative approach in distribution of open, flexible, well designed, multimedia, towards student oriented, without limitations in time or geographical position, interactive and easier educational environment, with ICT resources.

E-learning does not deny existing ways of learning, but complement and enriches them, while also improves importance of teacher role.

E-learning is not a new kind of learning, but new approach to methods of learning.

E-learning has coverage in psychology and pedagogy, and is possible to determine its didactical, logical and methodical foundation. Priority goal in e-learning is accomplishing educational outcomes by satisfying individual needs.

IV. DIMENSIONS OF E- LEARNING

One of the authors of e-learning theories, Badrul Khan [5], defined an 8-dimensional framework which does not give model of concrete solution, but indicates important technological and sociological factors responsible for efficiency of every system. Every dimension represents different factors of e-learning. Framework offers practical and detailed list of elements which should serve as instruments in self-evaluation of educational institutions’ readiness for e-learning.

Figure 2. 8 dimensions of e-learning, Khan [5]

Khan says that e-learning can be described through 8 dimensions:

Table 1. Dimensions of e-learning derived from Khan [5]

Dimension of e-learning	Description
Institutional	Institutional dimension is related to legal and administrative framework, or regulatory support to e-learning system.
Ethical	Ethical considerations of e-learning relate to social and political influence, cultural, geographic and demographic differences of students.
Pedagogical	Pedagogical dimension of e-learning relates to teaching and learning. It deals with questions considering content analysis, goals of teaching, didactical and methodical questions, organization and learning strategies.
Design of teaching resources	Interface design, site design, content design, navigation, intuitiveness, accessibility.
Forms of e-learning	Dimension of form of application of teaching resources of e-learning, structure, types and forms of e-learning.
Technology	Tehnological dimension of e-learning consideres questions of technological infrastructure in e-environments. This includes planning of infrastrucutre, hardware and software.
Management	Management of e-learning relates to systems for learning management - LMS.
Evaluation	Evaluation of system through summary and formative evaluation. Evaluation of students' achievements.

Institutional dimension processes questions of legal and administrative regulation. Legal questions are regulated with legislations, strategic orientation and legal foundation based on whole of educational system, as a discourse of state educational policy and mechanisms for maintaining teaching quality. In order to establish this dimension of e-learning, legislative and strategic acts of Republic of Serbia were analyzed, which have direct or indirect connection with e-learning. Law on the foundations of the education system [7] says that realization of general outcomes of education and discipline is provided with total educational process on all levels of education, through all forms, ways and work contents. In Strategy of education until 2020 [8], one of the main preference regarding quality of teaching and learning process is use of advantages of ICT and different forms in on-line environment (electronic conferences, course blogs, discussion debates, electronic testing etc.); also, possibilities and conditions of some forms of distance education should be tested.

Within National strategy for young in Republic of Serbia adopted by Serbian Government in 2008 [8], young are recognized as active participants of social flows, so their education is set as a priority task of the state. In the same document, accent is put on necessity for development of mechanisms for increasing information literacy level of young people. Information literacy means knowing basics of computer operations and conformity in using already developed applications. Imperative if this strategy is integration of Serbian educational system in European educational environment. New generations of students, so called "net-generation", requires new approach to learning focused on the student. It is more than just adapting to different learning styles and giving commands of learning itself in the hands of students. This learning is characterized not only with greater autonomy of students, but also with active learning, processes of creation, communicational and participation, with different teacher roles that the difference between teacher and student is fully erased.

Ethical dimension is dealing with questions related to social influence, differences, biases, different levels of digital literacy, information availability, information culture, questions of privacy and copyright. Ethics is a philosophical category which deals with theories of values. It considers values of certain concepts and procedures, and arguments them. Ethics in education presents discipline with the goal to evaluate resolutions in educational processes according to moral principles, and to be directed towards ethical strengthening of students in different phases of life [10]. Considering that ICT use in teaching has strong motivational power on student actions, it shapes his attitudes and actions to a large degree. It is significant that many previous barriers in teaching were overcome: linguistic, cultural, geographical, social, and that alone has great ethical values. Also, learning is now much more available, sources of knowledge at students' fingertips, that is alone ethical. Worldwide, great efforts are being made on establishing ethical principles and norms adopted on e-learning level and internet action in general.

Pedagogical dimension is dealing with sub dimensions such as modern learning theories and teaching, pedagogical questions, design of e-learning content, e-didactics, efficient strategies, principles and methods of e-teaching. Basic meaning of this dimension is shaping the system pedagogically. Dimension also relates to electronic methods of delivering teaching contents for achieving wanted learning outcomes. Aspect of pedagogical validity of e-learning use is complex and is moving from psychological assumptions, through learning styles, to concrete didactical and methodical actions and solutions.

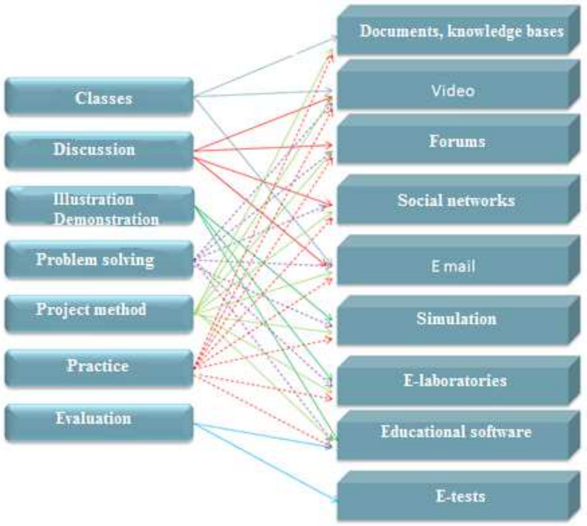

Figure 3. Methods in e-teaching, derived from [12]

Dimension of technology estimates questions related to hardware, software and planning of infrastructure. It also deals with questions considering the choice of the most suitable software for learning and ICT resources management. It processes sub dimension of infrastructure, meaning efficient servers, bandwidth and capacity, security, backup mechanisms and other questions. All technological resources are put in service of successful communication in teaching. Communication in electronic teaching as a first imperative has acquiring interactivity. Text or content publishing on web, as well as shows on radio and television, without contact with recipients, are examples of one-way communication. That depletes the prefix “e”. Meaning of electronic communication is two-way synchronized communication, dialog or timely feedback to teacher.

Focus of design dimension is on user interface quality, aesthetic look of site, respecting of intuitiveness principles, ease of navigation, usage and other questions. Instructional design is a pedagogical-didactical-technological-art interdisciplinary activity with the goal of efficient design of educational materials to facilitate desired outcomes of learning. In practice it is also called “interactive media design” and is defined as products and services of computer systems that respond to users’ actions, presenting content such as text, graphics, animation, video, audio, games etc. Interactive media design is area of fine arts that deals with aesthetic and functional aspects of interactive media use.

Dimension of management deals with defining standards of design, functioning and maintenance of learning environment. It deals with questions of quality control and security. SCORM (Sharable Content Object Reference Model)is currently one of the most recognizable and dominant standards on the market. It is a model for multiple use of teaching content for learning with computer, as well as for online learning. It is the most accepted standard that has every significant guidelines needed for design and implementation of e-education system [9]. It defines technical framework for creation of online teaching material.

Dimension of teaching resources considers all technical and educational resources that are exploited with the goal of creating meaningful and successful e-learning environment. Examples of support services are digital cooperation, computer and web supported learning. Arguments, whose validity is proven through series of scientific research for use of computers in teaching, surely lie in the fact that it is only resource that can contribute to visualization and simulation of real processes. Also, very significant argument is high level of motivation that computer itself has on young people. When it is said computer in teaching it is surely meant on educational software designed and licensed for that purpose. For example, very popular technology currently is video on-demand. It means broadcasting previously prepared video. Cameras of high resolution record video signal from Smart blackboard that allows transfer of digital pen mark to digital form. With synchronized recording of video and audio material with writing in digital form gives multimedia content that represents individual learning with the help of a tutor. Students can hear the voice of a teacher and follow the way of solving the task. Advantage of digital writing is that there is no visual obstruction with the hand or "the text is writing itself". Web 2.0 tools, known as platform of collective intelligence, enable student and teacher participation in creating the content of Web. It implies interactive two way communication between user and computer as well as with other users. Student has the role of active subject in teaching. Philosophy of Web 2.0 is to put the student in the centre of learning as an active participant, through network services (blogs, forums, portals, video services, photo galleries, web encyclopedias etc.).

Dimension of evaluation relates to estimation of complete environment of e-learning system quality, assessing development processes and contents, as well as mechanisms to measure student achievement. The term learning management system is adopted worldwide as an acronym from Learning Management System - LMS. There are many terms with the same or similar meaning. According to Alias, LMS can be defined as a software application or web based technology used for planning, implementation and evaluation of specific learning process. The most widely used LMS is a free Moodle educational environment. It has become very popular with teachers and according to research is on 9th place out of 100 most used tools in education. It is interesting that before Moodle is Twitter (on the first place!), Facebook, You tube, PowerPoint, Skype, Wikipedia [11]. In the category of LMS, Moodle is far from all others, because of its technical and educational-technological characteristic, as well as because its development is directed at new educational theories and methodologies.

V. CONCLUSION

Design of open, flexible, distributed e-learning system is a challenge, with new barriers and uncertainties for teachers. Key questions of e-learning through 8 dimensions of Khan's framework are significant in the phase of planning the institutional long-term development and action plan for informatization and modernization of education in Serbia. Surely it is significant from the aspect of teacher support and other factors included in educational process as well. When analyzing e-learning through all 8 dimensions, specific contexts of educational system, demographic and other characteristics of educational reality in Serbia were acknowledged.

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BASICS OF WINDOWS PHONE DEVELOPMENT

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Abstract – This paper gives overview of basic possibilities of Windows Phone development platform. The paper is focused on explaining core technologies used for Windows Phone development and it's application on Windows Phone project through simple example application made by using Visual Studio 2013. Example application is presented in C# and XAML beside other possibilities of the platform.

I. INTRODUCTION

Windows Phone is the next generation of Microsoft's mobile operating systems. It is a successor to Microsoft's Windows Mobile operating system and a big leap in terms of technology because of completely different user interface that was brought with this new version.

Windows Phone was initialy launched in October 2010 with version 7. Current version available to users is version 8. With its new approach to mobile phone market Windows phone severely differentiated itself from other smartphones in the market [1].

Windows Phone programs are written in .NET managed code [1]. Most commonly it is C# language, but applications can be developed by using Visual Basic .NET too. These languages are used for code behind.

There are two paths to take when talking about Windows Phone development, Silverlight and XNA platforms. Silverlight is mostly used for making applications, where on the other hand XNA is much better for game development.

Important characteristic of Silverlight is splitting of jobs in application to presentational layer and code-behind layer. XAML (Extensible Application Markup Language) markup is in charge of application's user interface. Code-behind is in charge of handling events and from controls and logic.

II. ABOUT WINDOWS PHONE PLATFORM

A. User Interface

Windows Phone is based on so called Modern User Interface (formerly Metro User Interface). Inovative feature of this type of user interface is usage of tiles and live tiles that are placed on main screen. They are icon replacement, rectangular scalable shapes that can contain applicatoin name, application related text, pictures or in case of live tiles they can contain dynamic content (Figure 1).

Figure 1. Modern User Interface (http://blogs.msdn.com/b/tfennel/archive/2012/11/13/windows-phone-8-notifications-and-tiles-intro.aspx accessed on March 3, 2014.

Amount of content presented in each tile depends of how scaled is the tile, small, medium or big. Tiles are.

Applications that are not pinned as tiles to main screen can be easily accessed by swipping main screen to left and complete list of available applications is presented.

On every phone there are 3 hardware buttons that are possitioned in a row, Back, Start and Search.

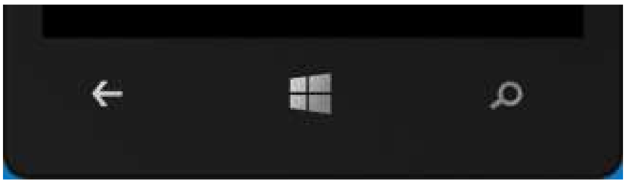

Figure 2. Hardware Back, Start and Search buttons

B. Sensors and services

Developers, and end users too, have folowing sensors and services to take advantage of while developing or using applications:

- Wi-Fi – for Internet connectivity
- Camera – for taking photos or video capture
- Accelerometer – for detecting phone movement or orientation
- Location – for detecting current location and speed
- Vibration
- FM Radio
- Push Notificatoins – notifications that pull data from services and present them only if they are updated

III. DEVELOPMENT TOOLS AND TECHNOLOGIES

A. Development Tools

All the development tools can be obtained completely free in Windows Phone App Development package which contains following applications:

- Microsoft Visual Studio 2012 Express for Windows Phone
- Windows Phone Emulator
- Blend for Windows Phone
- Store Test Kits

Also, paid Visual Studio versions are available for purchase too. For this paper Visual Studio 2013 Ultimate was used.

B. Technologies

When developing for Windows Phone, first weapon of choise, for most developers is C# programming language. In these projects it is used for code-behind.

C# is a C-based object oriented language language . It is sintatically clean language since it is hybrid of numerous language (Figure 3). C# is .NET aware language which means that it can use all the .NET framework libraries. In C# many things are made easier therefore things like pointers are not required, memory is automaticaly managed, non complex operator overload, support of anoymour methods and many others [3].

```
using System;
using System.Collections.Generic;
using System.Text;
using System.Threading.Tasks;

namespace ConsoleApplication1
{
    0 references
    class Program
    {
        0 references
        static void Main(string[] args)
        {
            Console.WriteLine("Hello World!");
        }
    }
}
```

Figure 3. C# syntax example

Silverlight XAML is technology that is used for constructing Windows Phone user interfaces. Even though it is a markup language, most likely use scenario for it is to use tools that generate XAML code [4].

```
<Window x:Class="WpfApplication1.MainWindow"
        xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
        xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
        Title="MainWindow" Height="350" Width="525">
    <Grid>

    </Grid>
</Window>
```

Figure 4. XAML example

There are few top level elements that XAML applications rely on, Window, Page and Application. In Figure 4, XAML document is shown with defined Window element, XAML namespaces (xmlns="http://schemas.m... part), window title, size and grid used for content/controls.

IV. HELLO WORLD BY WINDOWS PHONE

Making of first Windows Phone application starts with opening Visual Studio and creating a new project. It is done by going to File>New>Project>Templates>Visual C#>Windows Phone and choosing Windows Phone App project.

After that project is created and MainPage.xaml is opened (Figure 5). Project is created with pregenerated code, therefore there are more namespaces than in example from Figure 4. Also there are two controls defined in LayoutRoot grid, StackPanel with two text blocks inside, one saying "MY APPLICATION" and other one saying "page name". Second major control is another Grid named "ContentPanel" which is intended for application content (see Figure 6).

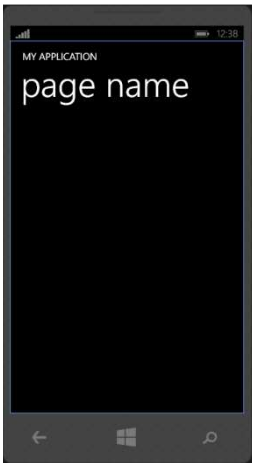

Figure 5. Look of pregenerated app template

```
<phone:PhoneApplicationPage
    x:Class="PhoneApp2.MainPage"
    xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
    xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
    xmlns:phone="clr-namespace:Microsoft.Phone.Controls;assembly=Microsoft.Phone"
    xmlns:shell="clr-namespace:Microsoft.Phone.Shell;assembly=Microsoft.Phone"
    xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
    xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
    mc:Ignorable="d"
    FontFamily="{StaticResource PhoneFontFamilyNormal}"
    FontSize="{StaticResource PhoneFontSizeNormal}"
    Foreground="{StaticResource PhoneForegroundBrush}"
    SupportedOrientations="Portrait" Orientation="Portrait"
    shell:SystemTray.IsVisible="True">

    <!--LayoutRoot is the root grid where all page content is placed-->
    <Grid x:Name="LayoutRoot" Background="Transparent">
        <Grid.RowDefinitions>
            <RowDefinition Height="Auto"/>
            <RowDefinition Height="*"/>
        </Grid.RowDefinitions>
        <!--TitlePanel contains the name of the application and page title-->
        <StackPanel x:Name="TitlePanel" Grid.Row="0" Margin="12,17,0,28">
            <TextBlock Text="MY APPLICATION"
                       Style="{StaticResource PhoneTextNormalStyle}" Margin="12,0"/>
            <TextBlock Text="page name" Margin="9,-7,0,0"
                       Style="{StaticResource PhoneTextTitle1Style}"/>
        </StackPanel>
        <!--ContentPanel - place additional content here-->
        <Grid x:Name="ContentPanel" Grid.Row="1" Margin="12,0,12,0">

        </Grid>
    </Grid>

</phone:PhoneApplicationPage>
```

Figure 6. MainPage.xaml file contents

MainPage.xaml file is followed by appropriate code-behind file. It has same file name with .cs extension added to the end, MainPage.xaml.cs (Figure 7).

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Net;
using System.Windows;
using System.Windows.Controls;
using System.Windows.Navigation;
using Microsoft.Phone.Controls;
using Microsoft.Phone.Shell;
using PhoneApp2.Resources;

namespace PhoneApp2
{
    2 references
    public partial class MainPage : PhoneApplicationPage
    {
        // Constructor
        0 references
        public MainPage()
        {
            InitializeComponent();
        }
    }
}
```

Figure 7. MainPage.xaml.cs file contents

MainPage.xaml.cs looks quite simple. It has namespaces defined with using directives. Beside this there is a MainPage partial class defined that is derived from PhoneApplicationPage. The other half of MainPage class from MainPage.xaml.cs file is defined in MainPage.xaml file (see Figure 6).

To customize this application a bit text values of <TextBlock/> control in MainPage.xaml code view are changed to "CONFERENCE APP" instead of "MY APPLICATION" and "wp demo" instead of "page name" (.

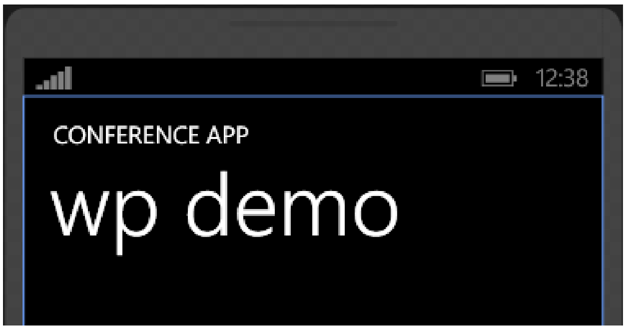

Figure 8. Text values changed, design view

To add "Hello World!" message TextBlock control was draged from toolbox to screen center in design view. It is noticable in code view that new TextBox control is added in Grid tag with name ContentPanel. Text value is changed to "Hello World!" and control is updated in design view.

Application is Run by hitting F5 button, and the results can be seen on the simulator. After that debug can be stopped with no need to close the simulator.

To demonstrate how XAML can be affected with code-behind button control was added to

ContentPanel and double clicked to create an event in MainPage.xaml.cs. For fonts to be bigger following line was added to Button_Click event:

```
HelloBlock.FontSize = 40;
```

If Hello World! font is to be in red color, "`using System.Windows.Media;`" namespase is added and following line is added to Button_Click event:

```
HelloBlock.Foreground =
new SolidColorBrush(Colors.Red);
```

Now, when the application is started after pressing the button, Hello World! font will grow and change color to red (Figure 9).

Figure 9. Final result, font has grown and color is changed to red

V. CONCLUSION

Since the smart phone revolution has taken over, mobile application development is probably the best way for students to take first steps in programming with something very close to their interests. Making first developer steps in Windows Phone application development might be even smart future investment since there are strong tendencies of unifying all Microsoft platforms, mobile, tablet and desktop.

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