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НОРМА

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Часопис излази два пута годишње у тиражу од 100 примерака.

Радови се рецензирају и категоришу.
Рукописи се не враћају.

Штампа
Службени гласник, Београд

Часопис је насловљен по *Норми*, првој школи за учитеље, основаној у Сомбору 1778. године.

Решењем Министарства за информације Републике Србије, бр. 632-1215/94-03 од 16. 01. 1995. часопис Норма је регистрован под бројем 1844.

Универзитет у Новом Саду
Педагошки факултет у Сомбору

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1/2016

Сомбор, 2016.

CONTENTS

САДРЖАЈ

Поштовани читаоци,

Пред вама је друга свеска *Норме* на енглеском језику, са 15 радова. Објављени су прилози колега из иностранства: из Словачке са Учитељског и Природно-математичког факултета Универзитета Матеј Бел у Банској Бистрици; из Румуније са Учитељског факултета West University у Темишвару; из Босне и Херцеговине са Природно-математичког факултета Универзитета у Сарајеву; из Мексика са Benemérita Universidad Autónoma da Puebla, México. На страницама и овог броја *Норме* своје прилоге објавили су професори са Универзитета у Новом Саду: Педагошког факултета у Сомбору, Учитељског факултета на мађарском језику у Суботици, и Природно-математичког и Филозофског факултета у Новом Саду; као и Универзитета Сингидунум из Београда.

Један број радова представљен је на међународној конференцији која је под називом Multi-dimensional Aspects of Learning and Teaching in Science and Mathematics Education (*MALT'14*), у организацији Педагошког факултета Универзитета у Новом Саду, одржана 3. и 4.октобра 2014. године у Сомбору.

Уверени смо да одабрани научни и стручни радови објављени у две свеске *Норме* на енглеском језику, представљају вредно научно и стручно штиво.

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STRUČNI ČLANAK
PROFESSIONAL PAPER
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ICT IN UPPER SECONDARY EDUCATION OF MATHEMATICS

Summary: We have created an electronic course in the Learning Management System MOODLE to make Mathematics more attractive for students. This course is dedicated to support geometry teaching, especially the theme Locus. It is designed mainly for students of secondary schools and grammar schools. The course contains textbook, interactive presentations that are supported by GeoGebra applets, solved and unsolved problems. Teachers can use these materials throughout whole lessons - in presentation and application of new subject matter, for review and evaluation. In our paper we focus on the usefulness of information and communication technologies integration in educational process and we present our electronic course.
Key words: information and communication technologies, electronic course, LMSMoodle, Locus, upper secondary education

Information and communication technologies

Devices of information and communication technologies are considered as inseparable part of everyday life. Stoffova defines them as "methods and techniques of searching, collecting, processing, verifying, selection and evaluation of information and also their distribution and prompt delivery of required information to consumers in desired form and quality." (2001). While working with information, we use traditional media such as television, video, radio, computers and devices for digitalization, internet and integrated educational programs.

People are not aware that they receive and work with information daily. They perceive surroundings by all human senses - sight, hearing, taste, smell and touch and they treat them as natural. It is necessary to integrate into education process, what

young generation consider as natural. Therefore information and communication technologies should became common constituent of education process.

In present school the emphasis is put on such education, where all attention is paid to learners. Slovak national curriculum claims that teachers have to prepare learners for real life and their future professions. Learners do not need to receive knowledge and skills passively from their teachers, but they ought to reach them by discovering, experimentation, investigation and by stating and verifying hypotheses.

Information and communication technologies can be used in all stages of lessons - in motivation, revision of already taught subject matters from previous lessons, in presentation of new subject matter and also in practicing. They can be used as effective tool for verification and evaluation of learners' knowledge and skills acquired throughout lessons. Modern technologies offer learners clearness, interaction and the ability of experimentation. Simultaneously they make lessons more attractive and tempting. Using of animations, applets or illustrative pictures livens up every lesson. Learners have an ability to discover new knowledge by themselves. They make their own solutions, so it is common they make some mistakes. In a case of incorrect problem solving, they have an option to return back, find the wrong step and continue in solving. They can state new hypotheses and subsequently verify them (Baramkova, 2008).

Effect of computers on education

- Computers create an attractive background for learning that does not harm learners, on the contrary, it attracts them and makes them curious. Children have a possibility to think about problem solution without being afraid that they become the object of ridicule in classroom. Unlike some children, computers do not mock those, who need more time for task understanding and problem solving. Last but not least, they also help those ones who have troubles with grammar rules or calligraphy to create readable notes with no mistakes.
- Each person uses their own learning style and has own rate of learning and therefore different requests for learning process. Computers can adjust to individual needs of learners and respect their specific requests, so they can work in such rate that is suitable for them, they can return back to whatever part of subject matter and then continue in learning. Most of software asks learners for explanation of made steps in their solutions, they allow them to start and stop at whatever part of solution and in contrary with teachers, they gives learners an immediate feedback.
- Computers offer children the opportunity to be successful in fields of study that were usually too difficult for them. They can cause that learners become enthused by subject, which they do not like before. Using computers in process of education decreases the risk of failure in collective. Sometimes a child who did not reach good results in the subject taught without integration of ICT reaches better results than his classmates.

- Various types of software allow learners discover dependence between quantities more easily and illustratively. They also show the effect of parameters on dependence development. Learners do not need to waste their time with tedious numerical calculations, but it does not mean they do not have to deal with numerical operations (Cernochova, 1988).

It is well-known that popularity of Mathematics as one of school subjects is very low. Integration of information and communication technologies into educational process could contribute to make Mathematics more attractive for learners and motivate them for deeper interest in this subject. ICT allows individualization of tasks, so each learner receives tasks that are appropriate for his knowledge, since teachers can think about the level of demands and time limit for problem solving. Learners have an opportunity for longer experimentation with input data, verifying their hypotheses and investigation of reached results and so teachers can create more difficult tasks from real life. Various types of software are very helpful mainly in clearness, because teachers are able to support their explanation and demonstration of new subject matter during lessons with illustrative pictures, presentation and applets (Fulier, 2005).

E-LEARNING

E-learning is a type of learning process that uses electronic devices for acquiring and subsequent using knowledge. It includes either complete educational courses or their parts. Huba defines e-learning as a system of education with central role of a learner who uses electronic methods of processing, distribution and retaining of information. Learners use modern information and communication technologies when they study a content of a new subject matter and when they solve tasks. E-learning gives opportunity to evaluate students according to different criteria among which belong time needed for solving and solving methods. Electronic methods allow learners to communicate among themselves and besides they administrate and coordinate educational process (2007). “E-learning area is quite extensive. It covers both creation of interactive electronic courses and management of education by various learning management systems. Courses are made of texts supplied with illustrative pictures, simulations, animations or videos and may be supported also with sounds. They usually contain tests that evaluate level of learner knowledge and what is more, they give learners immediate feedback.” (Hanzel, 2011).

We differ between two basic types of e-learning - off-line and on-line learning.

1. Off-line learning is a type of e-learning where learner does not need the net connection since he receives all materials on various digital media (CD, DVD, USB storage). This type of learning is used as a support of direct education in schools and it is called blending learning.

2. On-line learning is a type of e-learning where the net connection is necessary. Complete study material is distributed through net connection. On the one hand, there is synchronous learning that requires constant net connection. In the same time, learners are in contact with other learners and also with a teacher, who can manage the process of education by reactions on learners' tasks solutions. On the other hand, asynchronous learning is usually understood as self-study trough ICT. Learners do not need to study at the same time, they use materials on web sites, communicate among themselves via mails, weblogs and discussion forums. This type of learning allows learners to choose individual time rate of study, that is useful mainly in upper levels of education or if there are too many students in one course. But some problems with feedback should occur.

Teachers using e-learning have to prepare and manage their lessons conscientiously. First of all, they have to prepare quality study materials for selected subject matters, which should be prepared to be interesting and attractive for learners. The first impression is very important for learners. If they pay their attention, learners became curious and motivated for acquiring of new knowledge.

LMS (Learning Management System)

Education realized via internet cannot be understood just like digitalization of texts supplemented by animations, illustrations or applets. It should be understood as systematization of education in complete electronic learning course. Learning management system serves for organization and management of learning process. Each member of the course has assigned roles, which differs in extent of competences. LMS is a software application for the administration, documentation, tracking, reporting and delivery of e-learning educational courses. It contains tools for administration of the course, then tools for communication among its members and furthermore tools for testing and evaluation of learners results.

There are plenty learning management systems that differ in offered tools and functions, and the quality of each system are judged according to them. The first-rate LMS should be able to manage all types of e-learning education from integration of courses in classrooms (blending learning) to managing of electronic asynchronous courses. Quality LMS gives users accounts with passwords. Each member of course assigns a role with different competences. For example, they should be divided into groups since each group has different access to study materials. Teacher assigns a role of controller and administrator of the course and through LMS teachers have an opportunity to monitor test results of each student. System also shows dates where learners hand in tasks. Communication necessarily makes very important part of each course. Members can communicate among themselves, then with their teacher and also with

the educational institution in a form of chat or forum for discussions. Learning management system (LMS) takes over control role of a teacher (Hanzel, 2011). Software that allows managing of education, preparation of study materials and administration of data and databases is called Learning Content Management System (LCMS). Connection of LMS, LCMS and tools for communication creates Web Learning Environment and Moodle belongs to the most popular and well-known ones.

LMS Moodle is open source product that means it promotes a universal access via a free license, although it is protected by copyright. Users can modify and use Moodle on condition that they will not remove neither copyright nor original license. This software is worldwide spread. More and more people all around the world participate on improving its quality. Many teachers consider it as a popular tool for designing of dynamic web sites and courses for their students. The advantage of such courses is that learners are not limited with time, so they can educate themselves whenever and wherever they want. It is useful for those learners that have problems with shortage of time during time limited lessons. The next advantage is that learners make progress on their own rate of acquiring of new knowledge.

Educational software

Educational software is a type of software that is especially designed for education and is purposefully used for supporting of teaching and learning process. In schools there are used various general professional text packages that were not primarily designed for education (text, table and graphic editor), multimedia encyclopedias and some computer games. All educational software should develop literacy of working with information and communication technologies. The best way human learns is by observing and experimenting, therefore all of them ought to be interactive. They should develop associative learning, so they would help people recognize relations and associations between different objects. They have to give learners immediate feedback and also notice methods used for task solution, and also results of learners' work and consequently evaluate them. It is useful if they illustrate mistakes learners made while solving problems. Evaluation should not be just in form of giving points, but it should offer some king of praise or little reproof which should be understood as aid and encouragement for further work (Zidova, 2008).

Mathematical dynamic geometric educational software

Interactive geometric software is computer program that allows us making and subsequently manipulate with geometric constructions of plane and solid geometry. In the most of such software each construction began with making of some points that are

used to define new objects (lines, circles, and so on). When the construction is complete, we can move with points, change parameters and observe the changes that occur. There are two basic types of educational geometric software - supporters and dynamic programs. Supporters do not allow moving with objects and changing parameters, so learners should study just predefined objects. On the contrary dynamic programs allow manipulation with individual geometric object, changing of their shape and size, what enable to observe all solutions of geometric problems.

Educational dynamic software gives space for creation of interactive constructions that learners and teachers use not only for solving of geometric tasks, but also for investigation of interactive relationships between components of constructions. Among such software we include for example Cabri geometry, Compass and Ruler, GeoGebra and many others. When we change the position of basic geometric figure, we automatically change a position of all dependant figures. So we can observe a set of all possible solutions according to choice of positions of given figures. They give users an opportunity for experimentation, development of creative thinking, making and verifying hypotheses. They develop imagination and creativity. Hejny claimed that one of the basic aims of teaching plane geometry was acquiring skills in drawing, working with rule, protractor and compass, and in accuracy (1989). Without any doubt, learners have to know using of standard aids such as ruler, compass and protractor for improving their quality of drawing and they need to know how write down the order of construction correctly. However, on the higher level of thinking, when learners have already acquired such competences, software can reduce repeated manual drawing and can help to affect on the ability of complex view on tasks solving from plane and solid geometry. They should be able to use modern media for application of knowledge, among them dynamic software.

The aim of these kinds of mathematical software is to help teachers with demonstration of more difficult and time-consuming geometric constructions. However, they need some skills for working with programs and, of course constructions ought to be prepared ahead. It is common that learners are more skilful in using of programs than teachers who are not able to help them with solution of particular difficulties.

In both plane and solid geometry there are many tasks which solutions depends on the position of input figures. Among such tasks belong those, which use locus. If learners draw solution into their notebooks, each of them has a solution which differs from the others and also from the one on the blackboard. Interactive software helps learners change the position of figures and observe the change of final construction. Each geometric task contains draft, construction, proof of solution correctness and discussion about amount of solutions. In a case of using interactive programs, learners can simulate all basic positions and they can illustratively present their hypothesis about the number of solutions and so check solution rightness.

By using of applets teachers have an opportunity to explain subject matter for learners more illustratively. They can clarify algorithmic techniques (for example

graphic summation of line segments), then interpret and prove mathematical relations (sum of inside angles of triangle equals to the straight angle) and they do it for better explanation and easier memorization of mathematical rules. The aim of demonstrative animations is to catch learners' attention, increase the clearness of education, demonstrate principles of various techniques and show changes of solutions by changing of input data.

GeoGebra

GeoGebra is mathematical software dedicated to teaching mathematics which can be used from basic schools up to universities. Like LMS Moodle, GeoGebra is open source product and learners can find and download it for free from official webpage in many languages. It is usually used as dynamic geometric software, but it also covers basic algebraic functions and so connects algebra with geometry. On the one hand, GeoGebra is interactive geometric software where we can make constructions with points, line segments, conic sections, vectors and so on and dynamically change them. On the other hand we can input coordinates and equations of analytic geometry directly, because GeoGebra has an ability to work with variables for numbers, points and vectors.

There exist free database of educational materials created in GeoGebra. All applets from this database are placed at users' disposal and after free registration users have a possibility to insert their own materials and collections of them. They can also comment on each applet, so the quality of materials still improves. Teachers would like to use such materials as an aid during their lessons, but there are not enough applets in Slovak language. However, there are plenty materials in English language, that should be used as patters for Slovak ones.

Nowadays, we can find computers with net connection nearly in each household. Children in kindergartens are in touch with computers, although they use them mainly for playing various educational games. Computers present attractive form of knowledge inquiry. That is why not only computers, but all information and communication technologies should be integrated into process of education in all types of schools. To make education process more effective, teachers have to improve competence of working with information and communication technologies and subsequently be able to apply potentiality of using of ICT in education. In Slovakia, there were created and still are created many projects that are interested in integration of information and communication technologies into educational process and also projects that help teachers improve their skill in working with computer, programs and software. We have decided to design electronic course in Learning Management System Moodle that is meant mainly for schools of upper secondary education (secondary schools and grammar schools).

Slovak national curriculum divides subject matter of Mathematics of upper secondary education into five thematic spheres:

- Numbers, variables and numerical operations,
- Relations, functions, tables, diagrams,
- Geometry and measure,
- Combinatorics, probability and statistics,
- Logic, rationalization, proofs.

In our work, we have decided to focus on Geometry and measure and we put together a theme Locus from plane geometry. In pursuit of help students of secondary schools and grammar schools in knowledge acquiring by more attractive way and deeper understanding of new knowledge, we have created electronic learning course. Learners have an unlimited access to study materials anytime and anywhere they are. They have an opportunity to go back to those parts of course, that were not comprehensible for them at first sight and they receive immediate feThe course consists of five parts: a textbook, a set of lectures, solved and unsolved problems and tasks for evaluation.

1. The textbook consists of definitions of all types of locus with their proofs that are designed as applets in program GeoGebra. All applets are fully interactive, so learners can regulate input data and then they observe correctness of proofs.

There is an example of one chapter in textbook, concretely the one that focuses on the set of points under which we see the line segment under the angle , y G (0°, 180°).

1.5 Mnozina Q

Dalsou mnozinou bodov danej vlastnosti, ktoni casto vvuzivame pri rieseni liloh je tzv. mnozina ***Q.*** Pod mnozinou Q rozumieme mnozinu vsetkvch bodov v rovine, z ktorvch vidime danvi lisecku AB pod danvm uhlom y,y G (0°, 180°). Kvoii strucnejsiemu vyjadrovaniu budeme pre mnozinu vsetkvch bodov, z ktorvch vidime lisecku AB pod uhlom ***y*** pouzivat oznacenie Q^y Z vety o obvodovom a stredovom uhle (veta 1.4.1) vvplyva, ze mnozina Q je zjednotenie dvoch kruznicov\'ch oblukov ***k, k'***s krajn\'Tni bodmi ***A, B,*** ktore do mnozinv ***Q*** nepatria.

Uvedieme konstrukciu mnoziny

Image 1: Study material in textbook

The next two pictures show the change of applets with varying of the size of angle y.

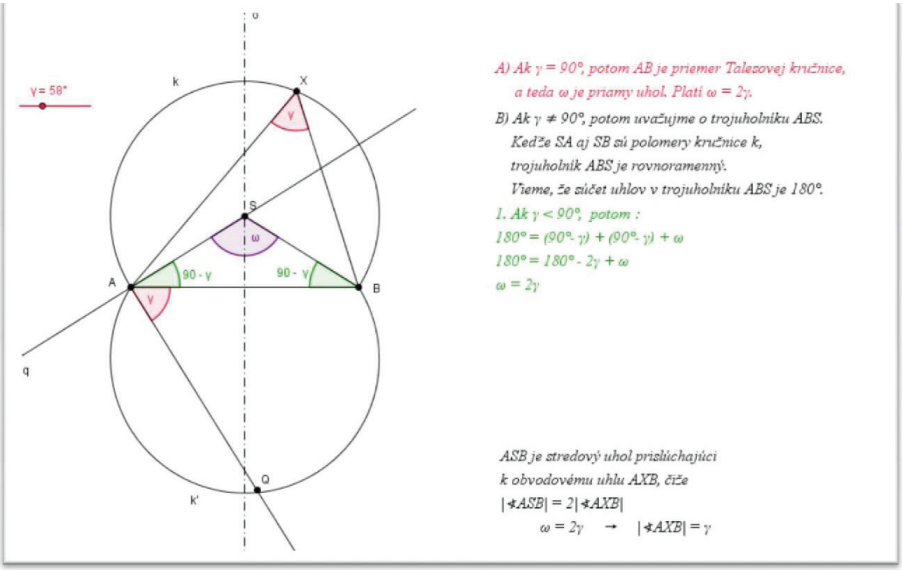

Image 2: Proof if γ is less than 90°

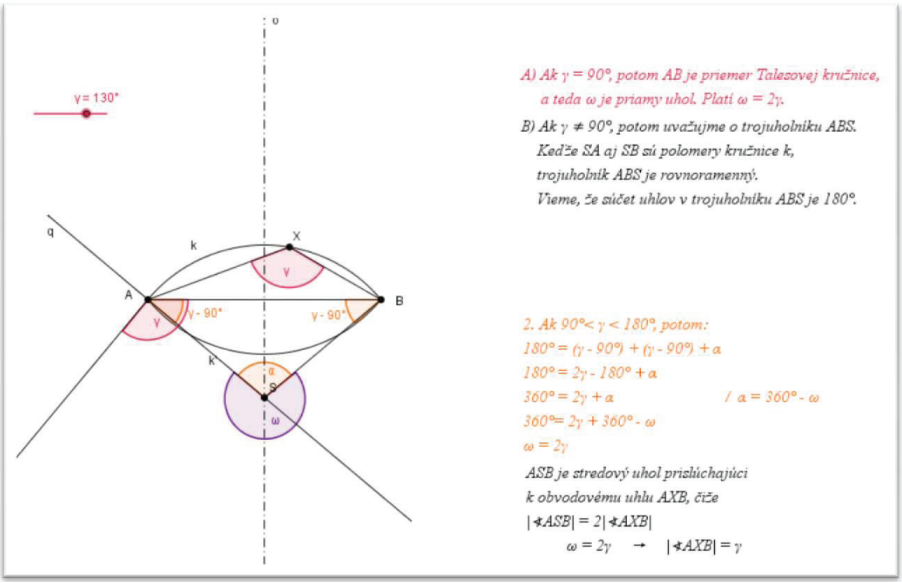

Image 3: The proof if γ is more than 90°

2. The set of lectures serves for explication of basic concepts of subject matter. Each lecture is supplemented by one or two tasks which are solved in

dynamic software GeoGebra. Task processing gives learners' solutions full play, because we have divided plane of drawing into two parts - the first one is blank, designed for learners' own solutions, the other one contains whole construction, where learners uncover constituent elements step by step. Learners can compare their solution with the prepared one and by this comparison they receive immediate feedback. Each lecture includes some unsolved tasks whose assignment is given in GeoGebra sheets. Learners just open these sheets, solve problems and send their solutions to teachers, who have competence to check and comment on their solutions.

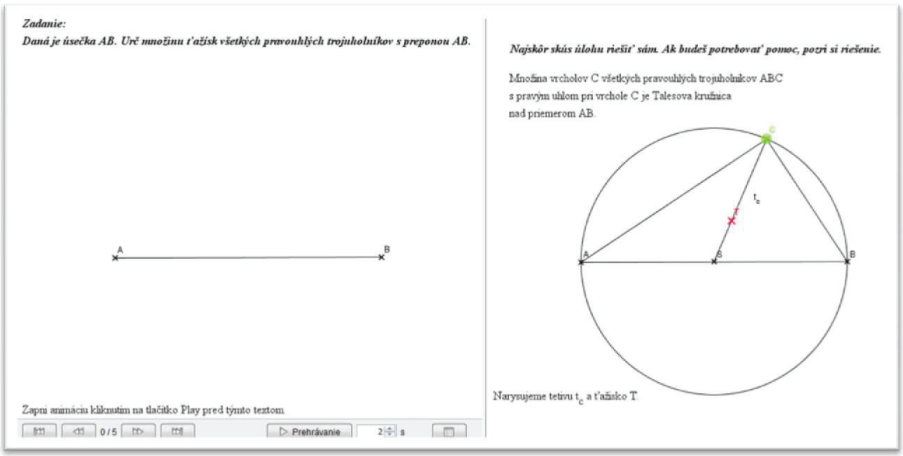

Image 4: Task with solution

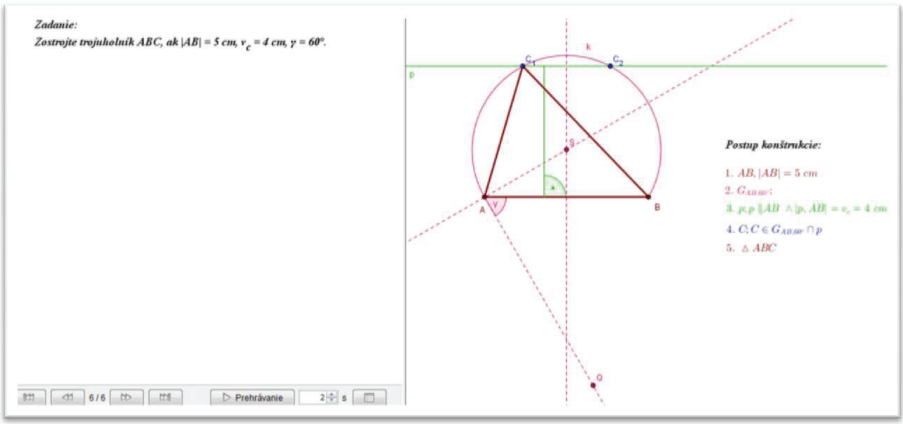

Image 5: Task with solution

3. There are also some tasks that serve for teachers to evaluate learners. Teachers can change the date of task uncovering and they determine time period for solving.

One important advantage of electronic course is the possibility of mutual communication with other members of the course. Learners can use chat or forum of discussion, where they can share individual thoughts and ideas for problems solving. The next advantage is that if there are some misunderstandings in handed in solved tasks, teachers can comment on them and learners have an opportunity to correct them and send again.

One of just unfulfilled aims of our work is making of a test that would consist of questions from theoretical part of locus with an opportunity to select a correct answer. It should be created to help learners with uncovering of their lack of understanding.

When the electronic learning course is complete, we want to use it in direct educational process in a form of blending learning. As we have said, it is designed mainly for upper secondary education, so we have selected several secondary and grammar schools where we want to teach students with aid of this course personally and other schools, where we want do offer our course to teachers of Mathematics as a supplement study material. We want to compare the learners' results of classes where teachers integrate our course into education with results of those, where it was not integrated. As information and communication technologies represent very attractive and modern way of education, we hope our course will help learners in reaching better evaluation and in easier acquiring of knowledge. We desire our course will inspire teachers in creating their own courses.

References

Hanzel, P. 2011. *Vytvorenie elektronickeho kurzu v LMS Moodle.* Banska Bystrica : UMB.

Сажетак: Креирали смо електронски курс у систему за управљање учењем *MOODLE*, како бисмо учинили математику атрактивнијом за ученике. Овај курс је посвећен подршци наставе геометрије, посебно теми *Простор*. Дизајниран је углавном за ученике средњих школа и гимназија. Курс садржи уџбеник, интерактивне презентације које подржава GeoGebra applets, решени и нерешени проблеми. Наставници могу да користе овај материјал у току целе наставне јединице – у презентацији и примени новог градива, за проверу и оцењивање. У нашем раду усмерили смо се на могућност информационо-комуникационих технологија у образовном процесу и представљамо наш електронски курс.
Кључне речи: информационе и комуникационе технологије, електронски курс, LMSMoodle, простор, средњошколско образовање edback.

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DIGITISING MEMORY SOURCES BY USING THE NEW MEDIA TECHNOLOGY
Case Study: www.memoriabanatului.ro

Summary: The site www.memoriabanatului.ro was created by a team of teachers from the West University of Timişoara as part of the CNCSIS project bearing the title "Memorial Practices in an Intercultural Context. Case Study: Banat", coordinated by Smaranda Vultur. The site represents a bibliographic and documentary base focusing on the history and memory of the people in the Banat area, at the same time being a valuable source for all those interested in different social aspects: family life, education, inter-ethnic relations, regional history, etc.
With this project, we meant to link several Timişoara archives: the Folklore Archive of the West University, Timişoara, the Oral History Archive of the Third Europe Foundation, Timişoara and family archives. By accessing the site www.memoriabanatului.ro, one can browse the databases containing information about the literary sources that explore the theme of local or regional history or memory, an inventory of the Banat monographs, diaries, letters, oral history and folklore sources. One can also find photo albums of the main villages or towns in Banat.
Key words: digitisation, memorial sources, website, Banat, Oral History.

'Memory only tries to save the past in order to help us understand the present and the future. Let us have collective memory serve the freedom and not the imprisoning of people.'
(Jacques Le Goff)

The new media systems have had an impressive development during the last decades. The new communication media have attracted more and more supporters of all ages belonging to all social categories. However, the youth represents the largest category of users of this technology. Teenagers' growing access to the Internet led to the consistent growing of the role that this communication medium plays both in their education and in their socialisation. The new media systems contain besides web pages, various ways of digitising information in electronic format.

Social and humanistic subjects focus on the development of several competences that should allow students the integration into a society characterised by an accelerated change of the value and attitude models. In order to make known the social phenomena and processes, the teacher has to use active methods and to be permanently anchored in the social reality by making use of several innovative didactic means. The aim of the paper present is to discuss the teaching potential of a new media system that can be accessed on-line both by the teaching staff and researchers, and by pupils and students.

The last decades have been characterised by the pupils' growing interest in the history of everyday life and in the different organisation forms of social and collective memory. The various national or international projects have had as objectives the facilitation of the inter-generational dialogue, the rediscovery of the past by remembering it and by using documents with an autobiographical character. For example, within the project 'History and Teaching History in South-Eastern Europe' of the Stability Pact for South-Eastern Europe, a group of researchers from several European universities have carried out a number of projects, aiming at stimulating the pupils' curiosity and interest regarding the past of the people who lived in South-Eastern Europe. Beside scientific books, one also published supplementary teaching materials. One of these focuses on family and gender relations during the 19th and 20th century, and the latter centres on past childhood. The 'EUSTORY' ('My History') network, which presently brings together 19 countries, has the goal of stimulating the pupils' curiosity about history and the discovery of the community that they are a part of. 1470 young people participated in the contests that took place in our country and the result was the publication of four anthologies of texts coordinated by Luminiţa Murgescu. Apart from using active-participative methods of learning, the contests have awoken the pupils' interest towards the use of oral history sources and facilitated the insertion of valuable documents discovered in family archives in the scientific field.

Among the important resources that one can access online, one can take into account the site www.memoria.ro, coordinated by 'Aspera' Foundation of Braşov. Lidia Gheorghiu Bradley, the manager of the project, emphasises the importance of studying the communist period during the high school years and shows how the resources available on this site can be used in the teaching process. The site contains both oral history interviews, and articles, studies, book reviews and books having an electronic version.

One of the projects recently initiated in Timişoara has as an objective the introducing of the subject 'The History of Timişoara' into the high school education system. The study of the regional history and of the various aspects of the Banat community life allows pupils not only to go deeper into the knowledge concerning the region they are a part of, but also to meet other objectives specific to the social and humanistic subjects. Various themes of the school syllabi can be much more easily learned by using real examples taken from the local or regional life.

The site www.memoriabanatului.ro was created by a team of university teachers from West University of Timişoara, as a part of the CNCSIS project bearing the

title 'Memory Practices in an Intercultural Context. Case Study: The Banat Region', coordinated by Smaranda Vultur. The site provides a bibliographic and documentary basis on the theme of Banat history and of Banat people's memory, being, at the same time, a valuable resource for all those interested in various social aspects: family life, education, inter-ethnic relations, regional history, etc.

Under the umbrella of this project, we wished to link several archives existing in Timişoara: the folklore Archive of the West University of Timişoara, the Oral History Archive of the 'Third Europe' Foundation of Timişoara, family archives, as well as to make an inventory of several types of memorial sources: monographs, literary sources, diaries, correspondence, etc. Also, there are photograph albums of the main places in Banat.

In the main menu of the site www.memoriabanatului.ro, Smaranda Vultur, the project co-ordinator, states that each of the memory sources refers to a specific type of memory practice. Thus, monographies are works that present a town, an institution, a community, a field of activity, a street; works analyzing significant facts (events) emphasizing the role played by a town, institution, family, personality, etc in a wider context; works presenting and analyzing personalities, specific institutions; works filing towns, institutions, individuals, etc; works describing and analyzing communities, traditions, customs, gestures, practices, etc. As a form of memory discourse, the monography enables us to look into the relation between memory and history and the way various social entities use and manage the memory and the history of certain communities, places, institutions, families, etc, giving us access to a very rich and rewarding material in terms of the cultural history of a region where this practice enjoyed a lot of prestige and success. Historian Vasile Docea was especially concerned with this segment of research.

Literary sources, namely works of fiction that contribute to the imaginary moulding of a theme and the formation of the memory of a place or moment. Adriana Babeţi and Cornel Ungureanu, who were in charge of processing and selecting those sources, had in mind works by authors writing in several languages specific to Banat. The introduction of these sources in the database was preceded by a typological classification of these sources available in several languages (Romanian, German, Hungarian, Serbian, Slovak, etc.) and by their analysis in terms of memory practices and cultural identity themes. Resulting from previous personal projects or projects run by the 'Third Europe' Foundation on Central European literature, the selection made by Adriana Babeţi and Cornel Ungureanu within the Banat literature takes into account its inclusion in a wider context than the regional one and the work experience in the Dictionary of the Central European Novel.

Memoirs and diaries (of various types, including travel accounts) have a borderline status, being placed in between autobiography and fiction. They were registered and introduced in the database without taking into account these peculiarities. We selected, among autobiographical memory practices, both published memoirs and diaries and manuscripts in personal or family archives or available in the archive of

the "Third Europe" Foundation. As in the case of other types of sources, the database specifies their location or place of publication, the period they refer to, the themes they focus on. The entire team processed, selected and introduced these sources in the database. We also focused our attention on volumes of literary correspondence where references are made to places in Banat or various aspects of life in Banat in different historical periods.

The category of the oral sources included two aspects: oral sources with an ethnographic character and oral history sources. The oral sources from or with the character of ethnological documents belong mostly to the Folklore Archive of the West University, coordinated by Otilia Hedeşan and her field research. They are either stories with a memorial character told by the interviewees or ethnographical documents proper about practices, rituals, customs. As in the case of the other sources, the description with the help of thematic indices enables us to link these sources with the others used in the database.

The oral history sources that one refers to in the site belong to the Oral History Archive of the 'Third Europe' Foundation of Timişoara. This archive was created in 1997 by a group of students and researchers brought together under the name of the Group of Oral History and Cultural Anthropology coordinated by Smaranda Vultur. The archive contains more than 800 hours of life-story interviews and 30 directed interviews concerning the life memory of people who lived or are still living in Timişoara. One can also find interviews taken by students or master students on various specific topics. The archive interviews are transcribed; the majority are edited on a computer and accompanied by photographs and other personal documents in many cases. The interviewed persons belong to the generations born in between 1908 and 1965. Our interviewees, men and women, belong to several generations (starting with those born during the first decade of the 20th century), ethnic groups, religions, social strata, etc. – the diversity of the situations was the very principle of selecting the sources for the database and the one that makes the archive more valuable. This diversity, a direct result of the multiethnic profile of the studied region (Banat) can be noticed throughout the interviews.

We wished it were easier for the youth to access this archive, which is why we digitised it. Thus, the site www.memoriabanatului.ro allows one access to a database that contains information about each interview that can be found in the archive. The interview record contains data about the interview (its date, duration, the interviewer's name, information concerning its publication), data about the interviewee (the birth year, gender, ethnic group, religion, etc.), and then the topics discussed in the interviews and the documents attached to it are made an inventory of.

The topic indexes that lay at the basis of every interview content analysis are organised taking into account several criteria. These criteria refer to the historical period or the events that the interviewee mentions, life stages (birth, childhood, adolescence, maturity, death) or various topics that are focused on, some of them more general such as *political history, administrative organisation* or *social life, celebration, education,*

family, ethnic group, religion, identity, memory, and others more specific such as *internment in USSR, world war, Fabric* or *Iosefin neighbourhood, group of friends, Loga high school, relationship with parents, carnival, party, Christmas, the Catholic dome, choir, fanfare, monument, Germans, Jews, Hungarians, Romanians,* etc.

The search can be made by using an interactive map of Banat, on which the main places, about which information is made an inventory of, are mentioned. By selecting a place, all sources of the databases are shown. One can also choose a thematic search with the help of key words.

The biographical material has enormous scientific potential, as J. Eliott states. Stories can be used in order to make connections among the major processes of social change and the real experience of social groups. A second advantage of biographic studies is that, unlike cross-sectional studies, they allow the study of the temporal evolution of social phenomena, as it is the case with longitudinal research.

The people who tell the story of their life do not only remember what they have been through, but also offer their own personal interpretation. Thus, we find out information regarding 'the values and beliefs that guided their actions, their silent ambitions, aspirations and strategies that influenced them' (Elliott, 2005, p. 308).

The biographical methods explore the manner in which individuals build a society and the manner in which the society shapes them, constantly encouraging us to shift our attention from the individuals' unique specific experience, to the regularities that allow us to identify the models of social change. Ferrarotti speaks about the identification of the most important areas among structures and individuals, of the social fields in which social systems meet people's unique experience (Ferrarotti in Elliott, 2005, p. 320).

Comparing the perspective that the historian offers on the social reality with that of the sociologist, Rock notices that 'subjective realities are irrevocably inaccessible to the historian' (Rock in Elliott, 2005, p. 321). As far as recent history is concerned, both historians and sociologists can benefit from biographical stories as they rediscover events and their meanings. Both categories of researchers can interrogate persons that have lived moments of major social change and whose actions or beliefs have been influenced by these (Elliott, 2005, p. 305).

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Referring to a book by Maurice Halbwachs, *'Les cadres sociaux de la mémoire'*, S. Vultur (2000, p. 334) notes that the past is recaptured by the person that tells

his/ her life from the perspective of the present 'social frameworks'. The storyteller has the tendency of interpreting the events lived, of lending them meaning according to his/ her values and beliefs. Life-story is not a process of 'immortalising the I', as for example, a photography would, but a process of building identity. Consequently, identity is not a finite work, but a dynamic construction, elaborated through the medium of the social interactions with 'the Other'.

Autobiographical stories are most of the times built in relation with the great historical events. Oral history interviews show the way in which people perceived traumatising events: anti-Semitism, the Second World War, the deporting to Bărăgan or USSR, the instauration of communism, collectivisation. The mechanisms of family adaptation, of individual survival and the manner in which life paths have been modified related to these events are emphasised.

The past influences the present, being reconstituted by the person who lived it as life episodes, the most significant of them being integrated into the life-story. People try to reduce the cognitive dissonance while narrating their lives, making an attempt at ensuring the continuity and internal coherence of the story. The life-story is fluent every time, the individuals 'explaining' themselves, rationalising, justifying their choices or actions. A life is a project or a set of unfinished projects. The subject tries to define his identity or his personal biography according to these projects.

The development of the generational consciousness is correlated with the fast rhythm of historical and axiological changes and many times implies a set of structural and symbolic discontinuities. Collective historical events and social changes leave their mark upon successive generations in a different manner. Regaining the past is a vital step of the social transformation process, and the comparative analysis of the various social processes and phenomena allow the grasping of the social reality by the new generations.

The study of memory practices of various types, from the perspective of how they include and reinvent a local intercultural tradition, is the ideal way to explore the connections memory has with history, with identity themes, with changing mentalities, with the reconfiguration of the range of values deemed important by the society at a given moment. The theme of identity is interesting in the sense of the connections that can be made at a local – regional – national – European level. Associated with the theme of memory, it is of special interest in a pluriethnic context such as the object of our study, in a Romanian frontier region, which gained symbolic prestige after its involvement in the 1989 Revolution and where the economic and social dynamics, as well as the dynamics of European integration are prominent.

The goal of today's Romanian educational environment is that intercultural competences be developed. This theme has been fiercely debated during the last decades, as an answer to the phenomena of increasing interconnections and globalisation. The studying of the interethnic relations in Banat, the use of some case studies or of some real examples regarding the forms of manifestation that intercultural relations take in this region, offer pupils the possibility of understanding the complex mecha-

nisms that lie at the basis of interiorising some values such as mutual tolerance or openness towards alterity.

References

Bocşan, N. 1986. Contribuţii la istoria iluminismului românesc [Contributions to the History of Romanian Enlightenment], Timişoara: Facla;

Elliott, B. 2005. 'Biography, Family History and the Analysis of Social Change', in R. Miller (ed.), Biographical Research Methods, Vol. III, London: SAGE;

Gubrium, J.E., Holstein, J.A. 2001. Handbook of Interview Research. Context & Method, London: SAGE;

Popova, K., Vodenicearov, P., Dmitrova, S. 2002. Familia în istorie. Secolele XIX – XX. Material didactic auxiliar [Family in History. 19th and 20th Century. Additional Teaching Materials], Art Print Blagoevgrad;

Ristović, M., Stojanović, D. (eds.). 2003. Childhood in the Past. 19th and 20th Century. Additional Teaching Materials, Belgrad;

Thompson, P. 1989. The Voice of the Past. Oral History, Oxford University Press;

Vultur, S. 2000. Lumi în destine [Worlds in Destinies], Nemira : Bucureşti;

www.eustory-romania.home.ro

www.memoria.ro

www.memoriabanatului.ro

Сажетак: Сајт www.memoriabanatului.ro је креиран од стране тима на западном универзитету у Темишвару као део пројекта CNCSIS *„Меморијска пракса у интеркултуралном контексту. Студија случаја: Банат“* који је координисала Смаранда Вултур. Сајт представља библиографску и документарну базу усмерену на историју и сећање народа Баната, али у исто време представља вредан извор за све оне који су заинтересовани за различите социјалне аспекте: породични живот, образовање, међунационалне односе, регионалну историју, итд.

Овим пројектом направљен је линк ка неколико темишварских архива: архиви фолклора западног универзитета у Темишвару, архиви усмене историје фондације треће Европе у Темишвару и породичним архивама.

Приступањем сајту www.memoriabanatului.ro, може се прегледати база података које садрже информације о књижевним изворима које истражују тему локалне или регионалне историје или успомена, као и попис банатских монографија, дневника, писама, усмене историје и фолклорних извора. Могу се такође наћи и албуми фотографија главних села или градова у Банату.

Кључне речи: дигитализација, меморијски ресурси, Банат, усмена историја.

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FOREIGN LANGUAGE AS ONE OF KEY COMPETENCES IN PRIMARY AND PRE-PRIMARY CURRICULUM

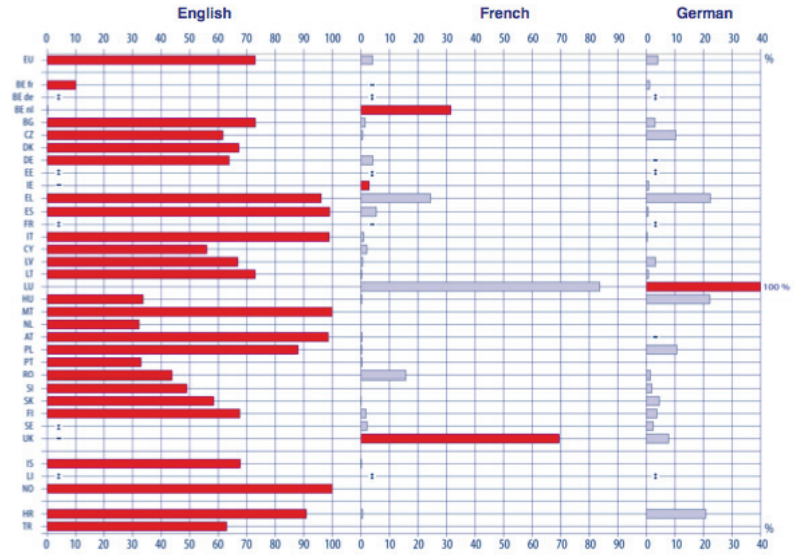
Summary: This paper offers a brief look at the current European trends in foreign language education, and their influences on primary and pre-primary school curricula. The authors based on the goals and vision outlined in the strategic documents of the European Commission illustrate the current state in Slovakia, affecting in particular issues related to ensuring continuity between primary and pre-primary level (ISCED 0 and ISCED 1) as well as issues of ensuring qualifications of teachers, their pre-graduate training.

Key words: teaching foreign languages, curriculum, primary education, pre-primary education, pre-graduate training

Coexistence in a multinational Europe requires of its inhabitants acquisition of communication skills for the common communication. In 2012, the Commissioner for Education, Culture, Multilingualism and Youth Androulla Vassilliou press release of the European Commission stated that: *"Linguistic and cultural diversity is one of the European Union's major assets. Language learning facilitates communication between people and countries, as well as encouraging cross-border mobility and the integration of migrants. I am happy to see that even our youngest citizens are being exposed to the joys of discovering foreign languages. I also encourage people to look beyond the most widely-used languages so they can appreciate Europe's incredible linguistic diversity."* (European Commission, IP / 12/990, 2012).

The school should respond flexibly to the current needs of society, therefore the introduction of broad-based, systematic and targeted foreign language teaching is a natural reaction to the new external socio-cultural conditions. According to a survey of the European Commission (Key Data on Teaching Languages at School in Europe

2012) English language is the most widely taught foreign language in European countries - percentage of students of lower and upper secondary education learning this language exceeds 90% (see Figure 1). The report also notes that during the last 15 years in most countries, the age limit of compulsory foreign language teaching lowered (see Figure 2)[1]. The report also informs that the age of students was lower, but in general, the number of hours of teaching foreign language did not increase, the report regards the time allocated for foreign languages relatively low compared with other subjects (Key Data on Teaching Languages at School in Europe, 2012).

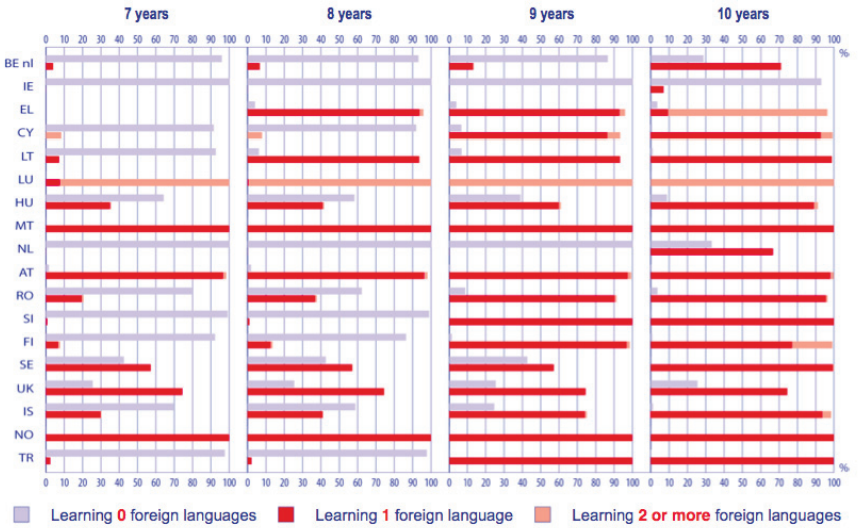


	EU	BE fr	BE de	BE nl	BG	CZ	DK	DE	EE	IE	EL	ES	FR	IT	CY	LV	LT	LU
English	73.0	10.0	:	0.2	73.1	61.6	67.3	63.9	:	-	96.1	99.1	:	98.9	56.0	66.9	73.0	0.0
French	4.1	-	:	31.5	1.5	0.6	0.0	4.2	:	2.9	24.4	5.4	-	1.0	2.1	0.6	0.3	83.6
German	4.0	1.1	:	0.0	3.0	10.3	0.0	-	:	0.8	22.4	0.6	:	0.3	0.0	3.2	0.7	100

	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	IS	LI	NO	HR	TR
English	33.7	100	32.3	98.6	88.0	33.0	43.8	49.0	58.4	67.6	:	-	67.8	:	100	90.9	63.0
French	0.3	0.0	0.0	0.4	0.3	0.4	15.7	0.0	0.1	1.8	2.2	69.5	0.2	:	0.0	0.6	0.0
German	22.2	0.0	0.0	-	10.7	0.0	1.4	1.9	4.5	3.7	2.4	7.8	0.0	:	0.0	20.8	0.0

Graf 1 Percentage of all pupils in primary education (ISCED 1) who are learning English, French and/or German - countries in which one of these languages is the most widely learnt, 2009/10
Source Eurydice (Key Data on Teaching Languages at School in Europe, 2012).

1 Explanatory note: Only languages regarded as foreign languages in the curriculum drawn up by the central education authorities are included. Regional languages are only included when the curriculum designates them as alternatives to foreign languages. Languages taught outside the curriculum as optional subjects are not included. The percentage of pupils learning 0, 1, 2 (or more) foreign languages is calculated with respect to all pupils in all years of primary education, even if such learning does not begin in the initial years at this level. The number of pupils learning 0, 1, 2 (or more) foreign languages is divided by the corresponding number of pupils enrolled at the ISCED level concerned. The figure covers only 18 education systems. For other education systems, data are not available (Key Data on Teaching Languages at School in Europe, 2012, p.56).



Graf 2 Percentage of pupils aged 7, 8, 9 and 10 learning 0 languages, 1 language and 2 or more languages Source Eurydice (Key Data on Teaching Languages at School in Europe, 2012).

Currently reform efforts in the European context go towards to the development of communication skills in two foreign languages. In this direction European Commission has identified a new benchmark, based on its aims there is one priority achivement objective, which is to about 2020, at least 50% of 15 year olds had a good knowledge of the first foreign language (from the current 42%) and less than 75% (from the current 61%) would have to study a second foreign language (Rethinking Education - country Analysis, 2012). Promoting multilingualism European Commission seeks to satisfy the following objectives:

- Promote intercultural dialogue and inclusive society.
- To help the public to build a sense of EU citizenship.
- Develop for young people more opportunities to study and work abroad.
- Develop new markets for EU companies that are competitive at the global level (European Commission, IP / 12/990, 2012).

These priorities of the European Union in language learning are reflected into the curriculum documents of its member states. Janíková (2006, p. 203) in the process of *"social system order"* sees on one hand, the positive plane (in democratic societies), but also highlights the negative consequences - such as the dictatorship of a strong ideologization and super saturation in language teaching in the curriculum, thus overloading a pupil (child).

It is obvious that in this respect it is necessary to follow current trends in member countries and try to follow them, but at the same time it is also necessary to coun-

terbalance the impact of these trends on our schools and pupil, on child. If we look once more again at the European Commission's plans in relation to the early education of foreign languages, we will find out that the Commission has developed strategic documents on which recommends all member states to develop key competences to communicate in a foreign language from an early age. Strategic Plan - Strategic Framework for European Cooperation in Education and Training (ET 2020) highlight just linguistic competence as a basic requirement of efficient and quality education systems. The purpose of that strategy is that by 2020 at least 95% of children between the age of 4 until the commencement of the period of compulsory schooling began attending pre-primary institutions, while during this period, children will also began to to acquaint a foreign language.

Even in our society since the 1990s, we observe an increasing interest of foreign language teaching. This interest not only concerns children of young scholar age, but also children of pre-school age who are attending kindergartens[2]. The acquisition of a foreign language now understand the need for lifelong learning and social interest in the foreground are getting second, questions concerning the appropriate implementation strategy, the concept of teaching foreign languages (language curriculum), as well as issues of undergraduate training of teachers of primary and pre-primary level. There is also not negligible the issue of shaping positive attitude towards learning the language.

If we return once more again to the words of Androulla Vassilliou: *"I am happy to see that even our youngest citizens are being exposed to the joys of discovering foreign languages",* we should not forget in the classroom teaching process to strengthen the internal motivation of children and creating a joyful, supportive atmosphere. Learning a foreign language young scholars and pre-school age children should build on experiential and playful learning.

Preschool children, as well as young scholar age children have the ability to learn by imitation, they have an ability to learn without repetition, thus imprinting – injection learning. Children at this age are very sensitive to external impulses, which are more easily injected into their memory without the need to increase their efforts, and what they learn is largely resistant to forgetting (Ježková, 2006). These mentioned advantages of children should therefore be understood as the teaching advantages, which need to be developed by an appropriate learning strategies and methods. Lojová (In Pokrivčáková et al, 2008, p.33) adds that every age has its advantages and disadvantages of pedagogical and psychological point of view. Calls for the elaboration of proper application take account of the following fundamental developmental-factors for the conditions of the Slovak education (curricula for schools) in relation to the teaching of a foreign language:

2 Slovak kindergartens are designated for children aged 3-6 and, in the case of free capacities, children aged 2 may also be accepted to a kindergarten. Children start attending the compulsory education at the age of 6. In Slovakia, within the possible limits of kindergartens; children have an opportunity to a first acquisition of a foreign language. Many times these lessons are under supervision of an external organisation.

1. 8-9 year old children are developmentally mature to form internal representations of another language and they are ready cognitively, emotionally, personally and socially to learn foreign language in terms of school learning.
2. During teaching a foreign language to children of young age there are essential not only cognitive, but mainly affective factors. These factors have a significant impact on success and effectiveness of children learning.
3. The success is hidden in motivation, which creates a positive attitude towards learning the language. It is important to use intrinsic motivation – such as curiosity, the need to discover or to experiment.
4. Neuropsychology highlights the importance of meaningfulness of learning; learning should be connected with children's lives - relevant knowledge and activities.
5. Effective learning must be based on the use of all senses, linking emotional and life experiences with curriculum.
6. The speed and pace of progress has its peculiarities. Younger pupils progress relatively slowly, gradually learning intensifying and accelerating the pace (in adults is the opposite trend). Teachers should not be deterred seemingly by slow progress of pupils.
7. In the language teaching applies the principle: Rather less, but pretty. Memorized phrases and words, it is necessary to repeat and practice in different combinations and contexts until such time as automation, thereby laying the foundation for confidence in foreign language communication.
8. 1) The theory of critical period notes that preschool and younger school age is the best time to develop phonetic aspects. By mimicking the appropriate language model the child receives those quality, which would be rather difficult to obtain at older age.
9. Increasing self-confidence in communication in a foreign language through positive assessment methods needs to be ensured continuously.
10. Children learn a foreign language easier when they learn unintentionally, and when natural learning mechanisms are supported – language acquisition. Not in formal awareness learning that the school often dominates (Lojová, 2008, p .33 - 34).

In general, the same professional and general public positively supports the early introduction of foreign language into the primary and pre-primary curricula, although as mentioned by Hanušová and Najvar (2008, p.17), despite many empirical researches has still not been determined „optimum age" for starting foreign language learning. The authors refer to large-scale research project by Edelenbos, Johnston and Kubánek (2006), which stresses that early introduction of foreign language does not guarantee later success. It is necessary to seek and provide quality-teaching process in particular, as well as in ensuring continuity in education – continuity between different educational levels.

We fully agree with the recommendation of researchers in the above mentioned study and we advocates to a **systemic sophistication, quality and continuity** in particular. In our country in this area, these elements in the pre-primary and primary level completely absent.

Currently, in most Slovak kindergartens teaching of foreign language (the first language acquisition) is realised, but there is no concept of teaching a foreign language for pre-primary level. The concepts were designed only for higher educational levels (The concept of foreign language teaching in primary and secondary schools, 2007), which were based on program goals of the Millennium[3] from 2001. In line with the objectives of this concept compulsory teaching of the first foreign language in primary schools began from 1 September 2010. This commitment resulted to schools from the Act. 245/2008 Coll. on education (Education Act) and on amendments to certain acts as amended, and from the State Educational Programme ISCED I (national curriculum).

The first compulsory foreign language has been included in the curriculum for pupils of the 3rd grade of primary school. The second compulsory foreign language has been introduced after implementation of new Education Act from 6 to 9 grade of primary school, at the same time the number of teaching lessons is at discretion of the school (www.minedu.sk). Despite the Education Act allows in kindergarten realisation of educational activities in a foreign language (more Ministry of Education Decree no. 306/2008 Coll., On kindergarten and Ministry of Education Decree no. 437/2009 Coll., which provide qualifications and specific eligibility requirements for each category of teaching staff and specialists, as amended) pre-graduate training of kindergarten teachers regarding this matter can not be considered as satisfactory. Teaching foreign language in kindergartens is most often provided by external organizations, by lecturers, who are not always able to take into account the specificities of preschool aged children. In addition, the organizational form which they are using, neutralizes the advantages of specific kindergarten environment which provides the optimal conditions for first foreign language acquisition – that unintentional child learning.

The criteria determining the quality of foreign language teaching are considered by many experts. Djigunovich and Vilke (2000, In Hanušová and Najvar, 2008, p.21) mention four criteria conditions, and at the same time Nikolovová (2000, In Hanušová and Najvar, 2008, p.21) adds that if only one of the condition criteria is not fulfilled then teaching of foreign language at an early age should not even begin:

- intensive interaction in the classroom,
- 45 minute time allowance per day, 5 days a week,
- groups of 10 to 15 children,
- teacher with language fluency, with good pronunciation and intonation.

3 Millenium is National Programme for Education and Training in the Slovak Republic for 15-20 years (The national program). It was drawn up on the basis of the government of the Slovak Republic in November 1998. It began working on it in 1999.

Preschool aged children and children of early school age are able to remember a lot of new words, songs and rhymes, but the intention of teacher can not be narrowed only on vocabulary development and good pronunciation and intonation. The intention of the teacher should focus more on developing the child‘s competence in natural communication in a foreign language in everyday life. Therefore the emphasis in teaching should be placed primarily on appropriate didactic procedures for pre-school children and children of young school age which will not cause aversion to learning a foreign language, on the contrary.

The choice of methods should stimulate the development of communicative skills, as well as creating an atmosphere that supports children/pupils learning. These kind of methods can be mentioned (Menzlová, Farkašová, Pokrivčáková, 2008), for example:

- Narrative audio-linguistic method (learning to listen to stories, imitating the situations of the stories talk).
- Communicative method (presenting phrases and sentence units in a meaningful context, applicable in everyday life).
- TPR (Total Physical response, so the total physical response, involving more senses in the learning process, the following are supported by various centers in the brain, the method promotes better memorizing, storing various information).
- CLIL (Content and Language Integrated Learning - Content and Language Integrated Learning).

Apart from the issues regarding insurance of continuity between the various levels of education system and matters relating to the actual language curriculum (content, teaching strategies, content integration, multiculturalism, etc.), on top “floating iceberg” gets the question of teachers competences, their qualifications and their undergraduate studies.

In Slovakia, especially after the adoption of the Concept of foreign language teaching in primary and secondary schools by the Slovak Government, on 12 September 2007 under number 767/2007 we struggled with the lack of qualified foreign language teachers. The situation has tried to alleviate a number of projects. In particular, it was the *National Project for the Education of primary school teachers in foreign languages*, which was approved in September 2008. The project has contributed to the spread of teachers meeting the qualifications for teaching foreign language in primary schools. According to the document SPI (2010, p. 7), the number of foreign language teachers in the first grade of primary school has increased since 2001 from 1,726 to 3,511 in 2009. (Menzlová, Farkašová, Pokrivčáková, 2008).

Many of the projects implemented were targeted orientated primary stage of primary schools; the issue of foreign language learning in kindergarten did not cover at all. According to Portíková (2012), the seven universities providing undergraduate teacher education as pre-primary and primary step in comprehensive training in

foreign languages are only two faculties - Faculty of Presov and Faculty University in Nitra. It is this fact that highlights the need to address the development of competence in communicating in a foreign language and develop a comprehensive strategy for its real ownership in a lifetime perspective with an emphasis starting in early childhood.

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References

EACEA P9 Eurydice. (2011). *Kľúčové údaje o vzdelávaní a inováciách prostredníctvom IKT v európskych školách 2011.* Brusel : Education, Audiovisual and Culture Executive Agency, 2011. ISBN 978-92-9201-203-8.

EUROPEAN COMMISSION. (2012). Deti v Európe sa začínajú učiť cudzie jazyky v čoraz útlejšom veku. *European Commission Press Release.* [Online] 20. September 2012. [Dátum: 9. January 2015.] http://europa.eu/rapid/press-release_IP-12-990_sk.htm

—. 2012. Strategic Framework for European Cooperation in Education and Traininig (ET 2020). [Online] 2012. [Date: 12. September 2014.] hhttp://ec.europa.eu/languages/policy/strategic-framework/documents/rethinking-leaflet/slovakia-rethinking-060913_sk.pdf.

Fenclová, M. (2004). Jazyková propedeutika pro základní školu aneb kudy do evropské multilingvní budoucnosti. *Pedagogika.* 2004, Zv. 3, 54, p. 251-260.

Hanušová, S., Najvar, P. (2008). Raná výuka cizího jazyka. [aut.] S. Pokrivčáková [ed.]. *Inovácie a trendy vo vyučovaní cudzích jazykov u žiaov mladšieho školského veku* . Nitra : Univerzita KF v Nitre, 2008, p. 13-25.

Janíková, V. (2006). Jazykové vzdělávání a jazykové kurikulum na počátku 21.století. [aut.] J. MAŇÁK a T. JANÍK. [ed.] J. Manák a T. Janík. *Problémy kurikula základní školy.* Brno: Masarykova univerzita, 2006, p. 203-215.

Ježková, V. (2006). Výuka cizím jazykúm v mladším školním věku. [aut.] J. MAŇÁK a T. JANÍK. *Problémy kurikula základní školy.* Brno: PF Masarykova univerzita, 2006, p. 216-222.

Lojová, G. (2008). Psycholingvistická báza kvalitatívnych cieľov ako východisková pozícia pri zavádzaní výučby cudzieho jazyka do primárneho vzdelávania. [aut.] S. Pokrivčaková [ed.] *Inovácie a trendy vo vyučovaní cudzích jazykov u žiaov mladšieho školského veku.* Nitra : Univerzita KF v Nitre, 2008, p. 26-37.

Lukášová, H. (2010). *Kvalita života dětí a didaktika.* Praha : Portál, 2010. p. 208. ISBN 978-80-7367-784-8.

Menzlová, B., Farkašová, E., Pokrivčáková, S. (2008). Didaktická efektívnosť metódy CLIL na prvom stupni ZŠ vo vyučovaní cudzích jazykov. [Online] 2008. [Date: 16. September 2014.] http://www.statpedu.sk/documents//31/clil.pdf .

Portíková, Z. (2012). *Model prípravy učiteľa anglického jazyka v predškolskej a elementárnej pedagogike.* Prešov : Prešovská univerzita, 2012. p. 116. ISBN 978-80-555-0514-5.

Porubský, Š., Kosová, B., Doušková, A. [ed.] (2014): *Škola a kurikulum – transformácia v slovenskom kontexte.* ISBN 978-80-557-0838-6

Pokrivčáková S., [ed.] (2008). *Inovácie a trendy vo vyučovaní cudzích jazykov u žiakov mladšieho školského veku.* Nitra: Univerzita KF v Nitre, 2008. ISBN 978-80-8094-417-9.

Štátny pedagogický ústav. 2010. Perspektívy zavedenia povinného anglického jazyka v základných a stredných školách Kvalifikovanosť učiteľov a dopad na kvalitu vzdelávania v oblasti cudzích jazykov. [Online] 20. September 2010. [Date: 17. September 2014.] http://www.educj.sk/buxus/docs/Povinny_AJ_FINAL.pdf.

Tandlichová, E. (2008). Výučba cudzích jazykov na ZŠ vo svetle reforiem. [aut.] S. POKRIVČÁKOVÁ [ed.]. *Inovácie a trendy vo vyučovaní cudzích jazykov u žiakov mladšieho školského veku* . Nitra : PF UKF v Nitre, 2008, p. 178.

Сажетак: Овај рад нуди кратак поглед актуелних европских трендова у образовању страних језика, као и њихов утицај на ниже основношколске и предшколске наставне програме. Аутори на основу циљева и визије наведене у стратешким документима Европске комисије илуструју тренутно стање у Словачкој, указујући на поједина питања везана за обезбеђивање континуитета између основношколског и предшколског нивоа (ISCED 0 и ISCED 1), као и питања обезбеђивања квалификације наставника, њихове обука у иницијалном образовању.
Кључне речи: настава страних језика, основно образовање, предшколско образовање, иницијално образовање.

TEACHER TRAINING

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STRUČNI ČLANAK
PROFESSIONAL PAPER
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MATHEMATICS TEACHER TRAINING FOR ASSESSMENT OF PUPILS

Summary: Assessment is an essential and a quite complicated part of any learning process. Understanding a real state of the pupil's knowledge and skills, provides a powerful feedback to the pupil and a teacher. My work is dedicated to the issue of education of the future teachers and their training for assessment of pupils. Little is known about this topic. I discuss the length, depth and overall quality in the field of mathematics. The conclusion is focused on the future prospects of the teacher training in the assessment part of the education process.
Key words: mathematics, school assessment, teacher training

Since Primitive Communal System, through Egypt, Sofists, Ancient Sparta, Athenas, Roma, through the Middle Age Industrial revolution, schools more or less reflected the needs of the society. In the first military schools, the aim was obedience, in the first Christian schools, the priority was to learn to read in order to study the Bible, in the period of Industrial revolution, the requirement was to educate good, skilled and obedient factory labourers. This model, unfortunately, is still present at most of the schools, even if the need in contemporary society is producing a creative, independent, responsible, and tolerant individual with developed critical thinking.

Appearance of first methodologies of education refers to the spread of organised education. Quintilian is considered to be the author of the first teaching methodology. He wrote 12 books about education of rhetorician, in which he gathered pedagogical concepts of others (Socrates, Plato, and Aristoteles) and his own. However, the name "didactics" was used for the first time by Wolfgang Ratke, who was an inspiration for Komensky to write Didactica Magna.

The history of school assessment was studied by J. Velikanič (1973). He claims that the first mentions of assessment come from the period of ancient slavery times. "Stick probably was the most remote instrument for stimulation." From the second half of the first century there are references of "locations" – places in class divided by results of learning. Front desks were for the best students as a reward. Wearing "signs" was common custom, too. Wearing dog-eared cap, sign of a donkey, twisted straw wreath, or kneeling on a chock or peas, pulling the ears was ment as a punishment. Also books of honour and "black" books were used. However, verbal assessment received at the end of school attendance had been dominant until the 16th century. Origins of classification date back to the 16th century. Classification is related to expansion of schools with the origins of industrial manufacturing, crafts, and market. According to Komensky, the mission of the teacher is to lead pupils to excellence, not to assort or classify them. State decree codified assessment of pupils in Czechoslovakia in 1905.

Assessment has always been an integral part of education. However, there are differences in concepts of assessment and its use.

Slavík (1999) defines the assessment as a comparison between important and unimportant, good and bad. "Assessment measures the breadth and depth of learning." (Petty, 2009) "The pedagogical assessment is a systematic process leading to the assessment of quality and achievements of a pupil or a group of pupils." (Pasch, et al. 1998)

Turek (2010) claims that every assessment should fulfil these functions:

- diagnostic – measurement of knowledge, skills, attitude,
- prognostic – prediction of future,
- motivational – improvement of approach to learning,
- upbringing – formation of character,
- informational – documentation of results and information for parents,
- improvement of skills of self-control and self-assessment,
- feedback for both pupils and teachers.

However, Turek claims failure of all these functions in our school system and considers present system of the students assessment neither valid nor reliable. Moreover, he considers also the following consequences:

- pupils' assessment subjectivity,
- failure of prognostic function of assessment,
- measuring only contemporary achievement in a given time,
- overuse of memorization as an outcome of learning evaluation focusing on bottom levels of learning – examination of facts, formulas, theorems,
- normative assessment is predominant and pupils are compared one to another,
- classification invokes stress and anxiety in pupils, which decreases effectiveness of learning,
- graded examination has negative impact on teachers' methods,

- pupils‘ passivity in the assessment system,
- insufficient feedback of grades,
- big emphasis on average achievement,
- summative assessment without reflection of learning process,
- dominant oral examination.

Turek is not the only one who draws attention to the failure of assessment. Benmansour (1999) claims that dividing students into groups of good and bad, test preparation and motivation by results, leads to test anxiety, extrinsic motivation and worse results.

“Classification is outdated; it does not fit for present and future schools.” (Číhalová, Mayer, 1997)

In Slovakia, Vladimír Burjan (1991) published a book in this field of research. He claims that the assessment is being considered as an important problem in international research, because it:

- is archaic and often not in harmony with goals of a modern school,
- does not give an adequate information neither to a teacher, nor to a student, nor to parents,
- does not serve as a sufficient feedback in an educational and learning process,
- does not correlate with success in life,
- often interferes with school atmosphere,
- is often being misused in different ways – i.e. by a teacher as a coercive measure, by society as a tool of discrimination,
- has a number of negative impacts on students,
- frequently has negative influence on self-esteem of students,
- negatively affects attitude of students towards mathematics and to school in general,
- deforms educational strategies of teachers, creates inadequate pressure on them, if it is used for direct evaluation of quality of their work and getting rewards.

Assessment in mathematics

Some people consider mathematics assessment less problematic or easier than assessment in other subjects. They base this belief on an idea, that it is easy to measure knowledge in mathematics, because results are either correct or wrong. But this is just very superficial opinion. On the other side, some assessment practices in school mathematics are based on this idea as teachers often assess only measurable things.

Given opinions of two teachers on the same pupil, we have usually two different views. If we want to know, what they value and what they assess, they will most

probably have different order of priorities. Informative value of such type of assessment is at least problematic.

Niss claims that "the assessment experiences for many students in the classroom are still based on a behaviourist approach where discrete facts and skills are tested, where grading and ranking are the primary goals" (Niss, 1993). The teaching with a goal to achieve good results in national or international test destroys creativity and innovative teaching practices in mathematics lessons. TIMSS 2007 data show that there are countries where children are overtested. In the Czech Republic, 97% of 8th grade students were given a test at least every two weeks to measure their progress. For Slovakia the data would be very similar.

Research in mathematics assessment in European countries (EACEA/Eurydice, 2009) criticized that mathematics assessment is overused for grading students and, on the contrary, it is less used for the improvement of students' achievements in mathematics.

School Assessment in Slovakia is specified mainly in the following documents:

- Methodical guideline number 22/2011 on assessment of elementary school pupils.
- Methodical guideline number 21/2011 on assessment of high school students.

Both these documents consider assessment to be a necessary part of educational process, which has informative, corrective, comparative and motivational function. Teachers are requested to assess knowledge and skills and to avoid assessment of behaviour in subject grade. According to the documents teachers should assess every moment of students' or pupils' educational process and to gather materials for evaluation, so that they have enough materials to assign grades at the end of term. The documents are very instructional, they suggest forms of assessment of pupils and students, they suggest how many exams, and verbal exams are required to finalize half year report.

Due to its success in international testing, Finnish educational system has been studied in recent years and still enjoys enormous interest of researchers and teaching authorities from all around the world (Savola 2012 and Hendrickson 2012). The basic document for assessment in Finnish schools encourages teachers to assess pupils to know more, to improve and formatively focus on strengths, to encourage pupils to succeed. The basis of the education in Finland is a development of skills of self-assessment, cooperation, responsibility, tolerance and healthy self-esteem. Positive self-image and positive learning experiences are dominant. Pupils should be guided to independent and critical acquisition of knowledge. Grades are used lately in 9th (final) grade. Grades are considered to be a final assessment of basic education.

The main objective of mathematics lessons is to experience pleasure of problem solving and succeeding in mathematics. This objective is preferred to core contents to be learned.

The difference in direction of Slovak and Finnish assessment methodology is apparent. Whilst Slovak documents focus on the formal aspects (how many grades should pupil have), Finnish documents are focused on a pupil, on a child – assessment for learning. The Slovak document is focused on a paper (or final grade).

Assessment is very difficult and sensitive part of the educational process. Is there sufficient (or at least some) time dedicated to this topic in preparation of future teachers at universities? Are they prepared for this role? The training of assessment of pupils has to be part of the teacher training.

„The Assessment Reform Group (a voluntary group of researchers who work closely with teachers, teacher organisations and local education authority staff to advance understanding of the roles, purposes and impacts of assessment) suggests that assessment should be regarded as a key professional skill for teachers." (Mansell, James, 2009).

Mathematics teacher training at the Faculty of Natural Science at Matej Bel University in Banská Bystrica is organised in two levels: first 3 years of Bachelors study and then 2 years of Masters study. Study consists mainly of study of mathematics (Geometry, Analysis, Algebra, Number Theory, Combinatorics, Probability and Statistics...), General psychological and pedagogic basis (General pedagogy, Psychology, Biology...), and Didactics of mathematics. I reviewed the study plan and subject information lists and there are the following findings:

Future teachers of mathematics study approximately 9 hours about assessment on general basis (pedagogical theory and psychology) and 2 hours in Didactics of mathematics during the 5 years of their studies. I consider this amount insufficient. It is not enough time neither to ask, to think of, to mention, nor to answer all of the following questions related to assessment.

What do we assess in math lessons? Does every teacher assess the same? What is the purpose of assessment? Who is the assessment addressed to? What types of assessment motivate one specific student? What types of assessment motivate another student? Is there some universal model of motivating students all at once? Which assessment models are demotivating? Are pupils being assessed the way that motivates them to improve? Do the assessment methods that are being used in our school system, reflect the recent results of research in the fields of psychology and theory of education? Do Slovak pupils and students have some experience of assessment different from grading? Do teachers consider assessment and grading as the same thing? Are grades motivating? If so, what do they motivate to? What children are motivated by grades? What purpose do we use grades to? If a child does not make mistakes, does it mean that child understands the curriculum? If a child makes mistakes, does it mean that child does not understand the curriculum?

How often does it happen that assessment of a student depends on teacher's mistake (incorrect question, wrong or ambiguous task)? Experience, the way of thinking, preferences are unique. Almost every word, idea, activity can be understood differently by different people. Something that is evident and simple to somebody may

not be the same to other person. How to assess pupils while using modern methods in mathematics teaching? How to assess pupils during group work? How to assess their portfolio? Is it appropriate to assess the pupil's way to the goal? If so, how to do it? What is the interaction between various types of assessment and motivation of pupils?

The school system, as we know it, cannot remain the same for another century. It has to be changed. Our future depends on it. We are in a position, when there is an evidence of not properly working system based on overtaken psychological premises. But this system is so conservative that despite results of a modern psychological research, it resists major innovative changes.

I suppose that it is important not to think of the assessment just as of a gathering of results of many test and other graded exams and activities. Assessment should not be only the information for parents, other teachers, school, the information on level of knowledge and skills of pupil. It is important to move from this definition of assessment to the concept that assessment is an information for a pupil, and for a teacher on how to manage the following process of learning.

"The purpose of formative assessment is to tell every individual, where he/she is on his/her way of learning and mainly how to proceed. Ambition of the teacher should not be to define, who is the best and the worst, but how to improve everyone's knowledge." (Kalhous, Obst, 2002)

To be able to diagnose a pupil, the teacher of mathematics has to (Burjan, Dubovská, 2014):

1. Master the mathematics curriculum.
2. Understand what it means to master a specific topic.
3. Be aware of phases and levels of mastering a theme.
4. Suggest appropriate impulses (questions, problems, tasks, challenges).
5. Watch, analyse and assess the process of a pupil's solution.
6. Analyse the results of pupil's work.
7. Provide an efficient feedback.
8. Modify the following teaching and learning process on the basis of findings.

I strongly believe that by teaching those skills at universities, it is possible to reach a higher level of understanding to mathematics by pupils.

American journalist Sydney J. Harris claims: "The whole purpose of education is to turn mirrors into windows." I would change the Harris´ quote to: "The whole purpose of the school reform should be to turn mirrors into windows."

References

Assessment in Finland
http://www.oph.fi/download/47674_core_curricula_basic_education_5.pdf

Benmansour, N. (1999). Motivational orientations, self-efficacy, anxiety and strategy use in learning high school mathematics in Morocco, *Mediterranean Journal of Educational Studies*. 4: 1-15

Burjan, V. (1991). *Hodnotenie vo vyučovaní matematiky*. Metodické centrum v Prešove. ISBN 80-85410-07-9

Burjan, V., Dubovská, M. (2014). *Private communication.*

Číhalová, E., Mayer I. (1997). *Klasifikace a slovní hodnocení: zkušenosti z praxe na ZŠ.* Praha Strom. ISBN 80-901954-6-6

EACEA/Eurydice. 2009. *National Testing of Pupils in Europe: Objectives, Organization and Use of Results.* 2009. Eurydice http://eacea.ec.europa.eu/education/eurydice./documents/thematic_reports/109EN.pdf

Hendrickson, K. A. (2012). Assessment in Finland: A Scholarly Reflection on One Country's Use of Formative, Summative, and Evaluative Practices. *Mid-Western Educational Researcher*. Volume 25, Issues 1/2, p. 33 – 43 http://www.mwera.org/MWER/volumes/v25/issue1-2/v25n1-2-Hendrickson-GRADUATE-STUDENT-SECTION.pdf

Kalhous, Z., Obst, O. (2002). *Školní didaktika.* Praha Portál. ISBN 80-7178-253-X

Mansell, W., James, M. & the Assessment reform group. (2009). *Assessment in schools. Fit for purpose*? A Commentary by the Teaching and Learning Research Programme.

London: Economic and Social Research Council, Teaching and Learning Research Programme. http://www.mantleoftheexpert.com/wp-content/uploads/2008/03/Assessment-in-schools-Fit-for-Purpose-publication.pdf

Methodical guideline number 22/2011 on assessment of basic school pupils (Metodický pokyn č. 22/2011 na hodnotenie žiakov základnej školy https://www.minedu.sk/data/att/462.rtf)

Methodical guideline number 21/2011 on assessment of middle school students (Metodický pokyn č. 21/2011 na hodnotenie a klasifikáciu žiakov stredných škôl) https://www.minedu.sk/data/att/461.rtf

Mullis, I. V.S., Martin, M. O., Gonzalez E. J., Chrostowski, S. J. (2004). *TIMSS 2003 International Report.* IEA. ISBN 1-889938-34-3 http://timss.bc.edu/timss2003i/mathD.html

Niss, M. (1993). *Investigations into Assessment in Mathematics Education: An ICMI Study.* Kluwer Academic Publishers ISBN 0-7923-2095-6

Pasch, M, Gardner, T. G. (1998). *Od vzdělávacího programu k vyučovací hodině: Jak pracovat s kurikulem. [z anglického originálu Teaching as Decision Making přeložil Milan Kolidinský].* Praha: Portál, 1998. 500 s. ISBN 80-7178-127-4

Petty, G. (2009). *Teaching today* . ISBN 978 1 4085 0415 4

Savola, L. (2012). Assessment in Finnish schools. *Journal of Mathematics Education at Teachers College* [online]. Spring-Summer 2012, Volume 3. http://journals.tc-library.org/index.php/matheducation/article/viewFile/793/488

Slavík, j. 1999. *hodnocení v současné škole.* portál. isbn 80-7178-262-9

Turek, I. 2010. *Didaktika.* Iura edition. 2.vyd. ISBN 9788080783228
Velikanič, J. 1973. *Skúšanie, hodnotenie a klasifikácia žiakov.* SPN Bratislava.

Сажетак: Вредновање је базични и прилично компликован део сваког процеса учења. Разумевање стварног стања знања и вештина ученика, даје снажну повратну информацију ученику и наставнику. Мој рад је посвећен питању образовања будућих наставника и њиховом оспособљавању за вредновање ученика. Мало се зна о овој теми. Ја разматрам дужину, дубину и укупни квалитет у области математике. Закључак је фокусиран на будуће перспективе обуке наставника у делу вредновања образовног процеса.
Кључне речи: математика, школско вредновање, образовање наставника.

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STRUČNI ČLANAK
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ANALYSIS OF THE OPPORTUNITIES OFFERED BY THE PEDAGOGICAL PRACTICES

Summary: At the Hungarian Teacher Training Faculty teaching of methodology takes place in the third year. Nevertheless, at the end of the first, second and third year students go to their home-towns' schools with different tasks and thus these are the first student-pupil encounters. Fourth year students spend one week at schools in September and December. In the rest of the school year they go to practicing schools where they spend their methodological practice. There they observe a total number of 12 sample lessons in six subjects at the beginning of the school year, after which the practicing teacher, the teacher assistant and the teacher of the given methodology prepare them for their own independent lesson. These lessons are actually practices. In May students spend two weeks in a primary school in Subotica chosen by them, where they can broaden their knowledge and experience what the beginner teacher's every day work is like. These lessons are also visited by the methodology teachers.

The survey aims to find out how the third and fourth year students feel about the methodological practices: to what extent are they prepared to teachers' profession, to evaluate the cooperation, attitude and helpfulness of the mentors, the primary school teachers, the pedagogues and the schools during the two-week training. This paper also deals with the teaching materials used by the students during the practice, the question of whether their work was corrected by the practicing class teachers, what innovations were used, whether they dealt with handicapped children and the number of lessons taught outside the classroom.

The survey was conducted with the help of anonymous questionnaires. The questionnaires were distributed to fourth year students at the end of the eighth semester. The present work has evaluated the data collected over the last six years.

The results suggest that the majority of the fourth year students are satisfied with the – methodology related - opportunities offered by the university. The mentors', teachers' and the schools' attitude is considered appropriate. However, some of the respondents feel that more experience is necessary, in order to work more effectively and prosperously in the future.

Key words: teacher, practice, school, pedagogue

Introduction

Both teacher and kindergarten teacher trainings have practical significance. The Hungarian Language Teacher Training Faculty has taken that in consideration when accrediting its curicula. Regardless of the fact that pedagogical practices should dominate on both teacher trainings, on the basis of the central instructions pedagogical practices should take up the 35% of the total number of courses. Pedagogical and methodological practices are expected to fit into this 35%. We believe - including students as well – that the first program of the institution lives up to the expectation of the legislation and we are on the adequate path.

Several articles have discussed the question of pedagogical and methodological practices: such as, Budić (2008), Cekuš (2006), Czékus (2005), Gajić (2008), Grubor (1995), Đurić (1995), Janković (2003), Jukić (1995), Meyer (2002) and Španović (2008). On the basis of the literature related to pedagogical and methodological practices it can be concluded that pedagogical and methodological practices are crucial segments of teacher trainings and they require modernization.

Pedagogical and methodological practices can be divided into two groups. The first is the acquistion of the theoretical side of methodology during the third year of university studies. The present study aims to discuss pedagogical practices outside the university timetable.

Pedagogical practices outside the university timetable are usually held during the last weeks of the academic year. Their purpose is to enable pre-service teachers and kindergarten teachers to function among 3-12-year-old children and fulfill their teaching-learning duties. In addition, the acquired professional, pedagogical, psychological and methodological knowledge needs to be reassured through practice and experience.

Pedagogical practices take place at the end of the second semester (one-week long observation consisting of 25 classes). Pre-service teachers spend a week at a primary school or kindergarten based on their personal preference.

On the basis of the instruction received at the Faculty, pre-service teachers are required to become familiar with the institution's history, work organization (special attention paid to the instituon's special services, school library, pedagogical documentations, school-parent cooperation, the work of teachers/kindergarten teachers, staff meetings), be familiar with the number of pupils and employees at the institution, get to know the conditions of enrolling into the institution (including the necessary administrative measures), participate in every institutional activity (excursion, meetings), with the assistance of the mentor, pre-service teachers are expected to familiarize with various class/kindergarten activities and establish relationship with pupils/children during breaks, participate in games, get to know the organizational segment of teaching, support pupils/children in their learning processes, and finally keep a journal of their observations, experiences, impressions which must be signed and notarized by the pre-service teacher's mentor.

Didactical practices take place at the end of the second academic year during which pre-service teachers also spend a week (25 classes) at an institution based on their personal preference.

During this phase of practice, pre-service teachers are expected to learn as much as possible about work organization, participate in teaching-learning processes, analyse classes and activities (based on their previous didactical knowledge in order to successfully implement their knowledge with practice), familiarize with the method of following pupils' learning progresses (paying special attention to gifted and disadvantaged pupils/children), get to know the various factors of grading, the conditions of teaching with the help of physical means (innovative education – various equipment at the institution), the analysis of the curriculum, participate in classes/activities, providing assistance to teachers/kindergarten teachers during breaks and out-door activities as well as keeping a journal of their observations and experiences.

Didactical-methodological practice is organized during the sixth semester and lasts two weeks (50 classes). Its objective is to enable pre-service teachers to apply their theoretical and subject pedagogical knowledge in their own teaching processes.

Pre-service teachers are expected to prepare for their classes using their methodological and professional knowledge, participate in various phases of teaching processes (class/activity preparations, providing assistance during class/activities, and afterwards as well), familiarize with the thematic planning (syllabus) of teachers, actively and consciously observe, make efficent, applicable notes based on the observed teachers classes/activities, prepare – as well as realize – some plans of classes/activities based on the consultations of teachers/kindergarten teachers (plans must be handed in to the teacher as well as signed by the mentor teacher and site supervisor a day before the realization of the class/activity), realize a class/an activity in the presence of site supervisor (which will be analyzed and valued by the mentor teacher and site supervisor), analyze the classes/activities of the teacher/kindergarten teacher based on various aspects and spend at least three scholarly hours in the library in order to familiarize with its work processes.

Duties during class and outside the classroom: pre-service teachers are required to participate in every activity that bears pedagogical characteristics during their pedagogical practices (observation, field trip, parents' meeting, family visit, staff meeting, periodic training, etc.), visit the day care groups (if there is one at the institution), inform upon various experiments, alternative programs running at the institution. Pre-service teachers are not allowed to realize family visits, organize field trips or parents' meetings independently and cannot be asked to stand in or replace the active teacher/kindergarten teacher. If allowed, pre-service teachers should participate in one staff meeting, or at least obtain knowledge of its items of agenda, its participants and chairperson, the institution's pedagogical program, the current academic year (breaks, holidays, periodic trainings, etc.) as well as the role of school maintainer. Journal should be keep regarding the obtained information.

Pre-service teachers perform their pedagogical practice during the seventh and eighth semester at schools/kindergartens. At the beginning of October per-service teachers observe two classes of each subject/activity and analyze them with the cooperation of the teacher/kindergarten teacher and the teacher assistant.

Afterwards pre-service teachers realize classes/activities until the middle of May: each group realizes two mother tongue classes/activities (communicative com-

petence development), mathematics (beginner mathematics teaching), environment education as well as one class/activity of physical education, arts and music. The realized classes/activities are analyzed and valued by the pre-service teacher, other pre-service teachers of the group, university assistant and mentor teacher.

The personal factors of pedagogical practices and their relations

The personal factors of pedagogical practices are the methodology site supervisor, pre-service teachers – one of them realizes the class, the colleague of the methodology supervisor, the mentor (university assistant), teacher of the institution.

The duties of pre-service teachers who realize a class: two-weeks before the realization of the class pre-service teachers are expected to prepare the teaching unit, the lesson plan and at least one week before the realization of the class the pre-service teacher hands them in to the mentor for his/her approval. Following the realization of the class they analyze it at the end of the class or another occasion.

The other pre-service teachers are expected to visit the practice classes of their peers and take notes during them, participate in the analysis of the classes. The realized classes and their analysis form a crucial part of the final methodological exam.

Fourth grade university students spend five weeks at schools/kindergartens in order to fulfill their *individual complex methodological practice.* They spend 100 classes at the institutions: two weeks in September, usually in December and in May.

Pre-service teachers are expected to actively and consciously observe during the opening ceremony of the academic year and welcome the new, entrant teachers/kindergarten teachers, keep a journal of the greeting of pupils, introduce the institution building and its policy or regulations, the role of parents during the opening ceremony, the realizator of the opening ceremony and its participants, as well as its circumstances, the institutions' expectations towards parents, pupils/children and the staff.

At the end of the semester, pre-service teachers fulfill a one-week long practice before Christmas. Its purposes are holiday preparations and familiarizing with the semester-final duties of teachers at primary schools, such as thematic revisions, forms of revisions, assessment, evaluation and grading.

During the two-week long *individual complex methodological practice* pre-service teachers perform a range of tasks with the guidance of their site supervisors in accordance with the institution's regulations. Pre-service teachers are expected to get in touch with the site supervisor and jointly develop an individual work plan.

During this practice pre-service teachers realize classes/activities (except for catechism and foreign language teaching, or perhaps Serbian language teaching).

The institution is required to provide a mentort (coordiator) who cooperates with the student and the Faculty's professors (assistants).

Pre-service teachers must have a lesson plan before the realization of the class/activity during which the teacher/kindergarten and upon occasions the site supervisor is also present.

At the end of the two-week long practice the mentor teacher/kindergarten teacher provides a brief report of the pre-service teacher's teaching performance and personality.

Pre-service teachers begin their practice upon the directions of the Faculty and return with a certificate that includes the mentor teacher's/kindergarten teacher's opinion, the signature of the institution director and the institution stamp. Pre-service teachers are expected to keep a journal that they hand over to the Faculty's trustee. Journals must be handed in to the vice-dean of methodology in electronic format who analyzes them in cooperation with the rest of the professors of various methodologies and finally enter a positive evaluation into the pre-service teachers' credit books.

Objective

The objective of the survey is to reveal the third and fourth grade university students' opinion regarding methodological practices. To be specific, to what extent pre-service teachers prepare for their teaching duties, how they value the cooperation, attitude and assistance of their mentor, primary school teachers and the institution. The present study aims to touch upon what teaching instruments are applied by pre-service teachers during their pedagogical practice, whether in-service teachers corrected their work, what innovations they used, whether they paid attention to special need pupils and how many activities they organized outside the classroom.

Sample and method

As a research method anonymous questionnaires were used which were filled in by fourth grade pre-service teachers and kindergarten teachers during their eighth semester of studies. The present study includes the questionnaire analysis gathered throughout 6 years. In 2009 27, in 2010 and 2012 117 pre-service teachers and kindergarten teachers filled in the questionnaires. Modifications have been introduced to the 2009 version following the text year.

The gender proportion of the respondents is female in 90% since the majority of the students are female.

Research analysis

Table 1 shows the results of questions in which pre-service teachers were expected to provide grades from 1 to 5 (1 being the lowest and 5 being the highest value) for various issues related to pedagogical practice. Pre-service teachers valued the organizational conditions of the pedagogical practice with the average of 4.21, the relationship of the teacher with their subject (Nature and Society, Our Environment) has

also received high ratings. The majority of the fourth grade university students believe that during their university studies they learned to teach and their relationship with the mentor teacher was positive. At the end of the eighth semester they felt prepared for the task of teaching (Table 1).

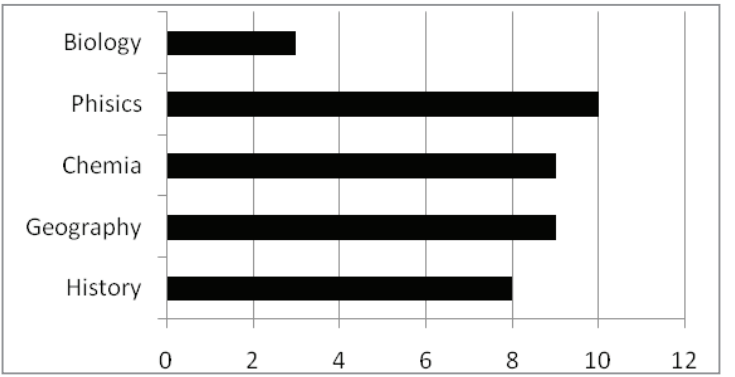
Table 1: Preparedness of pre-service teachers for teaching

Question	Rating (average)
Organizational conditions of the pedagogical practice	4.21
The relationship of the teacher with their subject	5.00
Did you learn to teach?	4.18
Student–professor relationship	4.40
Did the university prepare you to teach independently?	4.00

Some pre-service teachers believe that the realization of four practical classes during the academic year would be enough, while others believe that 6-8 or 10 would be the optimal number of classes.

More than 90% of the fourth grade university students believe that there are gaps in their subject and professional knowledge which are mostly biology, history, geography, chemistry and physics (Diagram 1).

Diagram 1. The frequency of subjects that pre-service teachers believe they lack knowledge



The 86% of the fourth grade university students believe that they did not have the chance to grade or to learn how to grade during their pedagogical practice.

Upon asking whether the presence of mentor teachers affected their work, pre-service teachers responded that it did not influence their performance (3 responses), they could get used to it (2 responses), it positively affected their work (2 responses), negatively affected their work (2 responses), they were nerveous (8 responses), caused stage fright (2 responses), they felt very nervous (2 responses), first negatively later

provided felling of safety (3 responses), until mentor teachers did not react their presence was not disturbing (2 responses), it was good that they helped if it was needed, they secured safety, because they helped if something did not function well, sometimes mentor teachers helped, sometimes the mentor teacher embarrased me.

The majority of pre-service teachers believe that extensive lesson plans were useful, especially during first classes when they did not dispose of adequate experience thus lesson plans reassured them. However, they added that later on shorter and less complex lesson plans could serve well during their classes. They admitted that detailed lesson plans tie their hands in the given situation when they feel the need to deviate from the original lesson plan.

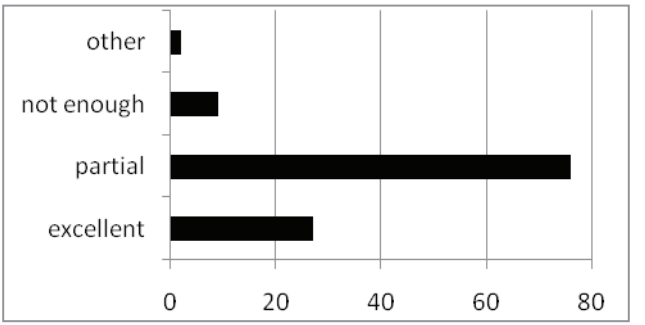
Further remarks of pre-service teachers are that they should observe more sample lessons and more pedagogical practice.

On the basis of the responses it can be concluded that the work processes at the institution were introduced by the teachers or kindergarten teachers while lesson/activity plans were prepared with the assistance of the mentor teacher/kindergarten teacher or pre-service teachers prepared them on their own (48%).

Out of 117 pre-service teachers 80 believes that university studies prepared them only partially for teaching while almost 30 pre-service teachers believes that they could prepare for their future profession (Diagram 2.).

The 81% of the respondents reported that they received help and information regarding the recognition of differences between pupils, while 5% did not receive any information regarding this matter.

Diagram 2. The level of preparedness for teaching



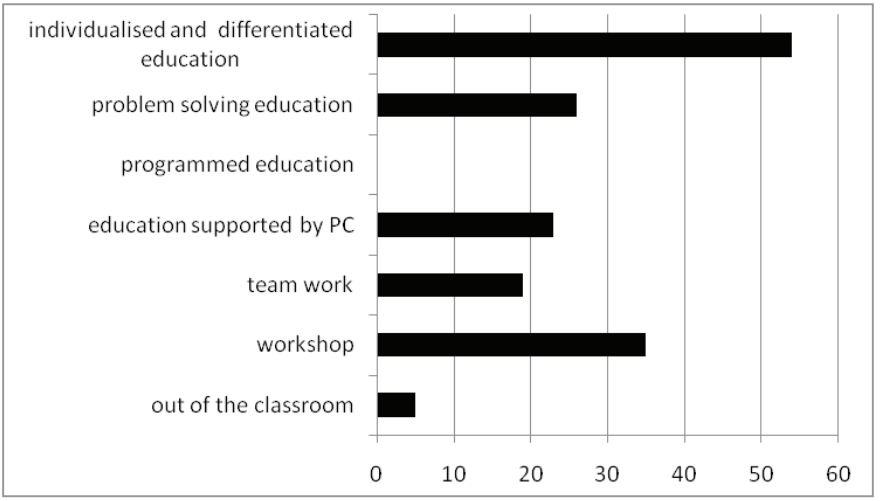
Pre-service teachers' performance was corrected by mentor teachers in 51% of the cases, in 4% of cases only when pupils did not pay attention. Mentor teachers were not present in 1% of the cases which proves the total presence and devotion of the mentor teachers.

Durign the two-week pedagogical practice the majority of pre-service teachers applied innovative, individualized and differentiate education as well as workshops. Lesser number of pre-service teachers applied computer-aided education, group work and prob-

lem-resolution education (Diagram 3) (outside of classroom activity, workshop, group work, computer-aided education, problem-resolution education, individualized education).

The 34% of pre-service teachers paid special attention to children of special needs during their pedagogical practice. In 7% of classes there was such child.

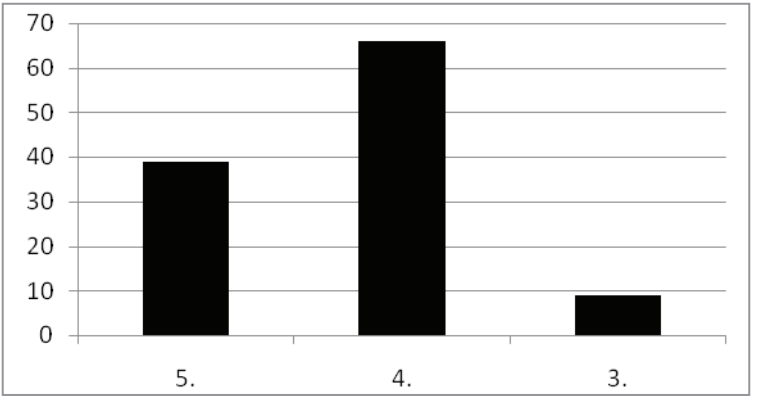
Diagram 3. Innovative activities and their frequency during pre-service teachers two-week long pedagogical practice in May (fourth grade university students)



The 47% of the fourth grade university students had the chance to engage with pupils who were interested in certain subjects.

The 58% of pre-servicce teachers and kindergarten teachers valued their own performance of pedagogical practice with a grade 4 (Diagram 4).

Diagram 4. The success of pre-service teachers during teaching practice



The quality of cooperation with the mentor teacher was mostly valued with the highest rate which suggests that they received assistance and useful advice from them (Diagram 5).

The majority of pre-service teachers rated their own teaching performance with 3 or 4. Less than 20% of the students considered their teaching performance deserved the highest grade (Diagram 6).

Diagram 5. The evaluation of the mentors' work

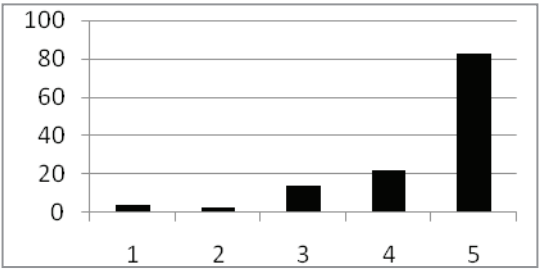
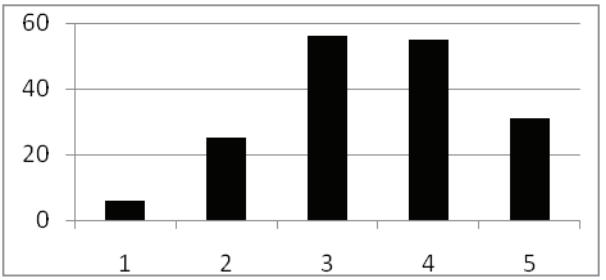
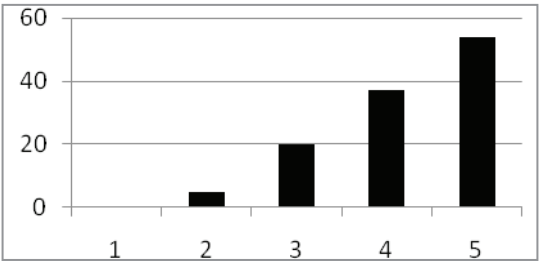


Diagram 6. The level of preparedness for practical teaching tasks



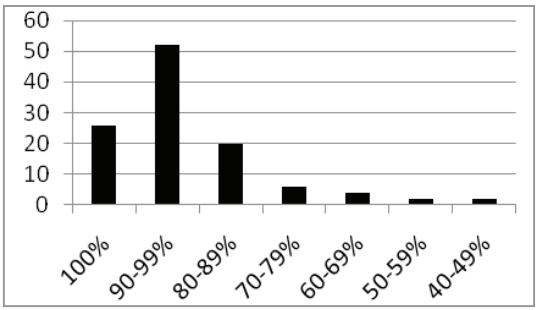
47% of pre-service teachers believe that the two-week long pedagogical practice meant a lot for their professional advancement, however 32% of them graded that question with a 4 (Diagram 7).

Diagram 7. The relationship between the two-week pedagogical practice and pre-service teacher confidence



According to the 80% of the pre-service teachers their work was independent during the two-week pedagogical practice, i.e. they could handle various, unexpected situations independently as well as realize the objectives of their lessons succesfully and independently (Diagram 8).

Diagram 8. Independence during teaching performance



Pre-service teachers successfully used various modern technological tools such as laptop, video projector, CD player, interactive board (Diagram 9). The majority of these tools were applied during Nature and Society subjects (or Our Environment) as well as arts, mother tongue, mathematics and music (Diagram 10).

Diagram 9. The application of modern technological tools

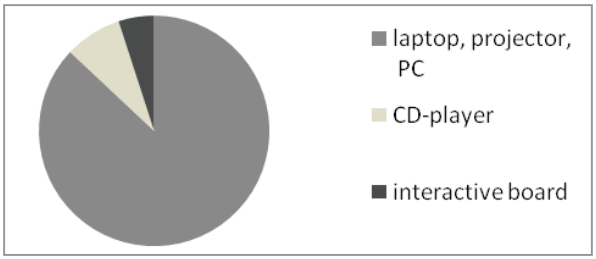
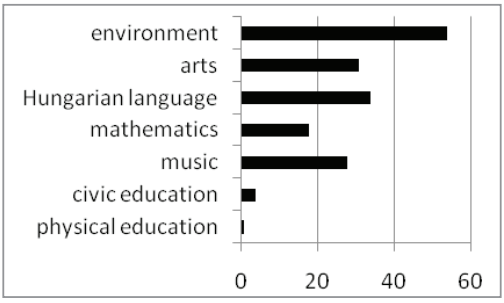
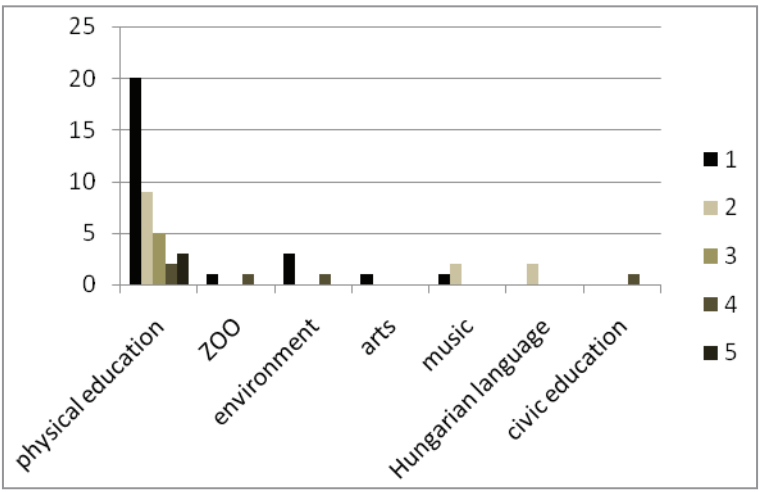


Diagram 10. Frequency of the application of modern technological tools according to various subjects



According to the research results Physical Education took place outside of the classroom, however a few Nature and Society (Our Environment), mother tongue and civic education classes were also held outside the classroom. Zoo visits also belong to this group during which mostly Nature and Society classes were held, but some creative teachers have also established connections with other subjects as well (Hungarian, mathematics, music, arts) (Diagram 11).

Diagram 11. The number of activities held outside the classroom according to various subjects



Among the suggestions and recommendations proposed by pre-service teachers the most frequent is the increasement of the number of classes held during pedagogical practice. Besides they also emphasised the importance of observing as many sample classes as possible before starting their own pedagogical practice. Some mentioned that they did not have the opportunity to acquire the principles of keeping a class register during their university studies.

Conclusions

The present study is based on the views and opinions of fourth grade university students of teacher and kindergarten teacher training students conserning their preparedness for their future professions.

On the basis of their answers the following conclusions can be made: Hungarian Language Teacher Training Faculty trains students of practical knowledge who form a stable basis for entrants. It is achieved by the two-week long pedagogical practice of fourth grade university students which takes place in the eighth semester of

their academic studies as well as four practical classes from each subject are held during the seveth and eighth semester. Pre-service teachers rated the teachers working at affiliated institutions positively as well as the attitudes of mentor teachers. Mentor teachers evaluated the classes of the candidates' performance and gave them advice when needed which was very useful for the pre-service teachers to find their way in the new classroom environment. The two-seek long pedagogical practice helped them a lot from a professional aspect as well and gained valuable experience. During their practice they often used innovative methods (such as individualized and differentiated education), but modern technical tools were also used (laptops, video projectors) which made their classes more interesting and successful. Several pre-service teachers experienced what it is like to hold classes outside the classrom and had the opportunity to engage with gifted children as well as children of special needs.

Among their opinions and recommendations pre-service students it is advised to hold more practical classes and participate in observations. A lot of students believe they lack the knowledge of grading and keeping a class register.

References

-- A tanító- és óvodapedagógus-jelöltek gyakorlati képzése. Szabályzat-tervezet. Ú.E. MTTK, Szabadka

Budić, S.: (2008): Modeli praktično-pedagoškog osposobljavanja studenata i razvoj njihovih kompetencija za buduće delovanje u praksi. In: Budić S. (edit.): *Didaktičko-metodički aspekti studentske prakse u partnerskim relacijama fakulteta i škola*. Filozofski fakultet, Novi Sad, Odsek za pedagogiju, Novi Sad, 11-40.

Cekuš G (2006): Razvijanje komunikacionih kompetencija nastavnika i učenika u nastavi poznavanja prirode. In: *Razvijanje komunikacionih kompetencija nastavnika i učenika* - Zbornik radova sa međunarodne naučne konferencije održane 23-24. 09. 2005. godine na Učiteljskom fakultetu u Jagodini, Pedagoški fakultet u Jagodini i Filološko-umetnički fakultet u Kragujevcu. pp.593-602.

Czékus G. (2005): A természetismeret-tanítás módszertana. Egyetemi tankönyv. Szabadka.

Gajić, O. (2008): Pedagoško-metodička praksa studenata u evropskom okviru savremenih obrazovnih

koncepata. In: Budić S. (edit.): *Didaktičko-metodički aspekti studentske prakse u partnerskim relacijama fakulteta i škola.* Filozofski fakultet, Novi Sad, Odsek za pedagogiju, Novi Sad, 41-72.

Grubor, A. (1995): Stručno-pedagoška praksa studenata. In: Zbornik radova Stručna praksa studenata, Sombor, Učiteljski fakultet, str. 5-19.

Đurić, Đ. (1995): *Neki metodološki i psihološki aspekti koncipiranja stručne prakse studenata*. In: Zbornik radova Stručna praksa studenata, Sombor, Učiteljski fakultet, str. 58-61.

Janković, P. (2003): Uloga nastavnog plana i programa (kurikuluma) u razvoju profesionalnih kompetencija učitelja potenciranih reformama obrazovanja, *Norma*, Sombor, br. 2-3, str. 75-92.

Jukić, S. (1995): Pretpostavke uspešne pedagoške prakse studenata, u zborniku radova Stručna praksa studenata, Sombor, Učiteljski fakultet, str. 53-57.

Meyer, H. (2002): *Didaktika razredne kvake: rasprave o didaktici, metodici i razvoju škole*, Educa, Zagreb.

Španović, S. (2008): Uloga stručne prakse studenata-budućih učitelja u sticanju profesionalnih kompetencija. In: Budić S. (edit.): *Didaktičko-metodički aspekti studentske prakse u partnerskim relacijama fakulteta i škola.* Filozofski fakultet, Novi Sad, Odsek za pedagogiju, Novi Sad, 119-160.

Сажетак: На Учитељком факултету на мађарском језику настава методике заузима значајно место у трећој години. На почетку прве, друге и треће године студенти одлазе у своје школе са различитим задацима и то је први сусрет студент-ученик. У четвртој години студенти проводе једну недељу у школи у септембру и децембру. У остало делу школске године они одлазе у пколе вежбаонице где имају методичку праксу. тамо посматрају укупно 12 часова на шест различитих предмета на почетку школске године, након чега их учитељ- ментор, асистент за праксу и наставник припремају за њихове самосталне часове. Ови часови су заправо пракса. У мају студенти проводе две недеље у основнј школи коју они одабирају, где могу да сакупе њихово знање и искуство о томе како изгледа сваки радни дан учитеља. ови часови су такође посматрани од стране наставника методичара.истраживање је имало за циљ пронаћи како се трећа и четврта година студената у вези са методичком праксом: у којој мери су они припремљени за посао учитеља, да вреднују сарадњу, ставове и помоћ ментора, учитеља у основној школи, педагога и школа за време двонедељног тренинга. Овај рад се такође бави наставним материјалима који се користе од стране студената током праксе, питањем да ли је њихов рад коригован од стране учитеља на пракси, које иновације су користили, да ли су се бавили децом ометеном у развоју и броју часова који је реализован ван учионице. Истраживање је спроведено уз помоћ анонимних упитника. Упитници су дистрибуирани студентима четврте године на крају осмог семестра. Овај рад приказује податке прикупљене у последњих шест година. Резултати показују да је већина студената четврте године су задовољни методологијом у вези - могућности које пружа универзитет. Ментори ‘, наставници’ и однос школа “се сматра потребним. Међутим, неки од испитаника сматра да више искуства је потребно, како би се ефикасније и просперoусли раде у будућности.

Кључне речи: наставник, школа, педагог.

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PROFESSIOGRAPHIC RESEARCH ON TEACHERS

Summary: The study deals with the theoretical outcomes for a research on teachers, their profession, work and special professional activities. There is short review of the researches realized in past periods in Slovak, Czech and other countries. The professiography of the teaching profession deals with the analysis of the teacher‘s specific professional activities. Professiography – corresponding terms: job–analysis, work analysis, work description; is a specialized activity within social psychology and human resources management and, at the same time, it is a research method aimed at systematic gathering, describing, analyzing and assessing working activities in terms of personal and expert requirements for their performance. In accordance with the current trends in professiography leading from descriptive to predictive analysis of job performance, the main objective is to use professiographic methods to produce a professiogram as a structured compilation of the activities.
Key words: Teacher profession, competences, standards, professiography, research on teachers, efficiency, methods of research.

Introduction

Research into teachers and the broader relations of the profession and personality is diverse in terms of topics covered. In connection with the aim of the research, we kept special attention to a type of specific research, convergently progressing from a diversity of themes to a narrow aim represented by the knowledge of the profession i.e. teacher work research and professiographic research. Apart from existing findings regarding the profession from this point of view, either no or only marginal attention has been paid to the professiographic analysis of pre-primary and primary

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education teachers within other research projects. Due to their specific focus, these two categories do not seem to fit in with the so-called major themes. Even if primary education teachers are sometimes mentioned, nursery school teachers or pre-primary teachers are a completely marginalized target group in scientific research. We will present in more detail well-known research studies that are in any way connected with a teacher's work, working time or professional activities. This topic was searched in the international project (Slovak-Poland-Czech) realized during two years performed international research team during and within project APVV-0026-07 Pre-primary and primary teacher in job analysis in dynamic access.

Current Professiographic Researches in the Central European Context

There are several research studies described an international research project carried out in the Czech Republic, Slovakia and Poland. The basis of empirical research was a functionally modified, comparative professiographic analysis of teachers, carried out by means of an activity survey based on self-reflection. Among the main research instruments there were a weekly record of the teacher's professional activities and a questionnaire for teachers. Expert reports served as an additional source of information about the education systems in the participating countries. The research sample consisted of teachers who completed higher education, had at least 5 years of work experience, including men and women from both rural and urban areas, working at the 1st, 2nd and 3rd level of schools. The research sample was divided into three groups: the first group completed time records, the second group completed questionnaires and the third group was involved in expert activities.

In Slovakia, this research was conducted by Fülöpová (1999), with 177 weekly records of professional activities and 247 questionnaires having been analyzed. In all countries the records of professional activities were analyzed according to nine categories, with the following findings. What the respondents see among the shortcomings of the teaching profession is insufficient remuneration, a low status of the teaching profession, stress at school and increased mental strain, as well as insufficient school equipment and mismatching teacher holidays and school vacations. The negative aspects of the profession proportionally prevailed over the positive ones.

There was also a qualitative aspect of the research, when each teacher assigned to the activity survey was asked to select one of his/her lessons which was the most successfully taught in his/her opinion. To describe that lesson, some additional questions were asked. In the conclusion of the publication, Blížkovský (2000) formulated seven reform strategies as prospects for the teaching profession.

Urbánek (1999) carried out professiographic research aimed at discovering how time-consuming it was for a teacher to perform his/her professional activities or how much time the teacher spent performing all of his/her professional activities dur-

ing an average working week and what was the structure of the teacher‘s professional activities. An additional research method was an interview with teachers. Between teachers at the first level and the second level no significant differences were observed in the overall level of time load or the structure of individual professional activities (teachers at the second level worked 20 minutes more on average), so the author interprets the results together. Furthermore, what was also compared was individual differences among teachers, who were divided into five groups, ranging from those with a below average time load to those with the time load above the average, differences in the time load between male and female teachers and whether teachers‘ time load was affected by the number of pupils or the length of school experience. Urbánek (2005) also carried out longitudinal research (1994-2003), in which self-evaluation statements by teachers-in-training about the quality of the professional activities performed during the continuous education practice were analyzed. The results of the analysis of the development of phenomena monitored over a long time show these trends: trainee teachers during the continuous pedagogical practice had increasingly more favorable opinions about their own performance in the following activities: *teaching content scheduling, appropriate formulation of questions, communication with pupils*. The opposite trend can be seen in education-oriented professional activities, especially in the first half of the longitudinal research, in activities such as *maintaining discipline, dealing with disciplinary offences* and, to some extent, *maintaining attention.*

Research into preferences concerning primary school teachers‘ activities was carried out by Vašutová (2004) as part of the research aim titled „The development of national level of education and the professionalization of teachers in the European context (UK PedF Prague, 1999-2004). Questionnaire-based results pointed out to the fact that those responsibilities and tasks in teachers‘ work were appreciated that kept the school or class running (supervision, substitution, meetings, maintaining discipline). Yet, the main burden was the field of student‘s educational problems, behavior and discipline, which is nowadays the most important activity that teachers deal with. Significant preference was given to pupils‘ testing and assessment. The least important activities include the teacher‘s self-development and the development of the teaching profession, communication with the public and cooperation with colleagues.

Janík (2005) used comparative research to compare professional activities carried out by teachers in Austria and the Czech Republic. Having a brief look at these researches, several facts concerning the condition, opinions and attitudes of teachers can be presented.

Hanesová (2009a) prepared a comparative analysis on the basis of available foreign pedeutological researches dealing with the professional activities of teachers and their time load. She presents the average numbers of hours that teachers in respective countries devote to educational activities on a weekly basis. The following activities were subject to research: *direct teaching activity, preparation and diagnosis, grading students‘ papers, making teaching aids, administrative tasks, contact with parents/ students, contact with colleagues and the public, further activities at school (tutoring,*

supervision, after-school activities), activities during weekends (preparation, grading), teachers' further education. The results indicate that the highest number of hours devoted to teachers' activities was identified by questionnaire-based research and the lowest number of hours (probably the most realistic) was observed through time records.

Table 1

Teachers' Time Devoted to Professional Activities (according to Hanesová, 2009)

Country	**Average time of the teacher's work in hours**
Hong Kong (2006)	63.5
United Kingdom (2002)	54.8
ňUnited Kingdom (1994)	53.6
Canada (2004)	53.3
Canada (2001)	53.1
Canada (2000)	52.5
Canada (2002)	52.0
United Kingdom (2006)	50.1
Tasmania (2004)	48.7
New Zealand (1995)	47.4
Australia (2005)	47.1
Czech Republic (1999)	45.4
United Kingdom (1971)	44.6
Austria (2000)	43.4
Slovakia (1999)	41.8
Poland (1999)	39.1
Switzerland (1999)	38.2
Slovakia (2009 - 2010)	*32.6*

The author also carried out a more detailed comparison of the specific lists of professional activity categories and their duration based on the results of some professiographic research projects performed in United Kingdom, which are presented in the following summary table.

Table 2

Categories of Teachers' Professional Activities and their Duration in United Kingdom (according to Hanesová, 2009)

Activity Categories Hours per Week	**Galton, McBeath (2002) in hours**	**Campbell, Neill (1994) in hours**	**Hilsum, Cane (1971) in hours**
Teaching and Whole-School Meetings	24.2	22.0	18.8
Informal Activities (Non-Teaching Time) Including Lunchtime and Breaks	3.3	2.2	11.1
Supervision during breaks	1.2	1.6	4.2
Meetings	2.0	2.9	0.4
Grading	4.6	6.3	3.8
School clubs	1.2	1.1	0.7
Planning, Preparation during The Working Week	9.6	10.9	2.3
Work during Weekends	5.4	3.2	3.3
Supervision before/after School	1.1	1.1	-
Meetings with Parents	0.9	0.9	-
Exhibitions of Children's Work	1.3	1.3	-
Total:	54.8	53.6	44.6

The results indicate the increasing workload and time load of teachers over the past 30 years, even though, when comparing the results, we have to take into consideration the differences caused by the methodology used and the method for obtaining these results.

Professiography and the Professiogram of the Teaching Profession

The professiography of the teaching profession deals with the analysis of the teacher's specific professional activities. Professiography *(job–analysis, work analysis, work description)* is a specialized activity within social psychology and human resources management and, at the same time, it is a research method aimed at systematic gathering, describing, analyzing and assessing working activities in terms of personal and expert requirements for their performance. A standard definition of professiography, drafted by the Workforce Deployment Commission of the Federal Employment Service at the U.S.

Department of Labor, states more specifically that it is a process of determining and gathering important information concerning the nature of a certain job, carried out by means of observation and study. It determines which tasks are included in the scope of work, as well as capabilities, knowledge and skills an employee is required to have to be able to perform the work. This analysis is a subject of interest for psychology, in particular labor psychology and personal psychology, but the application of expert pedagogical views is necessary to evaluate a certain profession in an optimal manner (the profession of preprimary and primary education teacher in this case).

The current trend in professiography represents a shift from descriptive analysis towards predictive job performance analysis with the aim of creating the standards of the profession and staffing a job position. The aim of professiography is not only to create a list of professional activities and related tasks and necessary competences, but also to point out to possible changes in the various dimensions of the profession in question. To ensure the productive use of a cognitive and rational potential of pedeutologic professiography, the following professiographic **dimensions or functions** need to be employed (Kasáčová et al. 2011 according to Blížkovský et al., 2000):

- ***descriptive*** – in line with the use of qualitative and quantitative research methods, it seeks to describe the work of a professional in its long-term, mid-term and short-term profile, with a detailed specification of the time needed to perform tasks and activities in space and time, with the intention of becoming familiar with and utilizing a professional activity, without an evaluative aim;
- ***evaluative*** **–** it represents an evaluative or critical assessment of the existing state, its main goal is to directly assess the conduct of a professional, professional group or institution through the performance of its employees;
- ***heuristic*** – aimed at discovering reasons and connections, it is mostly beneficial for research, for the development of the particular area of science and its applications in innovations, modernization or implementing new systems: financing, funding and management, initial professional training or content and the availability of related education and educational needs;
- ***comparative*** **–** comparison can be carried out within the obtained sets of data or across them and its aim can be to compare groups and subgroups of professions, institutions, up to and including international comparison;
- ***normative*** – a description and evaluation naturally lead to the specification of „what should be“, i.e. an ideal or desirable state, where professiography is further developed for a specific normative use e.g. setting performance standards, the categorization of professionals, drafting legislative, labor law and performance regulations at various levels, up to and including the remuneration system.

A professiographic research study is processed according to its purpose. With regards to the needs of the teaching profession, it can serve as a suitable instrument for the following: classifying professions by a specific criterion, standardization of

the profession, employees‘ assessment and remuneration, human resources management and selection of pedagogical employees, managing their adaptation and practical deployment, teachers‘ career development, modifying school needs to identify postgraduate education needs, characterizing working duties and responsibilities, creating a communication basis between job positions (employees and the management), identifying and changing incorrect and inefficient practices, identifying reasons behind failures at work, obtaining information and evidence about the success of working practices etc.

Types of professiograms

The internal composition of professiograms consists of *a general section*, describing the very purpose and function of an occupation, professional activities included in the profession, and qualification requirements for employment, and a *specific section* defining exact and dominant requirements for the somatic and mental functions of a person necessary for the efficient performance of the profession (Kohoutek, 2002).

The main criterion for the classification of professiograms

- Informative professiogram or classificative professiogram

Its function and purpose is to allow mutual comparison of individual professions. It consists of a structured system of indicators for each profession with selected comparison criteria and in a brief and easy-to-follow format. It is arranged in a system of categories and seeks to include all available professions. It is used in national and international occupational classification systems.

Another occupational classification system is the Geneva-based International Labor Office‘s system, where individual professions are classified into scientific, technical, freelance and related. The integrated system of job positions includes a database of job positions where individual occupational positions are structured according to occupational areas. Every profession in the database is defined on the basis of a key characteristic, which is further developed into individual categories: qualifications level, field of activity, type position on the labor market, personality requirements, working conditions, competences, health restrictions.

- Analytical professiogram

It represents a detailed and structured analysis of a specific profession with the level of detail depending on the purpose and character of a professiographic study. For these reasons, it is not necessary to follow its creation criteria as in the case of classification professiograms, but the resultant job description needs to be verified by research methods. Depending on the level of detail in the analysis, these professiograms are divided into standard - complex and minimalist. A guide to creating a complex professiogram of a primary education teacher can be found in the general framework for processing and deriving professiograms by Bureš (1981), who describes in detail

all primary elements of a profession and explains their specific factors with regards to personality requirements, qualifications, success criteria and performance.

We are aware of the fact that it is objectively not possible to include all items mentioned in the concept derived from our research. Still a number of elements of teaching as a profession have already been researched and have their fixed definitions and their problems, risks and proposed remedies are also known.

Professiographic Research Methods

Published professiographic studies contain a range of methods for recording, describing, analyzing and structuring a profession and the elements of its activities. In terms of their nature, these are divided into: *extensive* (describing the profession generally and globally) and *intensive* (providing a detailed description of the individual elements of the occupational activity). Some of these methods can be mentioned here:

- ***Free description of an occupation***. Its purpose is to obtain a qualitative description of a profession. In order to apply this method, two groups (the profession's experts and a group of individuals made up of „interested and informed laymen", who do not perform the profession, but have an in-depth knowledge of it) are asked to write down with as much detail as possible, yet in a clear and matter-of-fact style, those properties which in their opinion are necessary for the profession. The results are compared and reasons behind different views are subsequently analyzed. An inherent risk of this method is that it is qualitative in its nature, while professiography is traditionally a quantitative method. Therefore, when analyzing those differences, a defined categorization of phenomena under review needs to be provided in order to get to the essence i.e. description, not only narration.
- ***A questionnaire-based method – professiographic inquiry*** collects the opinions of competent persons (teachers, managers, pedeutology experts) on the subjective and objective aspects of the profession and the necessary qualifications of employees. To obtain professiographic data, the questionnaire must have clearly specified goals, a structure and a structured form of answers based on validated expectations. An inherent risk of this method (as with most questionnaires) is a selection of answers limited by the researcher and the degree of estimation concerning the detail level of the study. It is valuable when an identical and comparable instrument is used several times so that comparisons are possible – across professions, within a profession or within a certain time period in the same sample. Thus, the dynamics of the facts in question can be recorded.
- ***The critical incidents technique*** is a qualitative method focusing on the essence of a profession, its qualities and particularities. The critical incidents technique is not suitable as a basic strategy for learning exact information

about a profession, but it can be a very enriching addition to another strategy or a qualitative foundation before constructing a structured instrument – for example a questionnaire. It is particularly suitable for detecting partial phenomena related to the profession in a biodromal aspect. This technique can be described as a method of recording and analyzing crucial, important, critical, nodal or significant events, occurrences, moments or situations chosen in order to specify the essence of the profession. A critical incident can be any human activity that is important for the fulfillment of a task. The consequences of such an activity must be apparent and describable. Not only activities that may have negative consequences are regarded as critical incidents. Circumstances or situations that distract, discourage the respondent or make the respondent less confident may be of great importance. Incidents with positive results also need to be registered within the critical incidents technique.

- ***A daily record method*** is the most complex and difficult procedure implemented to obtain exact details about a profession. It not only serves to determine the types and kinds of activities, but also to perform a time analysis of an occupational activity. It detects in great detail regarding which activities, when, how long and in what structure performed by an employee in the profession in question. The optimal method for recording the duration and structure of activities is a day-to-day and day-long observation of the worker directly during the performance of the job. It can be in the form of external observation or auto-observation. Even if the observer is somebody other than the professional alone (a teacher in this case), the observer must be *an expert*. This means that he/she is well-acquainted with the profession in order to be able to record in a knowledgeable, objective and detailed manner all components of professional activities in ready-made record sheets. At the same time, he/she must be an *insider*, so that besides having the knowledge of the field, he/she must be part of the given social structure (school, class) to ensure that the monitored activities take place naturally and no special situation is created due to the presence of the observer.
- ***An interview-based method*** is the most often used to supplement, confront or further clarify the data obtained by other job analysis methods. Quantitative data is supplemented by a qualitative analysis leading to the understanding of potential disputable data and formulating final conclusions for the professiogram. Before the interview it is useful to know the results of the processed data so that it can be directed in a qualified way to clarity problematic issues. It may, however, happen that the problem has been forgotten in the meantime and the interview cannot cast any more light on it after a longer time, but this is due to the very essence of the dynamic approach.
- A suitable combination of methods can produce a complete and valuable picture of the profession in question, resulting in a job analysis study called

a **professiogram**. It represents a well-defined form of an efficient and expert-based typology of a profession based on physiological, psychological, pedagogical, economic, social and other types of knowledge. It was Kubalák (1979) who expressed the essence of the professiogram, "as a summary of requirements serving as preconditions and provisions for a worker's success in a specific working activity", their interconnections and mutual dependence within the system of occupational activities, clarifying workers' work duties and responsibilities, defining the quality of the performance of the profession and success criteria and the manner of their development in relation to preparatory and lifelong education. At the same time, the professiogram is an important source of support for innovations in undergraduate training, as it can provide feedback in a timely manner on ongoing work content changes.

Problems and Risks Related to Professiographic Research

As part of the planning, conduct and data processing of professiographic research, internal and external influences need to be taken into consideration as these can cause a misrepresentation of results. One of the undesirable influences is mentioned by Gavora (2007a) who writes about a methodologically interesting fact that people who are subject to research in fact play their roles – adjusting their behavior, conduct and thinking on the basis of their expectations about the research and their goals, i.e. they „idealize" reality. The reason for such role playing testifies a lot to group affiliation as it always contains the social identity indicators of an individual showing his/her position within society.

Swiss researcher Landert (1998), who carried out professiographic research by means of the auto-description (auto-screening) of teachers and a monitoring interview. The research sample was carefully selected, which means that at the first stage a representative sample of teachers from the country was prepared. At the second stage a sub-set of teachers was created including those who were willing to cooperate and met the given requirements. As part of auto-description (auto-screening), the teachers were asked to record the scope of activities in seven categories in the course of two successive weeks. To ensure the coverage of the whole school year, individual teachers recorded the time of their activities across different weeks. The running of the auto-description procedure went as follows*:* over two successive weeks the teachers filled out a form which kept a record of the time scope of their activities according to seven categories. Individual teachers recorded the time of their activities across different weeks, so that the whole school year was covered. Verification through an interview showed that accord between the activities recorded by autodescription and the teachers' statements was only demonstrated for 20% of teachers.

The published research-based experience and the requirement for triangulation indicate that performing a valid mapping of the professional activities in field work requires the use of several methods not only to provide a validity check, but also to capture various perspectives on the problem. It is important to ensure that auto-observation participants are properly instructed, but yet they remain a standard group of common members of the profession, otherwise, de facto, we would be studying experts. On the other hand, when an external observer is used and he/she enters an area in question, the actual performance of the monitored professional changes and the validity of such results is also questionable. An interview as such, even when structured, is always a very subjective instrument, on both parts, and can be questionable in this case. It is clear that professiographic research has its limitations, restrictions and risks and the researcher must be aware of them. In spite of all reservations, the importance of such research is undisputable.

When carrying out professiographic research, certain dynamic factors also need to be taken into consideration. These risks are connected with a degradation of the validity of research findings and discredition of the reliability of the research methodology and the research instrument. (Babiaková & Cabanová, 2011). In our strategy, we tried to eliminate these aspects by means of appropriate research procedures:

- The school, as an institution and environment for professional performance, is part of a *dynamic* process, which is constantly changing. That is why we need to regard the results of professiographic examinations only as one of many sources reflecting the actual activities of teachers.
- The teacher‘s performance as a *dynamic* life-long structure depends on the actual length of his/her school experience. (Kariková, 2004) An individual‘s work performance usually improves with the increasing length of his/her work experience. However, this does not mean that a lower time coefficient of the performance adversely affects the quality of the performance itself. Therefore, this factor needs to be statistically verified.
- On the other hand, a professional‘s lapsing into routine is accompanied by a lowering of the time coefficient. The time load of the performance does not decrease, but the teacher omits those activities that are not „indispensable“. This, however, can and often actually does degrade the professional fitness: for example by reducing or completely eliminating self-study, knowledge development, widening one‘s professional horizon etc. In this respect, the decreasing performance dynamics means the halting or even regressing of the professional development as a teacher.
- The professiographic measurement in a way reflects the specific environment the teachers work in (school culture, type, location etc.). This needs to be taken into account during the generalization of the outcomes and differentiation between the typical vs. specific professiograms.
- There are also other phenomena acting as a dynamic element of professiographic research: the course of the school year, the variability of individual

teaching professions (primary school teachers, secondary school teachers etc., but mainly the differences in the scope of job tasks between primary education teachers and pre-primary education teachers). The individual categories of the teaching profession deserve an independent examination, because teachers‘ activities are diametrically different depending on the pupils‘ age, as well as subjects taught.

- Differences between teachers can also occur depending on the scope of their teaching load, which is legally defined by the labor standards, but in the real school practice varies due to many factors: unexpected activities, current events in the classroom, substitution etc. Participants must be instructed to leave out absolutely non-standard days and to capture non-standard activities in special records.

Given these examples of possible risks, the objectivity and veracity of professiographic research could be questioned; however, all such negative aspects can be minimized by means of a carefully considered methodological strategy and careful preparation.

Conclusion: Significance and Objectives of Professiographic Researches

In accordance with the current trends in professiography leading from descriptive to predictive analysis of job performance, the main objective is to use professiographic methods to produce a *professiogram* as a structured compilation of the activities of a pre-primary and primary education teacher, their occurrence during the day/week, with the possibility to compare seasonal differences. According to recommendations, we performed daily time records of two weeks during three seasons.

The importance of producing a professiogram lies in the possibility of its utilization (supplemented according to: Kurelová et al. 1998):

- for human resources management – setting the content of job activities, classroom inspections and employee assessment,
- for the selection of pedagogical employees for standard and specialized posts related to job positions,
- for defining and completing evaluation criteria,
- for managing the adaptation of novice teachers and their integration into the continuing education system related to the evaluation criteria,
- for the career development of teachers, the formulation of priorities within teaching staff development and their targeted education,
- for the modification of job tasks for specialized functions following the specific requirements for job performance under the conditions of a particular school and class,

- for the area of teachers‘ undergraduate training, the creation of study programs and their evaluation,
- for the concretization of the content and objective of pedagogical practice during studies and setting the required performance standards for teaching profession students during and at the end of their training for the profession,
- for the formulation of professional standards on the national level and performance standardization at the level of schools,
- for employees‘ inspection, evaluation and remuneration,
- for the preparation of graduates for the real-life conditions of schools and the possibility to increase his/her adaptability to real school practice,
- for international comparisons between professional groups,
- for the international mobility of teachers and students.

Last but not least, teacher-oriented professiographic research carried out by academic researchers is also important for providing in-depth empirical insight to the knowledge of the target environment for which higher education institutions provide training for experts. The profiles of graduates, which are vaguely formulated for undergraduate preparation course designs, should reflect the standard of the profession and its specific form - a professiogram. This needs to be borne in mind when attempting to implement changes, restructuring or innovations for it is our primary interest that these efforts are planted in „good soil“.

References

Babiaková, S., & Cabanová, M. (2011). Analýza profesijných činností učiteľov na Slovensku. In B., Kasáčová (Ed.), *Učiteľ preprimárneho a primárneho vzdelávania. Profesia v slovensko-česko-poľskom výskume.* Banská Bystrica: PF UMB.

Babiaková, S. (2010). Teacher´s auto-evaluation and professional development. In L. Gómez Chova, D. Martí Belenguer, I. Candel Torres (Eds.), *International Conference of Education. Research and Innovation -Confererence Proceedings* [CD-ROM] Madrid: IATED.

Blížkovský, B., Kučerová, S., & Kurelová, M. (2000). *Středoevropský učitel. Na prahu učící se společnosti 21. století.* 1. vydání. Brno: Konvoj.

Bures, Z. (1981). *Psychologie práce a její užití*. Praha: Práce.

Cabanová, M. (2010). Primary teaching profession- the opportunities for learning its specifics. In *Teacher of 21st Century: Quality education for quality teaching* (pp. 202-209). [CD-ROM] Latvia, Riga: Latvias Universitate.

Cabanová, M., & Tabačáková, P. (2011). Czynności zawodowe nauczyciela edukacji początkowej - chwila obecna i perspektywy. In *Pedagogika wczesnej edukacji - dyskursy, problemy, otwarcia.* (pp. 624-634). Warszawa : Wydawnictwo Akademickie Żak.

Fülöpová, E. (1999). Profesijné činnosti učiteľa na Slovensku. *Slovenská pedagogika*, 2(3-4), 13-23.

Hanesová, D. (2009). Komparatívny pohľad na výskum učiteľa a jeho profesijných činností. In B., Kasáčová, B. & M. Cabanová (Eds.). *Profesia učiteľa v preprimárnej a primárnej edukácii v teórii a výskumoch* (pp. 157-164). Banská Bystrica : PF UMB.

Hanesová, D. (2009a). Development of Research on Teachers and Their Professional Activities Before and After The ‚Fall of Iron Curtain'. In *ECER, 2009. Theory and Evidence in European Educational Research*, 2009. [2010-03-25]. Retrieved :. http://www.eera-ecer.eu/ecer-programmes/conference/ecer009/contribution/1806/?no_cache=1&cHash=68f78bd2c5.

Hanesová, D. (2014). Development of Research on Teachers and Their Professional Activities Before and After the 'Fall of Iron Curtain'. *International Journal of Science, Commerce and Humanities*, 2(4), 166 – 191.

Hanesová, D. (2014a). Teacher Recruitment in Slovakia. In G.Pusztai, & Á. Engler (Eds.), *Teacher Education Case Studies in Comparative* Perspective (pp. 107 – 130). *S*upported by Visegrad Fund Standard Grant No. 21210119. Debrecen : CHERD.

Janík, T. (2005). *Znalost jako klíčová kategorie učitelského vzdělávání.* Brno: Paido.

Kariková, S. (2004). *Špecifiká profesijnej dráhy učitelia*. Prešov: MPC v Prešove.

Kasáčová, B. (2009). Výskum učiteľskej profesie – reflexia, perspektívy a výzvy. In B. Kasacova, & M. Cabanová (Eds.), *Profesia učiteľa v preprimárnej a primárnej edukácii: v teórii a výskumoch* (pp. 10 – 23). Banská Bystrica: PF UMB.

Kasáčová, B. Babiaková, S., & Cabanová, M. (2011). *Pre-primary and primary teachers in theory and job-analysis*. Banská Bystrica : Univerzita Mateja Bela.

Kasáčová, B., Babiaková, S., Cabanová, Filipiak, Seberová et al. (2011). *Učiteľ preprimárneho a primárneho vzdelávania. Profesia v slovensko-česko-poľskom výskume.* Banská Bystrica: PF UMB.

Kurelová, M. (1998). *Učitelská profese v teorii a v praxi*. 1. vydání. Ostrava: PdF OU.

Landert, CH. (2006). *Die Arbeitszeit der Lehrpersonen in der Detschsweiz, Ergebnisse einer einjährigen erhebung bei 2500 Lehrerinnen und Lehrern verschiedener Schulstufen und Kantone.* [online]. Zürich : Landert Farago partner, 2006 [cit. 2010-03-25].

Prucha, J. (2002). *Učitel (současné poznatky o profesi)*. Praha: Portál.

Revell, P. (2005). *The Professionals: better teachers, better schools*. Stoke on Trent: Trentham Books.

Seebauer, R. (1997). *Lehrer(in) Sein in Mitteleuropa: Eine Empirische Studie in Erkundungsabsicht: Zur Erfassung Der Taglichen Unterrichtsarbeit (Arbeitsweisen, Zeitlicher Aspekt) Sowie Der Besonderen Arbeitsbelastung in Ausgewahlten Bereichen Bei Lehrern Der Sekundarstufe I in Osterreich*. Der Tschechisch: Mandelbaum.

Kasáčová, B., & Tabačáková, P. (2010). *Profesia a profesiografia učiteľa v primárnom vzdelávaní*. Banská Bystrica: Univerzita Mateja Bela, Pedagogická fakulta.
Urbánek, P.(1999). Profesní časové zatížení učitelů ZŠ. *Pedagogika*, *49(3)*, 277 - 288.
Vašutová, J. (2004). *Profese učitele v českém vzdělávacím kontextu.* Brno: Paido.

Сажетак: Чланак се бави теоријским исходима истраживања учитеља, њихове професије, посла и специфичних професионалних активности, кроз кратак преглед истраживања реализованих у последњем периоду у Словачкој, Чешкој и другим земљама. Професиографија учитељског занимања се бави анализом специфичних професионалних активности учитеља. Са термином професиографија можемо повезати и појмове као што су анализа посла и опис посла. Налази се на граници између социјалне психологије и управљања људским ресурсима, а у исто време то је и метода истраживања намењена сакупљању, опису, анализи и процени радних активности са аспекта њихових личних и стручних услова за рад. У складу са трендовима у професиографији који воде од описа ка предвиђању активности, главни циљ употребе професиографске методе је конструкција професиограма као структуриране компилације активности.
Кључне речи: професија учитеља, компетенције, стандарди, професиографија, истраживање учитеља, ефикасност, методе истраживања.

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SELF-EVALUATION OF TEACHERS, CASE STUDY: APPLICATION OF THE NORWEGIAN TEACHER SELF-EFFICACY SCALE

Summary: Students are not the only ones subjected to evaluation, as the indispensable activity of educational work. Each teacher is exposed to the external evaluation process by professional services, but also with a variety of instruments teachers independently assess and evaluate their own work. Based on the fact that self- evaluation of teachers is of great importance to educational work and that the quality of education is largely dependent on it, research was carried out using the Norwegian teacher self-efficacy scale. This research was conducted with the aim of pointing out the necessity of developing the assessment skills of teachers' competences and their own work with the goal of objective consideration of the current situation, and the end result should be an increase in the quality of the education system.
Key words: evaluation, self-evaluation of teachers, professional development of teachers

Introduction

The quality of teaching process is greatly influenced by the quality of teaching staff. Pešikan emphasizes that " quality education can only be achieved by raising the quality of people and professions involved in it." (Pešikan, 2002, pg. 119). In Serbia there is a commitment to continual professional development of teachers and this area is defined by *Pravilnik o stalnom stručnom usavršavanju i sticanju zvanja nastavnika, vaspitača i stručnih saradnika* ("Official Gazette RS", no. 85/2013) which also regulates forms of professional development (trainings, professional gatherings, lifelong learning programs, accredited seminars, research projects, summer and winter schools, study tours, etc). However, in order to raise quality in educational and formative work, it is important, besides professional development, to be able to self-assess ones work.

Bandura defines self-efficacy as " judging your own abilities to organize and perform actions to reach a certain goal" (Bandura, 1986, pg. 391).

Each teacher is exposed to external evaluation by professional service, while schools are obliged, in period of five years, to do a self-evaluation in terms with *Standards for work quality in educational and formative institutions* (Institute for assessing the quality of education, 2010). These standards cover seven areas: 1. School programs and annual agenda, 2. Teaching and learning, 3. Student educational achievements, 4. Student support, 5. ETOS, 6. Organization and management of school work and 7. Resources. All areas are also controlled by external evaluation (at least once during five year cycle). It needs to be emphasized that evaluation is more effective if it gains a form of self-assessment. If the work is evaluated by someone else (external evaluation) even then there should be a tendency to include the individual (teacher) whose work is being evaluated (Vilotijević, 1992). Self-assessment is related to observing a teacher as a reflexive practitioner thinking about his work, analyzing his actions, activities and results and using them to improve his work and teaching practice. (Nikodinovska-Bančotovska, 2006).

There are various instruments used for independent assessment and evaluation of teachers' work. The authors of this work agreed that the Norwegian teacher self-efficacy scale, being composed according to Bandura's guide for constructing self-efficacy scales, sees the teachers' work multi-dimensionally and corresponds to the aim of research since it contributes to developing the ability to assess different competencies of teachers. (see: Bandura, A. (2006). Guide for Constructing Self-Efficacy Scales. In F. Pajares and T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 307-337). Greenwich: Information Age Publishing). The scales which look at only one dimension of self-efficacy do not completely portray the multifunctional nature of teacher's work. (Avanzi et al., 2013).

The Norwegian teacher self-efficacy scale proved to be a good instrument during development of programs for professional development of teachers, especially those aiming to increase teacher's competencies. Also, this scale enables to identify the dimensions that teachers are least certain at. Based on results given, schools can dedicate their full attention to those dimensions that proved to be problematic, and find ways to improve teacher's competencies and raise their self-esteem in those work areas. (Skaalvik and Skaalvik, 2007).

Research methodology

The **object** of this research is teacher self-assessment, carried out through the application of the Norwegian teacher self-efficacy scale.

The **goal** of the research is to stress out the necessity for the development of the assessment capability of teacher competencies, as well as one's own work, in order to get an insight into the present situation, while the end result should be estimating the quality of the education system.

In accordance with the defined research goal, the **tasks** have been selected as follows:

- - make a research on how much the length of the teacher's working life affects his self-efficacy assessment
- - determine if there is a connection between the length of the teacher's working life and his or her self-efficacy assessment on his capability to maintain student discipline and ability to solve conflicts among students
- - determine how the length of the teacher's working life affects his readiness to introduce new teaching methods in his work
- - make a research on the potential existence of a statistically significant correlation between the teacher self-efficacy dimensions which are included into the scale
- - determine if there is a difference in self-efficacy assessment between class teachers and subject teachers
- - determine if there is a statistically significant difference in the self-assessment process between teachers who work in the country and those who work in cities on the account of efficacy in adapting classes to the individual needs of students

Taking into account the goal and tasks of this research and its features, the methods applied in it are as follows: the method of theoretical analysis and the descriptive method

Techniques enable a researcher to reach the defined goal in an organized and systematic way, in accordance with his or her plan (Banđur and Potkonjak, 1999). The techniques used during this research are: content analysis and scaling.

The instrument used for the research is the Norwegian teacher self-efficacy scale. This scale measures six dimensions of teacher self-efficacy.

Dimensions, i.e. subscales of this scale are, as follows: 1. Instruction, 2. Adaptation of content to students' needs, 3. Motivation of students, 4. Restoring discipline, 5. Cooperation with parents and fellow teachers, 6. Openness to change. The scale has twenty-four items altogether, i.e. four items per each dimension. The first dimension (instruction) refers to the teacher's ability to do the following: give instructions, explain the curriculum, guide students through lessons and answer students' questions to increase the amount of knowledge they gain from the school curriculum. The second dimension of the scale (adapting content to students' needs) reflects the Norwegian national curriculum (from 1985), which demands that education is adapted to needs of each and every student. The individualization of the curriculum is also the key factor of inclusive education. The third dimension (motivating students) refers to the assumption that the optimal amount of studying depends on students' motivation. Motivating students is one of the most important tasks for all teachers. The fourth dimension (restoring discipline) refers to teacher's capability to keep everything in order in his class. The fifth dimension (cooperation with parents and colleagues) indicates the im-

portance of cooperation and communication of every teacher with other teachers, as well as with parents who must be informed about the situation and activities in school and included in the decision-making process. The sixth dimension of the Norwegian teacher self-efficacy scale (openness to change) represents the level to which a teacher is adaptable to changes in the education system (like being responsible for a large numbers of students in team-organized lessons in Norway, insisting on the differentiation of curriculum, or demanding the introduction of contemporary teaching methods) (Skaalvik and Skaalvik, 2007).

Although the Norwegian teacher self-efficacy scale was devised as an answer to the need for an expectancy analysis of Norwegian teachers, this scale has cross-cultural sensitivity, which means that it can be used in other countries, as well. The scale has significant advantages over other similar scales, because it analyzes different components of teacher self-efficacy, such as direct work with students, but also the efficacy of cooperation with parents and the capability of teachers to respond to changes.

The authors of this research have made a slight correction to answers on the Norwegian teacher self-efficacy scale. The original scale covers the range of 1-7 possible answers (although the precise meanings are given only for four answers), while our modified scale covers the answer range 1-5, out of which every single one is precisely defined. The reason for such modification lies in the fact that the original scale does not have precisely defined criterion for every answer.

Sample

365 teachers participated in the research, 246 of them working in primary school (67,4%), 92 in secondary (25,2%), and 27 (7,4%) in both primary and secondary school. 69,0% of teachers are involved in subject teaching and 30,7% in class teaching (0,3% unknown). 81,6% of teachers works in a city environment and 9,9% in a country environment (8,5% unknown). The majority of sample are teachers working in Serbia, while the minor part are teachers working in Macedonia, Bosnia and Herzegovina and Croatia. Gender structure is dominated by female, 86,3%.

Table 1. Teachers age groups

Age groups	N	%
20-29	27	7,4
30-39	103	28,2
40-49	158	43,3
50-59	72	19,7
60-65	5	1,4
Total	**365**	**100,0**

The Age of teachers in the sample varies, the majority falls in 40-49 age group, (43,3%), and the minority in 60-65 age group, (1,4%).

Table 2.Teachers according to teaching experience

Years of experience	N	%
1-5	56	15,3
6-10	57	15,6
11-15	67	18,4
16-20	48	13,2
20 and more	135	37,0
Missing	2	,5
Total	**365**	**100,0**

The sample covers teachers who vary in teaching experience significantly. The majority of teachers has 20 or more years of experience, (37,0%), and the minority has 1 to 5 years (15,3%). 0,5% is unknown.

Research procedure and data processing

Teachers covered by the research electronically filled the instrument - the Norwegian teacher self-efficacy scale - translated in Serbian, during June and July 2014. IBM SPSS 19 Statistics was used for data processing and the following statistical procedures were used: arithmetic mean and standard deviation calculation, one way analysis of variance (ANOVA), bivariate (Pearson) correlation and t-te

Results and discusion

Based on the problem, goal and tasks researched the following hypothesis were made:

1. It is assumed that the teachers with longer work experience are better at evaluating the degree of their efficacy;
2. It is expected that the teachers with longer work experience are better at maintaining discipline and resolving possible conflict situations between the students;
3. The teachers with shorter work experience are more willing to apply new, contemporary teaching methods;
4. It is expected that the teachers who gave higher grades (4 or 5) to one dimension of their self-efficacy will do the same with the other;

5. Class teachers are better at evaluating their self-efficacy (compared to subject teachers);
6. There is no statistically significant difference in teacher's self assessment of the efficiency of adapting to the individual needs of the students between the teachers working in the city and the country environment.

The first three hypothesis are based on the claim that the length of work experience will significantly influence the teacher's self-evaluation and that the examinees who have been teaching for a number of years will be better at grading all the subscales. It was expected that the teachers with shorter teaching experience will grade higher only in the part related to introducing teaching innovations and applying contemporary methods to the teaching process. This assumption was made based on the fact that young colleagues, who are at the beginning of their teaching careers come straight from the faculties, where they had been guided to actively introduce contemporary teaching methods (in order to avoid presently dominate traditional teaching methods). The teachers who have just started to work are at the initial point and are searching for the best realization of certain contents, while the traditional, frontal teaching method is still noticed when it comes to the majority of the teachers who have been teaching for a number of years.

Table 3. Application of ANOVA in examining the influence that the working life has on all subscales included in this research

	1-5		6-10		11-15		16-20		20 and more		F	p
	AS	SD	AS	SD	AS	SD	AS	SD	AS	SD		
instruction	4,18	0,71	4,21	0,48	4,29	0,46	4,41	0,44	4,33	0,47	1,977	,098
adaptation	3,78	0,70	3,61	0,70	3,69	0,70	3,79	0,72	3,90	0,65	2,221	,066
motivation	3,79	0,71	3,61	0,73	3,78	0,58	3,78	0,72	3,82	0,65	1,027	,393
discipline	3,93	0,97	4,03	0,88	4,29	0,64	4,17	0,73	4,17	0,79	1,826	,123
cooperation	4,24	0,71	4,31	0,51	4,27	0,55	4,28	0,53	4,37	0,52	,804	,523
changes	4,21	0,75	4,31	0,56	4,31	0,56	4,38	0,60	4,37	0,53	,823	,511
Total scale	4,02	0,60	4,01	0,47	4,10	0,40	4,13	0,48	4,16	0,44	1,474	,210

Table 3. shows that the highest arithmetic mean are recorded with the teacher who have been teaching a long time (16-20 and 20 more). The experience gained from working gives them self-certainty, therefore, they graded themselves rather high when self assessing the capability to transfer knowledge to their students, restore and maintain discipline, cooperate with the colleagues they work with, as well as to deal with the possible unexpected changes that may occur in teaching curriculum and require prompt action and adaptability.

The lowest arithmetic mean when it comes to all factors monitored occur with the examinees with the shorter working life (1-5 and 6-10 years), even thou their self-assessment is not significantly lower than the teachers' with longer working life.

Sustainability of the first, the second and the third hypothesis was checked using ANOVA. The results show that there is no statistically significant difference in answers by the examinees with different working life length (the P value (indicator of statistical significance) is higher than 0,05). Thus, this three research hypothesis must be discarded.

Assuming that a teacher graded one dimension of his self-efficacy with high grades (4 or 5) the Pearson correlation coefficient was used to examine if it is possible to expect the same when other dimension are concerned.

Table 4. Pearson correlation coefficient for examining statistical relation of teachers' self-evaluation and dimensions observed

		instruction	adaptation	motivation	discipline	cooperation	changes
instruction	r	1	,514**	,521**	,396**	,475**	,500**
	p		,000	,000	,000	,000	,000
adaptation	r	,514**	1	,542**	,401**	,441**	,472**
	p	,000		,000	,000	,000	,000
motivation	r	,521**	,542**	1	,479**	,402**	,437**
	p	,000	,000		,000	,000	,000
discipline	r	,396**	,401**	,479**	1	,455**	,386**
	p	,000	,000	,000		,000	,000
cooperation	r	,475**	,441**	,402**	,455**	1	,481**
	p	,000	,000	,000	,000		,000
changes	r	,500**	,472**	,437**	,386**	,481**	1
	p	,000	,000	,000	,000	,000	
**. Correlation is more significant at level 0,01.							

The sustainability of the fourth hypothesis was checked by Pearson bivariate correlation analysis. All examined dimensions of self-efficacy correlate at statistically significant level. Correlation coefficients have medium values (values between ,3 and ,6). Based on the results given it is possible **to accept the fourth research hypothesis**.

The fifth hypothesis assumed that class teachers would have better grades. This assumption was based on the fact that class teachers know their students better since they spend four years together. They know the capabilities, needs and interests of their

student and are therefore able to adapt the realization of etching more efficiently and restore discipline more successfully.

Table 5. Application of t-test in order to compare self-evaluation of class and subject teachers

	teaching type	AS	SD	AS difference	t	p
instruction	class	4,26	0,48	-0,04	-,709	,478
	subject	4,30	0,53			
adaptation	class	3,99	0,56	0,32	4,139	,000
	subject	3,68	0,72			
motivation	class	3,94	0,61	0,24	3,175	,002
	subject	3,70	0,68			
discipline	class	4,20	0,64	0,10	1,064	,288
	subject	4,10	0,87			
cooperation	class	4,30	0,51	-0,01	-,228	,820
	subject	4,31	0,57			
changes	class	4,40	0,50	0,11	1,732	,084
	subject	4,28	0,62			
Total scale	class	4,18	0,40	0,12	2,228	,026
	subject	4,06	0,50			

Even thou teachers graded themselves rather high in this segment too, the highest score occurred at "cooperation" subscale (the highest arithmetic mean for class teachers was 4,30, and 4,31 for subject teachers). The worse self-evaluation for subject teachers occurs within "adaptation" subscale (3,68). These results can be explained by a number of external factors that are not a part of this research.

The differences between self-evaluation of efficacy for class and subject teachers were examined using t-test analysis of independent samples. Statistically significant differences were found with variables Adaptation (t=4,139, p=,000) and Motivation (t=3,175, p=,002), as well as with the Total scale (t=2,228, p=,026). In all three cases class teacher graded their efficacy higher than subject teachers did. Based on these results, **the fifth hypothesis is partially accepted**, baring in mind that the differences were not found in all dependent variables.

During research a comparison of examinee's self-efficacy was made based on the environment they work in. The assumption was that there are no statistically significant differences between answers of teacher working in city and those working in country environment. Lack be reflected in the unevenness of the sample.

Table 6. Application of t-test in order to compare self-evaluation of teachers working in city and country environment

	location	AS	SD	AS difference	t	p
instruction	city	4,31	0,52	0,05	,550	,583
	country	4,26	0,44			
adaptation	city	3,75	0,71	-0,23	-1,890	,060
	country	3,98	0,59			
motivation	city	3,76	0,69	-0,14	-1,154	,249
	country	3,90	0,55			
discipline	city	4,10	0,81	-0,11	-,759	,448
	country	4,21	0,75			
cooperation	city	4,30	0,56	-0,03	-,290	,772
	country	4,33	0,57			
changes	city	4,32	0,60	-0,07	-,672	,502
	country	4,39	0,46			
Total scale	city	4,09	0,49	-0,09	-1,046	,296
	country	4,18	0,37			

Based on the results in Table 6. it is noticeable that the highest arithmetic means were recorded in "cooperation" and "changes" subscales, where both examinees working in city and those working in country gave equally high grades. Examinees' answers for all other subscales are also characterized by an insignificant difference, all grading their capabilities relatively high, regardless of the environment they work in.

The differences in reported efficacy between city and country teachers were examined using t-test analysis of independent samples. Even thou there are differences between teachers in all examined dependant variables, those differences are not statistically significant (p is greater than 0,05). Based on the results given, it is possible to **accept the sixth research hypothesis**.

Conclusion

Professional development is an obligation for every teacher and it contributes to a certain effect to raising of quality of education. However, the teaching would be even more successful if the teachers educated and strengthened themselves in the areas that are problematic for them and where they do not feel comfortable enough. Evaluation monitors each activity and that makes it unfailing in both educational and formative

work. The evaluation process provides better results if it has a form of self-evaluation. To reach a goal, and for a teacher to have the role of a genuine reflexive practitioner and an independent professional, it is necessary for him to master the skills of self-evaluation. It is essential that a teacher is able to objectively assess his self-efficiency in different dimensions of his work. It is extremely important that the teachers seeks and receives suitable expert aid in the dimensions he is not competent enough in. That will benefit himself (self-esteem improvement), his students, the school and the entire school system. The use of Norwegian teacher self-efficacy scale may help in reaching this goal.

The results show that the working experience of the teachers covered by this research (both class and subject teachers) has no effect on their self-evaluation. Teacher who are at the beginning of their careers, as well as those who teach for several decades, graded themselves average in certain subscales , and in some cases very good. This shows high level of self-esteem when it comes to capabilities and manners of knowledge transfer and restoring discipline, cooperation with their work colleagues and students' parents. When applying contemporary work methods to the teaching process is discussed, it can not be generalized that only those examinees who are at the beginning of their careers are prone to it. The research showed that the teachers with several decades of teaching experience consider that they readily approach changes and that they, using certain contemporary methods and modes of work, manage to motivate students, thus contributing to better instructions and quality of teaching process. It was recorded that class teachers grade their adaptation to changes that may be conditioned by various factors (covered by scale) higher, as well as their ability to motivate students. According to analysis of the results related to the environment the examinees work in, there is no difference in self-evaluation, whether or not the school they work in is a city or a country one. This can be explained by the fact that both environments have their faults and virtues. Country schools have fewer students, thus the teachers can adapt to them and motivate them easier, and, simply, work easier in classrooms with fewer students, gain a clear picture of students accomplishments and increase assurance in own work (according to subscales covered by this research). On the other hand, there are numerous limitation that occur at country schools, such as poor school equipment, lack of extracurricular activities in the local community which could be used for teaching, lack of expert aid, etc. Such limitations are less present at city school and again we can conclude that both environments have their faults and virtues.

References

Avanzi, L., Miglioretti, M., Velasco, V., Balducci, C., Vecchio, L., Fraccaroli, F. and Skaalvik, E. M. (2013). Cross-validation of the Norwegian Teacher`s Self-Efficacy Scale (NTSES). Teaching and Teacher Education, 31, 69-78.

Banđur, V. i Potkonjak, N. (1999). *Metodologija pedagogije*. Beograd: Savez pedagoških društava Jugoslavije.

Bandura, A. (1986). *Social Foundations of Thought and Action. A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (2006). Guide for Constructing Self-Efficacy Scales. In F. Pajares and T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 307-337). Greenwich: Information Age Publishing.

Nikodinovska-Bančotovska (2006). Vrednovanje i samovrednovanje – procesi usmereni ka efektivnoj nastavi. Pedagoška stvarnost, LII, 1-2, 63-68.

Pešikan, A. (2002). Profesionalni razvoj nastavnika – šta je tu novo? Hemijski pregled, godište 43, broj 5, 115-120.

Pravilnik o stalnom stručnom usavršavanju i sticanju zvanja nastavnika, vaspitača i stručnih saradnika («Sl. glasnik RS», br. 85/2013).

Skaalvik, E. M., and Skaalvik, S. (2007). Dimensions of Teacher Self-Efficacy and Relations With Strain Factors, Perceived Collective Teacher Efficacy, and Teacher Burnout. Journal of Educational Psychology, Vol. 99, No. 3, 611-625.

Standardi kvaliteta rada obrazovno-vaspitnih ustanova (2010). Beograd: Zavod za vrednovanje kvaliteta obrazovanja i vaspitanja.

Vilotijević, M. (1992). *Vrednovanje pedagoškog rada škole*. Beograd: Naučna knjiga i Centar za usavršavanje rukovodilaca u obrazovanju.

Appendix

Appendix 1. Norwegian Teacher Self-Efficacy Scale

How certain are you that you can:

Instruction

1. Explain central themes in your subjects so that even the low-achieving students understand.
8. Provide good guidance and instruction to all students regardless of their level of ability.
12. Answer students` questions so that they understand difficult problems.
16. Explain subject matter so that most students understand the basic principles.

Adapt Instruction to Individual Needs

5. Organize schoolwork to adapt instruction and assignments to individual needs.
11. Provide realistic challenge for all students even in mixed ability classes.
18. Adapt instruction to the needs of low-ability students while you also attend to the needs of other students in class.

23. Organize classroom work so that both low- and high-ability students work with tasks that are adapted to their abilities.

Motivate Students

2. Get all students in class to work hard with their schoolwork.
10. Wake the desire to learn even among the lowest achieving students.
15. Get students to do their best even when working with difficult problems.
21. Motivate students who show low interest in schoolwork.

Maintain Discipline

6. Maintain discipline in any school class or group of students.
9. Control even the most aggressive students.
14. Get students with behavioral problems to follow classroom rules.
19. Get all students to behave politely and respect the teachers.

Cooperate With Colleagues and Parents

3. Cooperate well with most parents.
7. Find adequate solutions to conflicts of interest with other teachers.
13. Collaborate constructively with parents of students with behavioral problems.
22. Cooperate effectively and constructively with other teachers, for example, in teaching teams.

Cope With Change

4. Successfully use any instructional method that the school decides to use.
17. Manage instruction regardless of how it is organized (group composition, mixed age groups, etc.).
20. Manage instruction even if the curriculum is changed.
24. Teach well even if you are told to use instructional methods that would not be your choice.

Original Response Categories:
1 = *not certain at all*; 3 = *quite uncertain*; 5 = *quite certain*; 7 = *absolutely certain*.

Response Categories (used in this paper):
1 = *not at all, never certain*; 2 = *a little or sometimes certain*; 3 = *sometimes certain, sometimes uncertain*; 4 = *fairly often certain*; 5 = *completely, always certain*.

Source: Skaalvik, M., E. and Skaalvik, S. (2007). Dimensions of Teacher Self-Efficacy and Relations With Strain Factors, Perceived Collective Teacher Efficacy, and Teacher Burnout. Journal of Educational Psychology, Vol. 99, No. 3, 611-625.

Сажетак: Вредновању, као неизоставној активности сваког васпитно-образовног рада, не подлежу само ученици. Сваки наставник изложен је процесу екстерне евалуације од стране стручних служби, али и уз помоћ различитих инструмената самостално процењује и евалуира сопствени рад. Полазећи од чињенице да је (само)вредновање наставника од великог значаја за васпитно-образовни рад и да од њега у великој мери зависи и крајњи квалитет образовања, спроведено је истраживање применом Норвешке скале самопроцене наставника. Истраживање је спроведено са циљем указивања на неопходност развијања способности процене наставникових компетенција и сопственог рада ради објективног сагледавања тренутне ситуације, док крајњи резултат треба да буде повећање квалитета система образовања.
Кључне речи: вредновање, самовредновање наставника, професионални развој наставника

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THE SUPPORT OF SUBJECT „EDUCATIONAL CONCEPTIONS OF NUMERACY DEVELOPMENT“ BY ELECTRONIC COURSE

Summary: In this paper we are engaged by support of teaching by e-learning at the Pedagogical faculty at Matej Bel University in Banská Bystrica. Teachers of pre-primary education are prepared at this faculty. They must obtain a lot of information from different areas in a short time. Every subject is very important for them. They improve their mathematical knowledge at the only course Educational conceptions of numeracy development. Students of full-time study have only 26 hours of mathematics during the masters' degree and students of part-time study have one eight-hour block. During this time they must learn how to develop mathematical thinking of children in kindergarten. We decided to use electronic support of teaching in the environment Learning Management System Moodle. The paper presents the electronic course and concise results of questionnaire survey that was focused on obtaining the feedback on this course.
Key words: Elementary math, preparation of kindergarten teachers, electronic course, pre-primary education

Pre-primary education in Slovakia

Education of children begins from an early age primary in a family environment. Children learn from their parents and siblings by observation, imitation, and later by asking and listening to the others. Later they begin to imitate friends and people around them. When children achieve the age of three, they can be incorporated to a new team – the school team. In Slovakia the institutional education begins in kindergarten, which is included in the school system according to the Law of education. Children aged from three to six years can be taken to pre-primary education. When children have six years, they must begin compulsory education, by attending a primary school.

It is suitable if children attend pre-primary education one year before beginning of compulsory education. They are gradually adapted to the school environment and get used to a new role – the role of pupil.

The new Slovak national curriculum is valid since 2008. The curriculum also determines the educational content for pre-primary education. The pre-primary education curriculum is named *A Child and world*. It is divided into four thematic parts: I am, People, Nature, Culture. Complex child personality development is necessary in pre-primary education. Development of personal qualities (self-knowledge, knowledge of the world and people, knowledge of nature and culture) is implemented via continuous daily pedagogical activities. It is important to develop competences in the native language. The development of mathematical competence is equally important. "The aim of pre-school mathematics is not only to acquire new knowledge, skills and habits but also to develop cognitive skills and to form relationship to mathematics, to learning and to also work." (Gerová, 2010). Uherčíková and Haverlík (2007) write about the importance of the mathematical competence development: "… the mathematical competence, which is acquired during pre-school education, is important for a successful self-assertion in the future. The first contacts with math are created in pre-primary education. Children understand that math is in our life all around us. Children learn to perceive math gradually, they became familiar with math via activities with objects around them. It leads to the natural use of math in their life and they are not afraid of it. This relationship is an important factor in lifelong learning, career choices, etc.".

The development of Mathematical knowledge is mainly in cognitive part *People*. "This area is oriented on the development of social experience and relationship to the human community. It develops the ability to create a contact with other groups of people. The cognitive part *People* informs children about work activities and other activities of people and it develops their ideas about places where people live and work. It learns about environments where people live, about multiculturalism and ethnicities. This part has the following components: human activities and their artistic expression, the importance of work, colours, mathematical concepts and language skills." (Brincková, 2010)

The preparation of future teachers of kindergarten

Parents, who give their child to kindergarten assume, that their child will be educated by a teacher, who is adequately prepared and educated. It is therefore necessary that kindergarten teachers have the knowledge and skills they will use in the work. In Slovakia, the kindergarten teacher can be:

- a graduate of completed secondary education with the supplementary pedagogical study of pre-school education,

- a graduate of the bachelor degree study program Preschool and Elementary Education, or
- A graduate of the master degree study program Preschool Education.

Qualification requirements for teacher of pre-primary education are define by law 437/2009 of Collection of laws.

Future teachers of kindergarten have the opportunity to study a bachelor degree program Preschool and Elementary Education at seven universities in Slovakia. Master's degree education in Preschool education study program provides two universities in Slovakia (Matej Bel University in Banská Bystrica, Prešov University in Prešov).

Graduate of the study program Preschool and elementary education (Bc.) is able to design educational and training environment in the institution of pre-school education and leisure activities for children of younger school age (school clubs, leisure centre, etc.). They are competent to implement educational and training programs in a specific group of children; to lead groups of children in relation to pedagogical intention of the relevant institutions and organisations. A graduate of the Master's study program Preschool Education is competent to practice the profession:

- teacher at pre-primary education in nursery school and facilities for children of preschool age,
- methodology for the pre-primary education,
- specialist personnel of state administration for the education of preschool aged children,
- a worker in education of children with cultural handicaps,
- a researcher in the area of pre-primary education and the area of education of preschool aged children.

During the study, every student should acquire knowledge and skills, which they will use in their future profession. Future teacher of pre-primary education should have knowledge from native and foreign language, math, natural science, human science, art, education and many other areas. Kindergarten teachers have to develop child's personality complexly and prepare the child for primary education.

The subject Educational conceptions of numeracy development

As well as we pay attention to the native language development, it is necessary to pay attention to the development of mathematical skills. Already during the pre-primary education the logical and critical thinking basis is created. Uherčíková, Haverlík (2007) gives their opinion: "…inner beliefs of teachers of kindergarten about the necessity and importance of mathematics are probably substantial methodological instruction to the best learning mathematics. Only by this way, they will be able to present math to children

adequate." Often, the university seminars have to convince students about the necessity and importance of mathematic. Most students of Pre-primary and Elementary Education have not positive attitude to mathematics. The research conducted at the Pedagogical Faculty of Charles University in Prague confirms this. Hejný (2004) wrote: "From an students interview we know that students don't understand mathematics as an environment for the ideas cultivation but as a large chaotic set of definition, theorems, formulas and instructions, meaning of it they do not understand. "

Teacher trainers of pre-primary education must complete several subjects dealing with mathematics to have sufficient knowledge in math. During the bachelor study in Matej Bel University students have two compulsory courses of mathematics (104 hours per study) and two compulsory optional courses (52 hours per study) dealing with mathematics. Students can choose the other from three optional courses. In the master's degree, they can choose only one compulsory optional course, which develop mathematical knowledge and skills. The course 'Educational conceptions of the numeracy development' have to develop abilities that activate connections of the real world to mathematics. During the term students enrich their math knowledge and develop their ability, learn how to use elements creatively and assess suitability of elements of non-traditional education. Students also learn how to suppress the stereotype and the routine of education by using different teaching structures. The teacher trainers support their creativity and inventiveness. Students solve interesting tasks during the term, because we want to arouse the students' interest in the creative approach to the numeracy development.

For students of pre-primary education is necessary to acquire not only theoretical knowledge about the national curriculum, knowledge of math and from using mathematics in everyday life, but they have to acquire practical skills with development of math. During the term students work with various toys, games, poems, singles that develop numeracy of children, imagination, logical thinking and mathematical thinking. Often students do not realize that they can use aids, which are normally available in each kindergarten to develop mathematical thinking.

The course 'Educational conceptions of the numeracy development' is compulsory-elective subject. This course is designed for students of the first year of a master´s degree in study program Pre-primary education. The course is given in thirteen two-hour blocks during the summer term. Students of part-time study graduate this course during one eight-hour block. Time allocated of this course is very small with respect to the content of the course.

In the course 'Educational conceptions of the numeracy development' we focus on the following topics:

- didactic concepts of teaching of math, present concepts of education in Slovakia and in world,
- the national curriculum,
- mathematical thinking development,
- process of creating concept in math,

- mathematical thinking and numeracy,
- innovation of fundamental strategies and methods of teaching preschool math,
- mathematical fairy tales, poems, singles,
- creation of application tasks that differentiate the numeracy levels achieved in the cognitive part People,
- art seen in mathematics,
- teaching aids – kids brick-box and their using in dimensional imagination, development of numeracy by ICT,
- problem and project teaching.

Our course in Learning Management System Moodle

We decided to use an electronic support of subject by e-course in a Learning management system Moodle because of the wide range of course syllabus and the lack of time allocated.

Every block consists of one hour exercise and one hour lecture. In lecture we discussed theoretical bases. It is necessary that teacher trainers acquire practical skills in the mathematical thinking development of children of pre-primary education. They obtained the necessary experience by exercises done during the seminars. Students worked with simple materials for example paper from which they made the aids to develop mathematical thinking of child – tangram, mandala, mosaic, square grid.

Image 1*: Preview of electronic course - introduction*

We used options of Learning Management System Moodle, therefore we can spend more time on practical work of students. Every student created account in Learning Management System Moodle on the beginning of term. Students had free admission to electronic course in role student during the term.

The electronic course is divided into several sections. Fundamental information about course, lecture syllabus, content of the course, assessment and literature needed for the course are in the introduction section (Image 1). After the introduction section follow five blocks of lecture and seminars. Every block contains from two to four topics. In the individual blocks, students can find presentations, which are used at lectures (they can look it at home), aids, worksheets and tasks for seminar works (Image 2). Before every course, students have to send elaborated tasks of seminar works via the Moodle. Students prepare worksheet for the kindergarten pupils in seminar works.

Testing of students is performed by electronic form. Tasks of test, communication with students and evaluation were performed in the environment Learning Management System Moodle.

Image 2: *Preview of the electronic course – the first block*

The last part of our electronic course is a final project sample, which students have to prepare at the end of the term. Students send their projects by Moodle.

The using of the electronic course has great benefit, especially for part-time study students, for whom it is intended only eight hours' time allocated. During this time, it is difficult to master theoretical knowledge, but also practical work. For this reason, in this course we focus on practical students activities that are accompanied by a brief theory. Students can study the theoretical part at home. The electronic course was helpful for us in terms of communication when we could communicate with students by chat if they had a problem.

We met with negative comments by older students on using the electronic course in environment Learning Management System Moodle. For them was the work with electronic course very complicate. On the contrary, we met with positive comments by students at the younger age.

Evaluation of e-course

The first time we taught with use of the Learning Management System Moodle in the summer term of academic year 2013/2014. At the end of term, we carry on the questionnaire survey. The questionnaire was focused on the importance of course for students and on using the Learning Management System Moodle. We want to present the results of questionnaire survey in this section.

The course Educational conceptions of numeracy development visited 9 students of full-time study and 35 students of part-time study. 29 students write out the questionnaire. The respondents were women aged from 22 to 52 years.

The questionnaire consisted of several parts. In the first part we examined the students' relationship to math. It is important that the kindergarten teachers have a positive attitude to math, if they want to develop mathematical thinking of the children in pre-primary education. In the second part we examined benefits of course 'Educational conceptions of numeracy development' for students. In the third part of the questionnaire students evaluated individual parts of course – work on course, seminars works, work with the Learning Management System Moodle and other.

Students met with math during the whole term. We want to know how many hours (approximately) per week they spend with math. They can to choose from four options: I don´t devote to math, 1 hour, 3 hours, another. The most of the students (38 %) reported that they devote to math one hour per week, 28 % of students do not devote to math, 17 % of students devote to math 3 hours per week and the same 17 % of students choose option another. In this case we don´t know how much time they devote math.

In the next question students evaluated how favourite is math for them. Students colud choose from five options: very favourite, favourite, neutral, unpopular, very unpopular. Chart 1 shows students' evaluation.

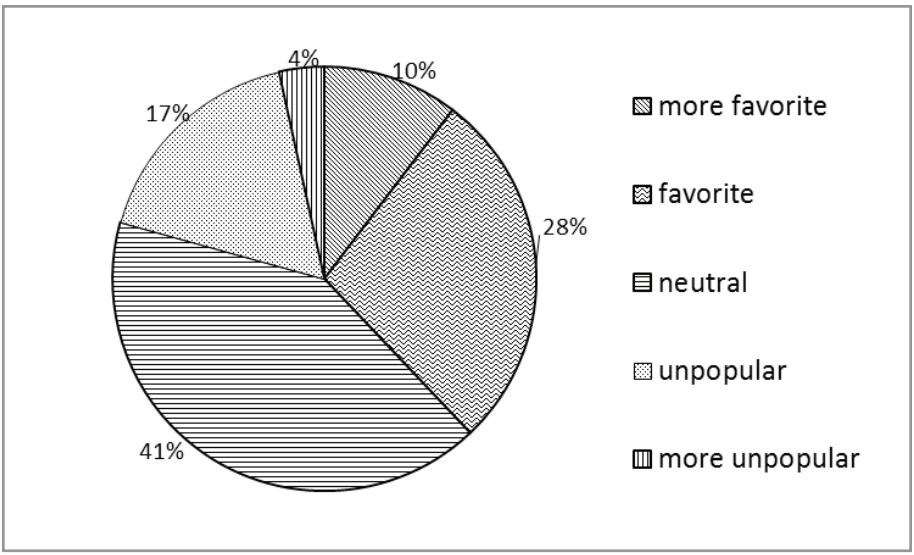

Chart 1: *Popularity of math by students of Pre-primary Education*

The follow question was: *Do you have school leaving examination from math?*. Seven students from twenty wrote that they have school leaving exam from math. In five cases was this exam compulsory.

From the questionnaires followed, that students who have the school leaving examination from math, evaluated math as favourite subject.

Students agree that they use math in everyday life. They quote the examples as shopping, cooking, estimate of distance, working in garden, construction and furnishing of the house (dimensional imagination), finance, Christmas decoration, planning of activities and any others.

The course 'Educational conceptions of numeracy development' is the only subject aimed at math. We wanted to know if in study program Pre-primary education should be more subjects focused on math. Positive answer gave 28 % of students. In the following question we asked for opinion about importance to develop mathematical thinking of children in pre-primary education. All students, except one, agreed that is important to develop numeracy of children of pre-school age.

We used the Learning Management System Moodle on course during all term. Many of the students had problem with work with Learning Management System Moodle – logging, sending the tasks and seminary works, and writing on the computer. Nowadays, computers and various software are using very often. For this reason, we wanted to know the students' attitude to information and communication technologies. Students could to choose from five options: excellent, very good, good, sufficient,

insufficient. In the most cases they have excellent attitudes to information and communication technologies (45 % of students). More detailed answers are in the Chart 2.

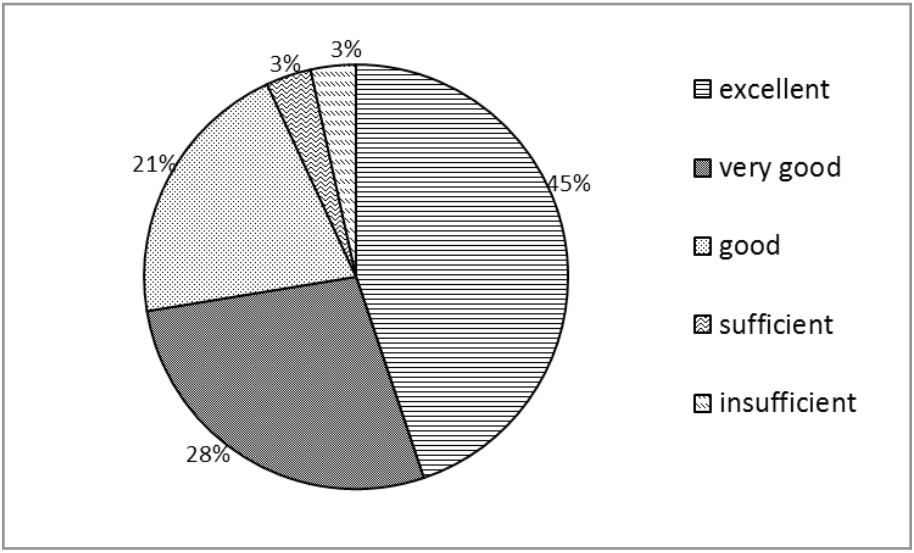

Chart 2: *Relationship of students to Information and Communication Technologies*

In the second part of the questionnaire, students had the opportunity to express their opinion about the course Educational conceptions of numeracy development. 90 % of the students answered this question positively: “Do you think that Learning Management System Moodle helps you to understand better the course Educational conceptions of numeracy development?“.

Students wrote that in course *Educational conceptions of development numeracy* they learned*:*

- to work in new software,
- to use new games, activities and aids, which develop mathematical thinking of children,
- to have another view on math,
- to use tangram in pre-primary education,
- to look at math in activities, where there is not primary mathematical aim,
- to explore in math,
- meaning of terms, which they didn´t know,
- make education programmes, games and projects for pupils of pre-primary education.

One of students wrote that it was only repetition of previously acquired knowledge.

Teacher trainers of pre-primary education will use in their future job: worksheets, which they made during the term, games and activities, tangram, software RNA, graph plotting, orientation in space, information and communication technologies and mathematical fairy tales. Students think that many tasks in the course, which they must do during the term, were unnecessary for them (a lot of theory, information about PISA testing, a lot of writing on a PC, and some activities). 44 % of students wrote that everything in the course was necessary.

Students evaluated individual parts of the course 'Educational conceptions of numeracy development' in the third part of the questionnaire. They could to choose from five options: excellent, very good, good, sufficient, insufficient. Students evaluated:

- slideshow used during the lectures (all slideshows are available in the electronic course),
- the content of the course,
- aids used during the lectures and exercises,
- electronic course in the Learning Management System Moodle,
- comprehension of the course,
- using of knowledge obtained in the course in job,
- the clarity of the course.

In this part of the questionnaire, students evaluated their work during the term but also work of teachers. During the term, students had to prepare for the lessons periodically, by writing composition, final all-day educational project and four tests. They could evaluate educational project and tests. The results of individual evaluation are in the following Table 1.

Table 1: *The evaluation of parts of course*

Items \ evaluation	excellent	very good	good	sufficient	insufficient
Slideshow	23	5	1	0	0
Content of course	11	13	4	1	0
Aids	21	4	4	0	0
Work of students on the course	4	20	4	0	1
Work of teachers on the course	22	5	2	0	0
E-course LMS MOODLE	18	8	2	0	1
Intelligibly of the course	8	16	4	1	0

Items \ evaluation	excellent	very good	good	sufficient	insufficient
Using of knowledge from the course in future job	17	8	2	2	0
Clarity of the course	13	12	2	2	0
Difficulty of the course	10	12	6	1	0
Composition	10	11	7	1	0
Tests	11	12	5	0	1
Final educational project	15	8	5	1	0

We focused on the analysis of only selected items, which are connected with the electronic course in the Learning Management System Moodle. Students evaluated electronic course in the Learning Management System Moodle on average by score very good. This evaluation is shown in Chart 3.

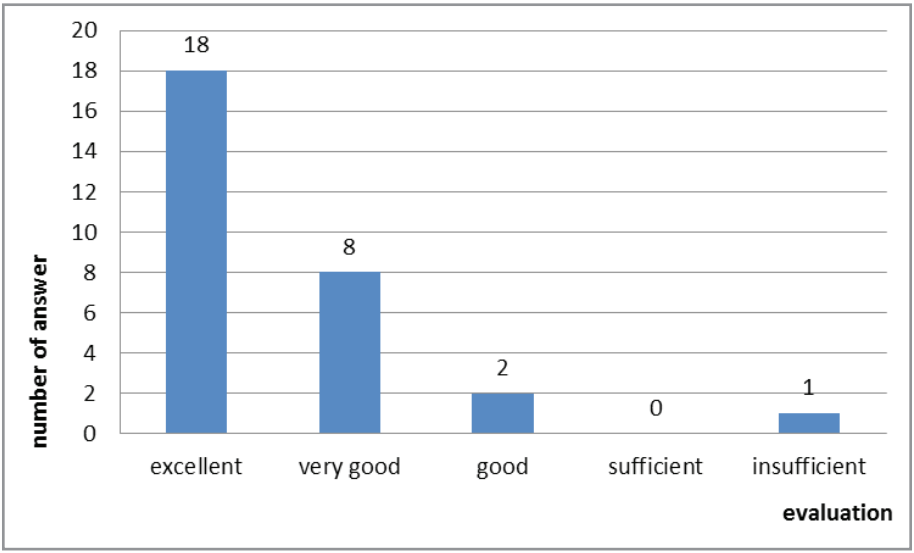

Chart 3: *Evaluation of e-course in Learning Management System Moodle*

The electronic course was evaluated by 62 % of students as excellent, 28 % of students gave score very good. Only one student evaluated the electronic course as insufficient. Students evaluated the clarity of course worse. In this case, the mark excellent gave 45 % of students and mark very good gave 41 % of students (Chart 4).

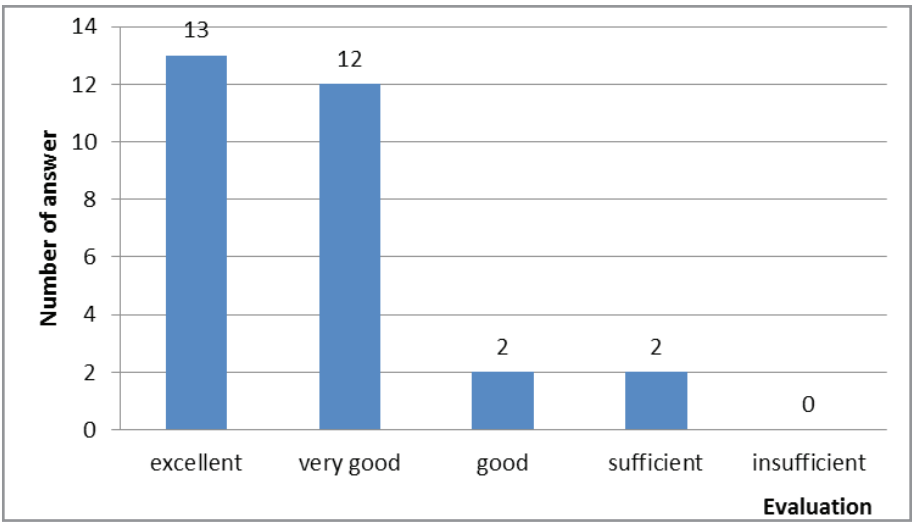

Chart 4: *Evaluation of clarity of e-course*

Students evaluated slideshows, which were used during the lectures and exercises as the best. The slideshows contained not only theory but also examples, instructions to practical activities with children. The mark excellent gave 79 % of students. Nobody gave mark sufficient and insufficient.

We gave to students space to express an opinion in the end of the questionnaire. We want to quote a few opinions of students:

"The completion of this course was enriching for me. I will apply knowledge from this course in my future job."

"Associate professor wants to show us a lot of things during one day so we were little confused (students of full-time study have it better). Slideshows that are available help me with the study."

"I had a problem to send my composition via Moodle. I was worried about it."

"I liked the course. It shows me maths in real life and possibilities of mathematics in the practice."

In future we plan to verify the effectiveness of the electronic course. We want to supplement the course by additional parts so the course should be a good aid for students.

References

Brincková, J (2010). Edukačné koncepcie rozvoja matematickej gramotnosti v príprave učiteliek Predškolskej pedagogiky. Matematika 4.Mathematical Education in a Context of Changes in Primary School. The conference Proceedings. Pages 62 – 66.

Gerová, Ľ. (2010). *Propedeutika matematiky a počiatočné matematické predstavy*. Banská Bystrica: Matej Bel University in Banská Bystrica.

Hejný, M., et al. (2004). *Dvacet pět kapitol z didaktiky matematiky. 1 díl*. Prague: Charles University in Prague – Pedagogical Faculty.

Uherčíková, V., Haverlík, I. (2007). *Didaktika rozvíjania základných matematických predstáv*. Bratislava: Dony.

Сажетак: У овом раду бавимо се подршком настави путем е-учења на педагошком факултету Универзитета Матеј Бел у Банској Бистрици. На овом факултету припремају се предшколски васпитачи. Они морају да добију велики број информација из различитих области у кратком временском периоду. Сваки предмет је за њих важан. Они унапређују математичко знање на курсу *Образовне концепције развоја рачунања*. Студенти са пуним временом имају само 26 часова математике у оквиру мастер студија, док студенти који студирају са пола времена имају један блок од 8 часова. За то време они морају да науче како да развију математичко мишљења деце у вртићу. Одлучили смо да користимо електронску подршку наставе у окружењу система Learning Management System Moodle. У раду је приказан електронски курс и концизни резултати анкетног упитника који је фокусиран на добијање повратне информације о овом курсу.

Кључне речи: Основна математика, припрема васпитача, електронски курс, предшколско образовање.

CLASS TEACHING METHODOLOGIES

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FACET OF REGIONAL INSECURITY
- THE CIVIL WAR 1991–1999 AND THE SERBIAN HISTORY TEXTBOOKS -

Summary: This article adresses the issue of what happens with stability and the orientation and commiment of political elites to peace and reconciliation which are indispensable preconditions for „disarming" impassioned history and building material for regional security. Important part of process of reconciliation, regional security and diminishing the political myths in the region of ex Yugoslavia is to work on textbook development by supporting, initiating, and monitoring textbook revision processes, conducting official evaluations of teaching materials,providing textbook analyses, and sponsoring scholarships for textbook authors. Also it should be mention that building bridges between the academic world and the world of educational practice, between historical scholarship and didactical and pedagogical expertise through the organisation of training seminars, conferences, and summer schools are functioning as a transmission belt for the dissemination democratic values and peace stability in the ex Yugoslav countries. To this list of indispensible preconditions,the commitment of educational authorities as an independent body of professional expertise should be added alongside that of the political elites- to the extent, of course, that there exists a distinction between the two.
Key words: Civil war, Serbia, Yugoslavia, History Textbooks, Nationalism, educatio.

Introduction

The present research is based on the conviction that national ideologies are internalised through, among other means, educational processes in general and history textbooks in particular that influence not only learning activities among students but also give a strong shape to everydays life and political standpoints of the same population. People of Ex Yugoslavia have been involved in eight years of conflict, enmity and hatred in which each side's identity has been formed and developed in the context of a culture of war.

Attitudes and values related to peace and war are reflected clearly in history and civics history textbooks; they deal with conflict, with national self-identity and with the image of „the others". This article investigates how did Serbian history school textbooks narratives from the time of the wars in Ex Yugoslavia influenced on political viewpoints of the Serbian students of history at University of Novi Sad (Vojvodina – northern province of Serbia) and Serbian students of history at University of Banja Luka (capitol of Republic Srpska in Bosnia and Herzegovina). This research aroused a few Serbian national reflections on issues of war in Ex Yugoslavia, communism, nationalism and of the role of formal, legitimized collective memories in molding national self-identity. The methodology in the present research is based on textbook analysis, surveys carried out among students of two univerisities and relevant literature that deal with Ex Yugoslav conflict. The aim was to collect a sample in which students from the different regional and social background were represented. The 2-page questionnaire were processed in two Universities among students of geography, demography and pedagogical studies. In each University were chosen students who made decission to listen History of Yugoslavia as the optional subject. The final sample consisted of 205 students.

Disintegration of the Socialist Federal Republic of Yugoslavia (SFRY) in 1991 triggered a series of wars. During the whole decade, from the brief war in Slovenia to the long and bloody wars in Croatia and Bosnia and Herzegovina, 1991-1995, to the war in Kosovo and North Atlantic Treaty Organization (NATO) bombing of Serbia, 1998-1999, and the war in Macedonia in 2001, Western Europe – then amidst the optimistic process of integration, has encountered on its soil a long, destructive and disturbing conflict unseen since the Second World War (WWII). Hundreds of thousands of people lost their lives, whole cities were destroyed, several millions of people lost their homes and never returned to their places of origin, many became gravely handicapped from war wounds, and invaluable material property, cultural heritage and historic monuments were distroted or seriously damaged. The new European enthusiasm and faith in the progress of civilization have been temporarily frustrated by the horror happening less than a two-hour flight distance from the major urban western European centers. New states founded on the ruins of the destroyed Yugoslav federation, except for the western most Slovenia, have gone through a difficult process of stabilization, democratization and renewal attaining ambiguous and in some cases disappointing results. Borders of the ex Yugoslav republics were redrawn and are – in some cases – still being disputed; population were displaced, uprooted, and induced either to forced or voluntary migration; the social texture of societies was torn apart; and finaly, processes of nation-state and identity building were initiated that are partially still going on today. The establishment of a multiparty system at the beginning of 1990s was accompanied simultaneously in Serbia by the expansion of a one-party hegemonic rule. Concurrently, the new pluralist political system that was installed did not effect a separation of state and the party.[1] At the end of the war in Bosnia while Karadžić was accused for the war crimes in 1995 and was fugitive from 1996 to 2008 - Milorad Dodik became a majority leader of the National Assembly

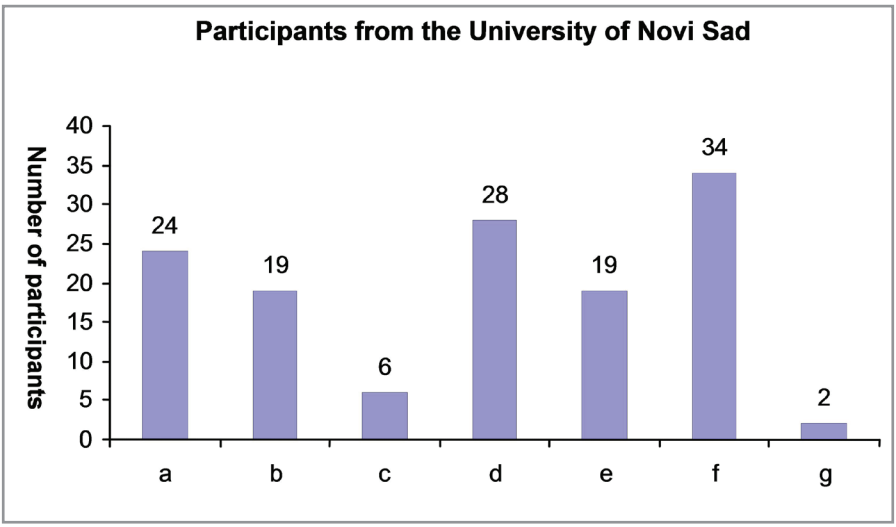
1 On Serbian politics during the 1990s see Robert Thomas, *Serbia Under Milosevic: Politics in the 1990s*, (London, Hurst 1990).

of RS - Milošević lost his presidental elections in September 2000, but, unfortunately for both countries, in Milošević and post-Milošević times same as in Karadžić and post-Karadžić times, the creation of new history textbooks was intended to shift the ideological framework as well as to force a new identity matrix that include changes in national and historical consciousness.

Since the beggining of nineties educational authorities in Serbia and Republic Srpska prefer to operate with historical models that seek cohesion rather than with ones stressing diversity. So, we made a decission to ask the students to answered on questions such as: for what purposes should history be taught and learned? Should the history of the recent wars be incorporated into the history textbooks? Most of the students said that history textbooks should inculcate, first and foremost, state or ethnic loyalty.

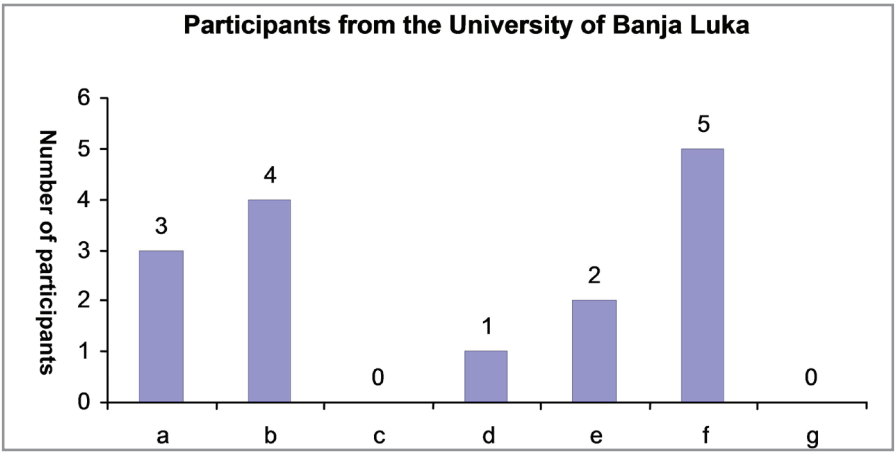
1. What do you think should be the first aim of History concerning your education needs?

Figure 1. The first aim of history in terms of the needs of adequate educational background



a – to teach about the state,
b – to strengthen patriotism,
c – to strengthen nationalism,
d – to encourage multiculturalism,
e – to teach about the ethnic group to which I belong,
f – to present the overall knowledge about the individual and the group in time and space,
g – other

Figure 2. The first aim of history in terms of the needs of adequate educational background



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f – to present the overall knowledge about the individual and the group in time and space,
g – other

Also they agree upon that history of the recent wars be incorporated into the history textbooks.

2. Is there a need for learning the history of the Yugoslav wars in the 1990s?

Figure 3. The need for learning the history of the wars in former Yugoslavia

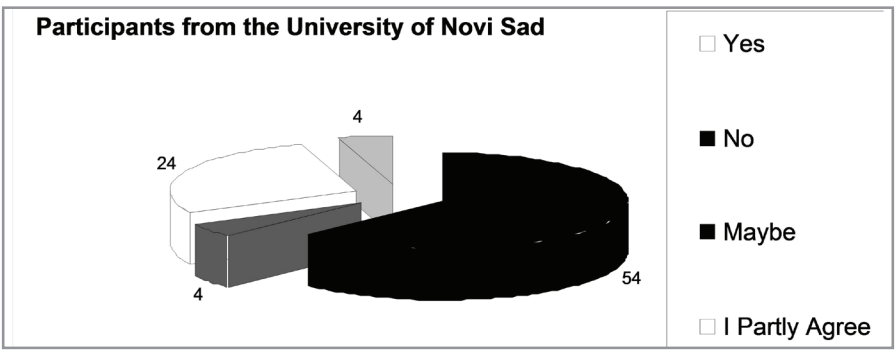
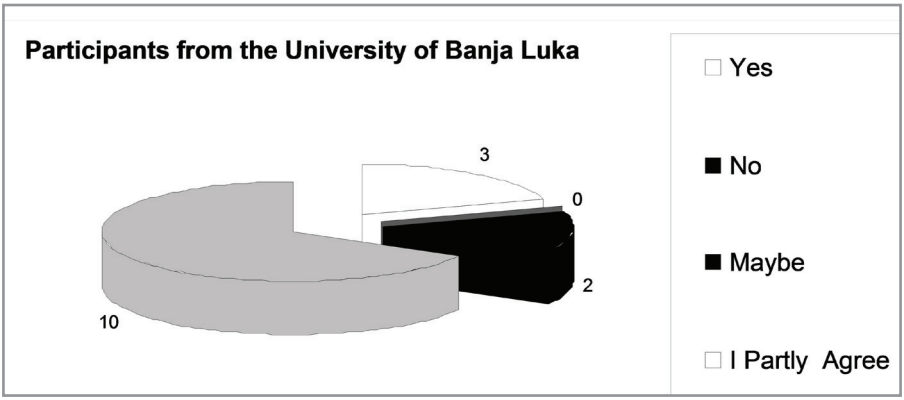


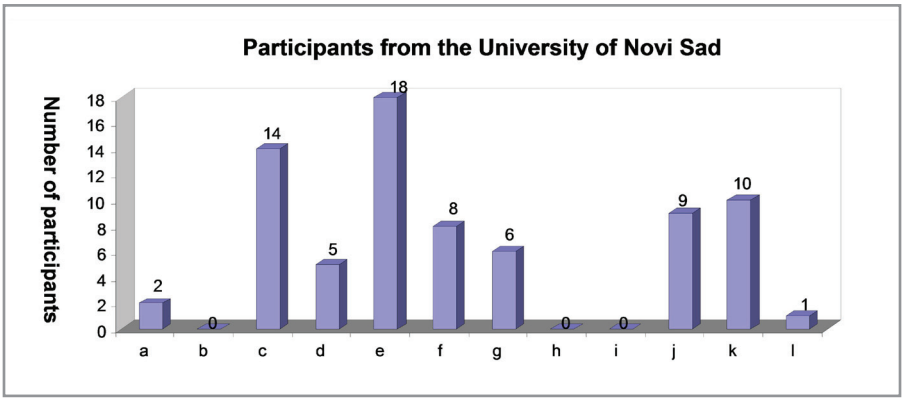
Figure 4. The need for learning the history of the wars in former Yugoslavia



But, unfortunately, most of them, under the influence of the schooltextbooks do not clearly see the guiltiness when they were asked about the wars in Ex Yugoslavia during the nineties.

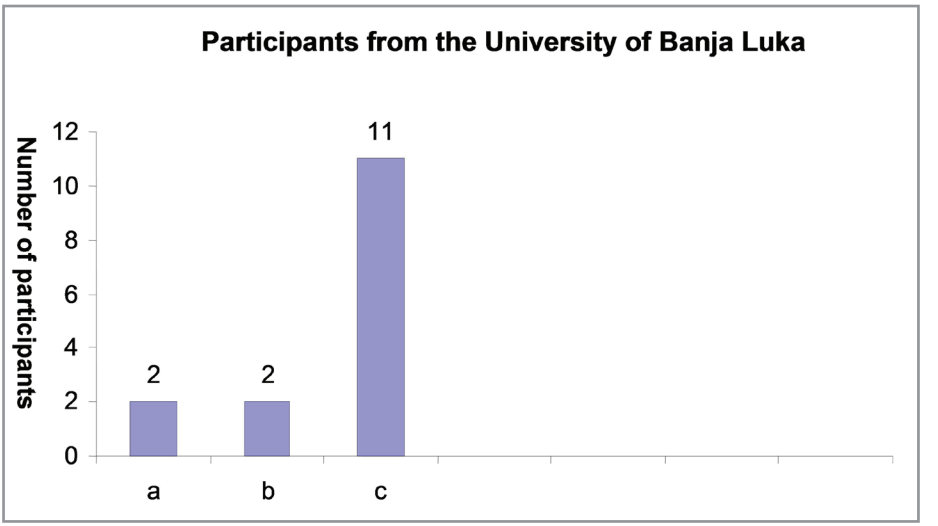
3. Who is to blame the most for the war in Yugoslavia?

Figure 5. Responsibility for the war in the former Yugoslavia



a – Western countries,
b – USA,
c – NATO,
d – Croatian politicians,
e – all of them equally,
f – Politicians,
g – Josip Broz,
h – Slobodan Milosevic,
i – Franjo Tuđman,
j – Alija Izetbegovic,
k – Slobodan Milosevic,
l – Colonists

Figure 6. Responsibility for the war in the former Yugoslavia



a – I do not know, b – everyone except Serbs, c – NATO, America

Multiple factors play a role in this, from political expediency and populism to generational differences and exposure to different kinds of propaganda that are coming from media, school and history school textbooks.

The tendency toward centralization and etatization also affected the educational sector. All these factors acted as significant obstacles to the process of democratization and the potential of education to aid the promotion of democratic values. These mutating conditions affected education in mainfold ways – from the structure of educational systems to the content of history teaching. This article, with its focus on the Serbian state and Republic of Srpska constituted as a result of the Yugoslav wars of succession provides an analysis of develepments in the filed of history education from the beginning of 1990s onward.

Politics and Historical education in Serbia and Republic Srpska (Bosna and Hercegovina)

While scholarly optimism maintained the „de-ideologization“ of history after 1989 in Serbia and Republic Srpska, experience ever since has defied this optimism. During the civil war the collapse of the Marxist master narrative led rather to a „re-ideologization“ of history in the form of a historical revisionism that in the majority of cases elevated the nation and the „return“ to Europe to its main reference points. Habitually strongly connected

to political projects, revisionism was „not based on new knowledge or the application of new methods, but rather on the simple turnaround of semantic notions of certain aspects of the past ... In former Yugoslavia, revisionism was usually linked to attempts to delegitimize not only socialist rule but also the entire Yugoslav order.“[2]

Same as war promoted hatred and fear, history education in Serbia and Republic Srpska in the 1990s became a battlefield of interpretations and historical myths. The devastation of the family as a pillar of a functioning society provided a powerful influence, as well. In this primary environment, the young come into contact with the values and formulate their views for the first time. Bearing in mind that the generational concept of acceptance of role models from the past was disturbed due to disharmony in the interpretation of the history, the young people were left with sensationalism, idealism and naive creation of their own views. In an atmosphere of suggestive media play, without dependence on good models because of the instrumentalized educational system, they were a suitable corpus for nationalist manipulation. Those who were resistant were either marginalized or left the country. The process of uncovering a lack of information which is based on facts in history is a slow and demanding process even in a situation in which it has been agreed upon the minimum required moves by the experts and political elite. However, such agreement has not been presented so far, and the students in this case have formed their attitudes in the synergy of a curriculum loaded with intolerance, teacher enthusiasm and preferences, and their own already formed attitudes which have obvious shortcomings. Hence, in such a variety of diverse views, the most impressive view is the one of frustrated nationalism that is difficult to release from the accumulated prejudices.

Ironically, the new historical versions were a mirror inversion of the eschatological narratives of the previous regime. Whereas before emphasis was laid on the similar historical experiences and the common historical destiny of the South Slavs, the new identities proposed, stressed the absolute incompatibility and the differences among them. Much worst than historical revisionism was the rise of parahistory as a legitimate way of thinking and talking about past. History became literally „public“ and was produced for public consumption, not the least remorseful for the lack of epistemological and scholarly standards.[3] Dramatic developments in Serbia and Republic Srpska in the last two decades directly influenced the changes in the ways in which history is taught. These changes were related, first and foremost, to the country's two nearly revolutionary political changes in domestic politics:in each case, the newly established authorities sought, through shifts in the educational system, to gain historical legitimization for themselves, as well as to construct a particular type of tradition. The first political change occured in 1987, when Slobodan Milošević came to power in Serbia; a several years followed by Bosnian Serb leader Radovan Karadžić. All of their politics, rhetoric,

2 Ulf Brunnbauer, '(Re)Writing History: Historiography in Southeast Europe after Socialism', *Studies on South East Europe*, Vol.4 (Munster :Lit, 2004) p.21.

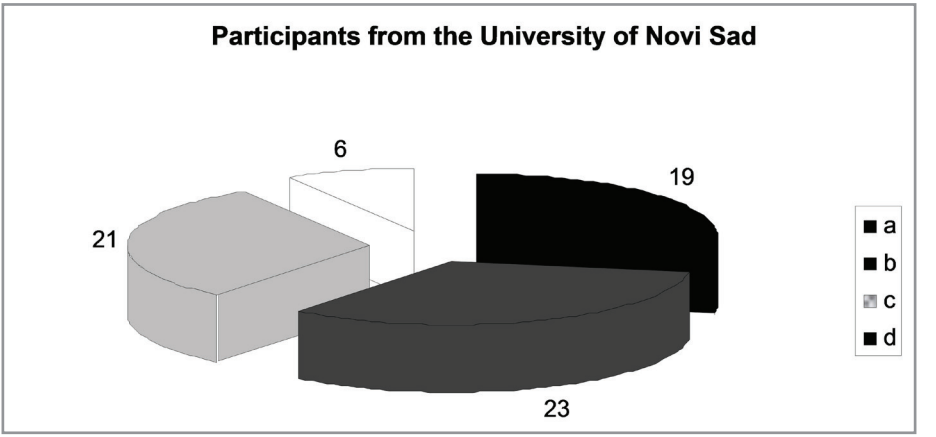
3 See *'Prispevki za novejšo zgodovino'* (Contributions to Contemporary History, Historiography in the Successor States of SFRJ), XLIV-2 (2004).

and dominant discourse were, from the begining of 1990s, inserted into the nationalist ideological matrix. Shifts in ideological and identity matrix during Milošević's had the aim of placing Serbian history within a nationalist mythic framework necessary to justify the wars of the early 1990s in the former Yugoslavia.[4] This mythical narrative had several key components. „The Myth about Chosen (Serbian) people" were declared to be the main protagonists of history.[5] „The Chosen (Serbian) people" were essentialized as a „unique being",almost like biological community, an organism with clearly defined common traits that deny any individuality, particularity, or pluralism. In accordance to that, it was necessary to reconstruct a new national and historical consciousness that was blend of delusions of grandeur and self-pity,of national arrogance and self-victimization.

The following figures speak in favour of this statement.

4. Are the Serbs the greatest victims of the wars of the nineties?

Figure 7. The victims of the wars of the twenties - the Serbs



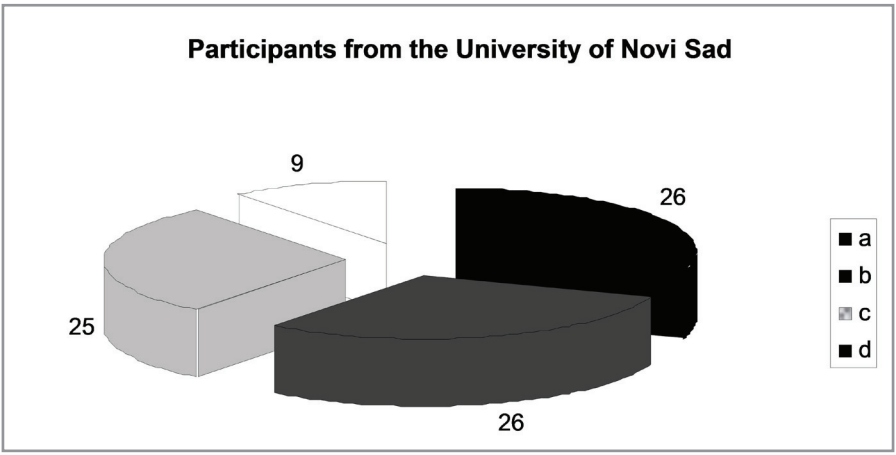
a – yes, c – perhaps,
b – I partly agree, d – no

4 The creators of myths of nationalism exploited the ideas and symbols imported from both the New and Old Testament. The Old Testament concepts of the "Chosen People" and the "Promised Land", which Christians later adapted, were revived in the nationalistic ideology. Similarly to these myths, three equally important myths ideologists of nationalism distilled from the Old and New Testament were born: the "Myth of the Enemy", the "Myth of Death" and the "Myth of the Savior". Since then, they have often been, as needed, interwoven with the two former myths, providing national leaders with legitimacy for waging wars, giving them justification for killing and deaths, absolute political instrumentalization and conquering new territories. More about in, Darko Gavrilović, *Udari sudbine – politički mitovi 20.veka*, Novi Sad, Stylos 2006)

5 More about political myths among the Serbs see at ed. Vjekoslav Perica&Darko Gavrilovic, *Political Myths in the Former Yugoslavia and Successor States- A Shared Narrative*, (Dordrecht, Institute for Historical Justice and Reconciliation – Republic of Letters Publishing 2011)

5. Were the Serbs the greatest victims of the Second World War in Yugoslavia?

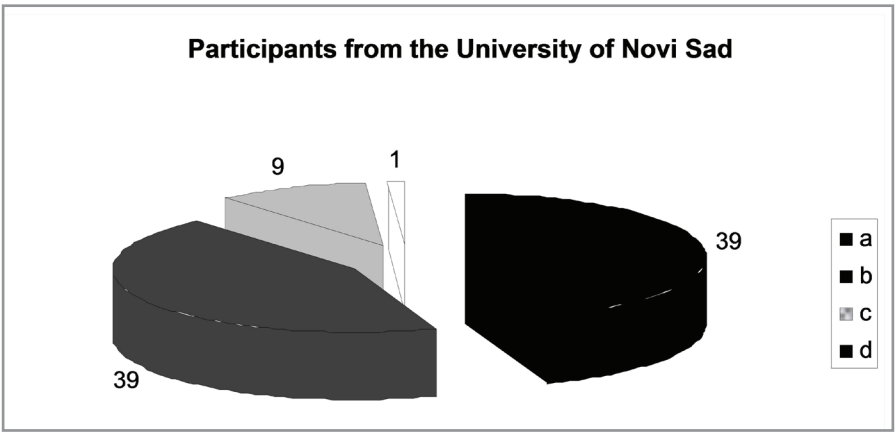
Figure 8. The victims of the Second World War in the former Yugoslavia - Serbs



a – yes, c – perhaps,
b – I partly agree, d – no

6. On the basis of what you learned, can say that Serbia led defensive wars?

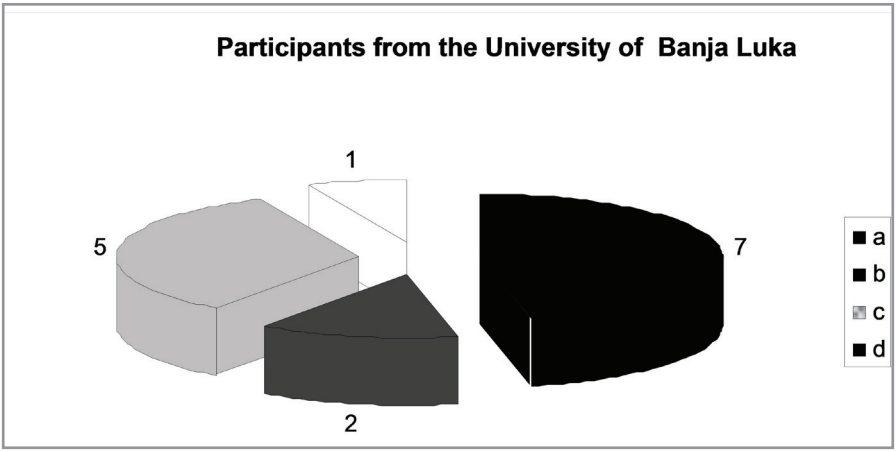
Figure 9 Did Serbia lead defensive wars?



a – yes, c – perhaps,
b – I partly agree, d – no

7. Are the Serbs the greatest victims of the wars of the nineties?

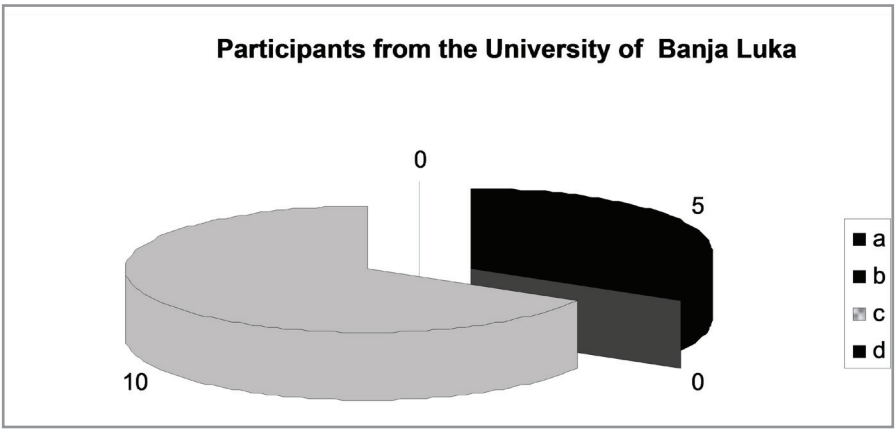
Figure 10. The Serbs - the greatest victims of the nineties?



a – yes, c – perhaps,
b – I partly agree, d – no

8. Were the Serbs the greatest victims of the Second World War in Yugoslavia?

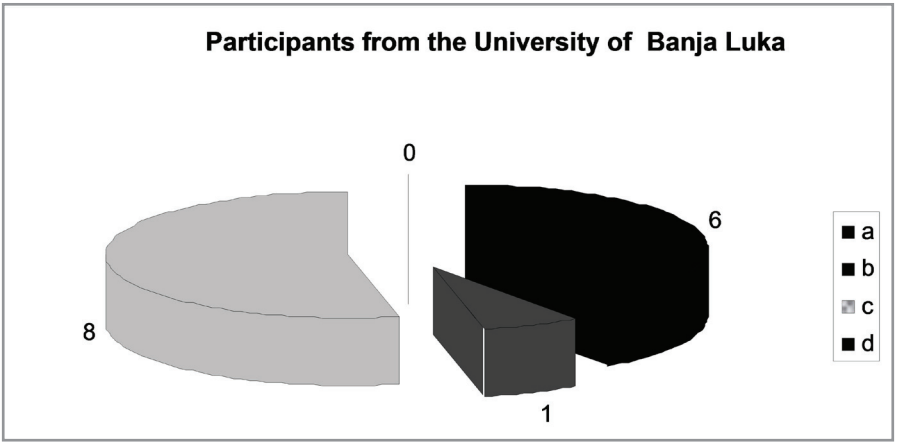
Figure 11. The Serbs - the greatest victims of the Second World War?



a – yes, c – perhaps,
b – I partly agree, d – no

9. On the basis of what you learned, can say that Serbia led defensive wars?

Figure 12. Did Serbia lead defensive wars?



a – yes, c – maybe (not sure),
b – no (conquest), d – I partly agree

Based on the presented graphs, it is clear that the nationalist ideology, which has taken a dominant place during the civil war in the former Yugoslavia in the societies of the Republic of Serbia and the Serbian Republic in Bosnia and Herzegovina, and which has found a way to influence young people through history books and contents to be adopted in schools and later among those students who choose to study history, is still prevalent in the society.

The political programs and wars that they conducted were direct consequence of this shifting ideological pattern and were started in the name of nationalist aims. Historical facts were changed in order to build an image of „the people" that was „historically corect" – a people that never led wars of conquest and never strove for something that belonged to others. In order to achieve this events contrary to this message were thrown out of the history curriculum, or their importance was blatantly reduced.

For example, there is very little about Serbian government's policies toward Kosovo and Macedonia in the nineteenth century[6]; there is no explanation of the attack on Bulgaria in 1885, nor of the several attempts to annex Northern Albania during

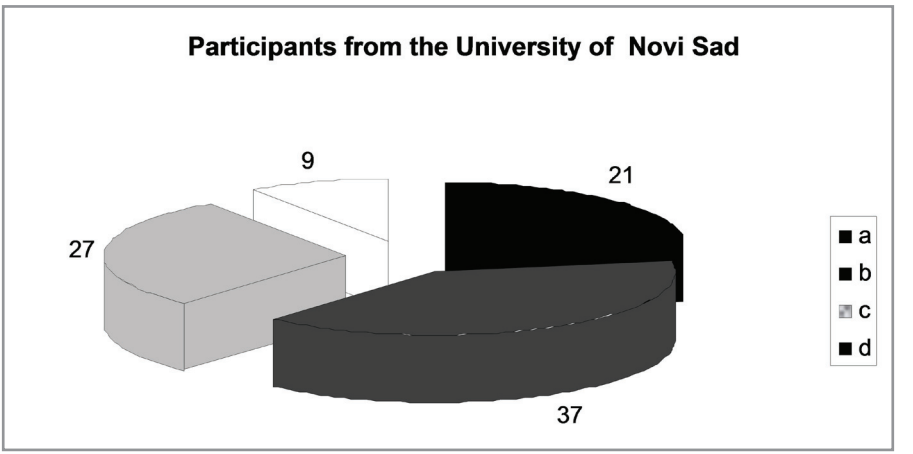
6 The persistence of Panta Srećković and Miloš S. Milojević, Serbian history and literature textbook writers from the second part of 19th century, earned them a prominent place among the romanticists who wrote about Serbian history at Kosovo and Macedonia. The latter two authors founded their idea about the multi-millennial historical seniority of the Serbian people mostly on etymology, similarly to their romanticist colleagues from abroad. Following this line of reasoning, for example, they found a river named the Srbica in one of Ptolemy's maps, which they construed as yet another proof of the land the Serbs originated from, but also of their ancient origin.

Balkan Wars.[7] Serb national politics were presented only in a defensive manner – a mythical framework necessary for creating a new identity, a framework that was also used in ongoing wars. Building caracter of the main hero, the „Serbian people-Chosen Nation“ was necessary to place the wars of the 1990s in a continuity of defensive efforts, thereby leading to an acquisition of a moral capital, a kind of guarantee that Serbian people were, just as in previous historical circumstances, „on the right side of the history.“ Thus-formed mythical construct are additionaly helped by the interpretation that Serbia's neighbors were on wrong sides in the two world wars, and it was „us“ (Serbs), due to our own right position,who later enabled them absolution and brought them to side of the winners, thanks to creation of Yugoslav states.

10. Do you think these sentences are true: “Serbian neighbours during the two world wars were the parties that lost the war.

Serbs in the wars were victorious. Thanks to the Serbs and the creation of Yugoslavia, the neighbouring South Slavic peoples have their own countries today.“

Figure 13. The opinion of the respondents from the University of Novi Sad



a – yes, c – perhaps,
b – I partly agree, d – no

11. Do you think these sentences are true: “Serbian neighbours during the two world wars were the parties that lost the war.

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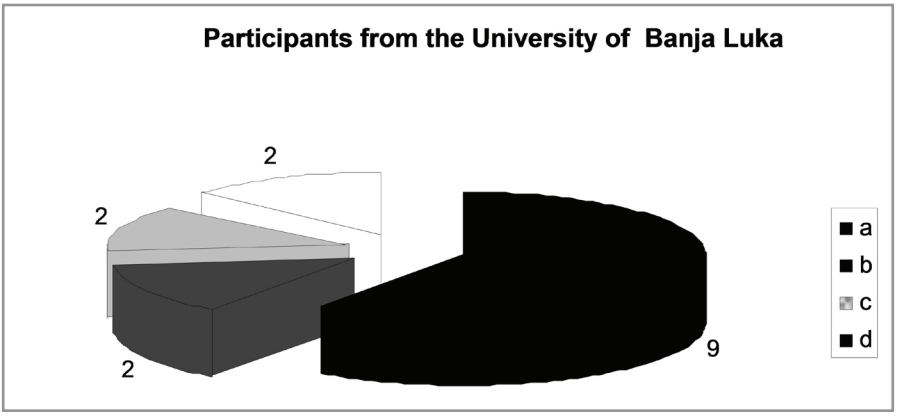
7 Dubravka Stojanović, *History textbooks Mirror their Time, in Warfare, Patrriotism, Patriarchy*, (Belgrade, Center for Antiwar Actions 1994) pp. 81-111.

Figure 14. The opinion of the respondents from the University of Banja Luka



a – yes, c – perhaps,
b – I partly agree, d – no

The present textbooks include the following statements that toward the end of the First and Second Wolrd War, Serbs joined the group of war winners. Among other things, through this, Serbs enabled other Yugoslav peoples to leave the side of the defeated ones and join the victors, through formation of the Yugoslav state.[8] This substantial distinction between „us" and „them" at the sametime meant the building of an arrogant component of national identity,as evidence in factographic manipulations showing that „we" have always been on victorious side of history.

In the context of two-century-long search for a historical identity, the most visible is the misconception about the quality achievements of the Serbian people if they survived or returned to nationalism, i.e. the context of statehood egoism. This bias is evident in the attitudes of the students in our survey. It is conditioned by the previous education acquired on the basis of curricula and their interpretation. In spite of the sufferings from which none of the people of the former Yugoslavia have been spared, bidding justice for Serbian students of history based on Serbian victims is a basic moral postulate. This makes the security as the foundation of any co-existence unattainable. A nation that has recently come out of war and is still burdened with the frustrations of its consequences, sees nationalism as a patriotic act and not an act of conquest. The survey confirms this view. The civil war affected the national homogenisation and barrier distance towards the inevitable nationalism of other peoples. Thus patriotism is first and foremost a militant expression of those unwilling to compromise. This attitude reflects the tension of the current social situation. With a dominant position on the condemnation of the international factors (i.e. the West) for the events in the recent past,

8 About role of Serbia in the First World War see more in Kosta Nikolić, et al., *Istorija za 8.razred*, (Belgrade, Zavod za izdavanje udžbenika 2005).

we have to deal with the situation of ‘ frozen conflicts’’. It is a generator of the image of Serbian exclusion from the modern world and the autistic show of self-sufficiency due to misunderstanding. In order to excommunicate this wrong context, it is necessary to make a Copernican revolution in the approach to the past, and, in connection with this, to educate young people. Values of a nation are only achievable as part of the universal values which the nation contributes to vy its own achievements. Intellectual potential for such a view among the Serbs exists and it is synonymous with the victory of culture over extremism. Such an approach needs to be set towards the national values, as well. Only then can national expression become open and developmental, with the young being its worthy representatives. That would lead to a civil co-existence in the Balkans and its European perspective.

Even if we are presenting the problems inside the history textbooks in Serbia we have to mention that during the Zoran Djindjic political reforms (2000-2003) history textbook writing followed the ambitious modernization of the country. Unfortuntely, after assassination of him in March 2003, the elections brought a new governement from opositional parties into power. After Djindjić’s assassination the reform was left without political backing and it was dismantled because Kostunica wanted to keep continuity with the previous system.[9] The new minister of education, Ms Ljiljana Čolić,who, to put it mildly, was less reformist in orientation. She pledged to discontinue the subject „from play to the computer“, which she deemed harmful to children’s health, and considered impeding the import of textbooks for the various national minorities on the grounds that they „destroyed Serbian spirituality.“[10] Even the most prominent writers of the history textbooks thought the same. Their attitude is well known by now: „History is a national discipline.We need our faith; we cannot have unreliable people meddling with our history. We have to protect the mission.“[11] The minister Slobodan Vuksanović (2005-2007) minimized educational problems in Serbia by arguing that „our educational system is still one of the best in the world,“ while his successor, Budimir Lončar, a few months after becoming minister of education, announced his vision as „the necessity of adopting a strategy of education based on „the national, spiritual roots,and the long educational tradition in Serbia.“[12] What happened in the case of Serbia is a well-known cyclical pattern. The reform government legislated changes thatwere immediately annulled by the oposition party that followed in government through counter-legislation. Finally, with

9 The future of the reform in Serbia was closely connected to the political constellation Koštunica-Đinđić. They represented two diametrically different psilosophies on how to go about constructing future Serbia. It could be framed in terms of the dilemma continuity-discontinuity. Đinđić wanted the year 2000 to be „year zero“,a complete break with the past and swift move forward.Koštunicawanted continuity,to keep the distribution of power as it was, to change things slowly andminimally. After Điniđić’s assassination the reform was left without political backing and it was dismantled because Koštunica wanted to keep continuity with the previous system.

10 ’Kuda ide naša škola’, *Vreme*, no.715, September 16, 2004.

11 Interview with Serbian historian Dubravka Stojanović, December 18,2006,in Augusta Dimou ed., *Politic or Policy?Transition and the Politics of History Education in South east Europe*, (Gottingen, Eckert. Die Schriftenreihe, V&R unipress 2009) p. 194.

12 Helsinki Committee for Human Rights in Serbia, *Self-Isolation: The Reality and the Goal* (Belgrade, Annual report:Serbia 2007 – 2008) p.341.

a view toward sustainability, small-scale measures like small pockets of reform with a self-perpetuating dynamic could have been encouraged instead of opting only for the implementation of the big reform design.

Another important topic is that of the nation-victim. This starts from the premise that, despite their own historical righteousness, „the people" were the historical victim of all neighboring, and even some more distant, peoples. Crimes of other peoples against the Serbs are described in the most graphic terms, from the early grade textbooks onward, helping to create an image of the people as „victim of genocide", thereby granting the people a sort of preventive historical indulgence.This was especially important during the wars of the 1990s, for it strengthened the image of a people who should be excused at any price, after having suffering so much throughout history.

As legacy of last war, Bosnian history textbooks have conveyed as clear perpetrator –victim dichtonomy. Memory of violence suffered divides people and pevents them from acknowledging that violence was part of their own (re)-actions.The term „victimisation" refers not only to the depth of suffering, however, but gives a people a sense off purpose in the name of which political sovereignity and cultural autonomy haveto be defended. This purpose has a historical dimension which goes back in the Bosniak case at least to the beginnings of a „Bosniak national history" in the seventeenth and eighteenth centuries and, in the case of Bosnian Serbs, to the Middle Ages." Suffering in history is also being translated into numbers. The number of victims is proof of the cruelty of the „other" and one's own capacity to suffer. According to the official political discourse and history textbooks referring to memory in Republic Srpska, a total of 700 000 people fell victim to the Ustaša regime in the Jasenovac concentration camp; the exhibition in the section of the Jasenovac memorial which belongs to the RS continues to state, same as RS history textbooks that 500 000 of those victims were Serbs, although there is no longer any doubt that these statstics are unproven and that they date from the immediate postwar years from 1946 when the Yugoslav state gave priority to the history of Yugoslav resistance and victimhood.[13] Contrary to the Serbs, who insists on their victims during the WW2, today, Bosniaks exaggerate the number of victims of the last war in Bosnia. To this day, there are still no accurate documents, or at least none recognized by the state, which gave us a credible story about the victims of the war of 1992-1995. The prevailing Bosniaks estimates of 250 000 dead are clearly exaggerated. These numbers therefore lend themselves especially well to memory politics. Since there is no doubt that the majority of victims of the war of 1992-1995 are Bosniaks, the possible reduction of the numbers affects the myth of suffering upheld by this group.[14]

13 According to recent documentation, there is proof of approximately 83 000 dead, including 45000 Serbs, 12000 Croats and muslems, 17000 Jews and 10 000 Gypsies; Ivo Goldstein, 'Jasenovac. Myth and Reality', *Sudosteuropa Traditionen als Macht*, (Verlag, Oldenbourg 2007) pp. 97-111. Also in Falk Pingel, 'From Ownership to Intervention – or Vice Versa? Textbook Revision in Bosnia and Herzegovina', ,in Augusta Dimou ed., *Politic or Policy?Transition and the Politics of History Education in South east Europe*, (Gottingen, Eckert. Die Schriftenreihe, V&R unipress 2009) p.294.

14 The Research and Documentation Centre in Sarajevo, has,untill now, found proof of aprox. 98 000 dead andmissing people. See Mirsad Tokaca, 'L'importanza di ogni vittima', *Diario europeo,* IV/1(2008) pp.56-59.

Anyhow, competition over the numbers of victims is a part of today's competition between nationalities in Ex Yugoslavia and unfortunately this battle found once own battlefield in history textbooks. And the fact that the soldiers and citizens of BaH waged, or were at least involved in, a war of defence makes it easier to subsume all of the casualties under the notion of „victims" and integrate people by giving them a sense of shared victimhood, which defies and hinders any rational explanation of the war. Since the interpretation of the war in school education in BaH is ccurrently an object of dispute, history teaching can not simply fall back on official memory politics. Moreover, teachers are very vulnerable to the criticism expressed by politicians and social pressure groups – regardless of the solution they propose, whether this is to omit the subject from their courses, to briefly mention the bare facts, or to give a thorough and emotional account of what happened.

Despite the ravages of war during the civil war in the former Yugoslavia, binding peace agreements, shifts of the political elites and the decade-log temporal distance, which were the expected pre-requisite to exposing and eliminating the generators of conflicts, we are the witnesses that they still exist, though not in such an exclusive political form. Education of the young generations based on the stereotypes of the ''just war on our side'' and labeling of injustice as belonging to the ''other'', ''recognition of our own victims, and a lack of interest in other people's plight" in a subtle script that attempts to scientifically objectify an essentially nationalist expression, questions the persistence of the achieved truce. Strategically speaking, regardless of the present authority of the European Union and the major powers and the illusion of sustainability, there is a chance that the character of such efforts would experience a political fiasco in a crisis that would undermine the concept of the existing value.

Acknowledgment

We would like to thank to Serbian Ministry of Education and anonymous reviewers for helpful comments.

References

Robert Thomas, *Serbia Under Milosevic: Politics in the 1990s*, London, Hurst, 1990.

Ulf Brunnbauer, '(Re)Writing History: Historiography in Southeast Europe after Socialism'*, Studies on South East Europe*, Vol.4, Munster :Lit, 2004.

'Prispevki za novejšo zgodovino', Contributions to Contemporary History, Historiography in the Successor States of SFRJ, XLIV-2, 2004.

Darko Gavrilović, *Udari sudbine – politički mitovi 20.veka*, Novi Sad, Stylos, 2006.

Vjekoslav Perica&Darko Gavrilovic, *Political Myths in the Former Yugoslavia and Successor States- A Shared Narrative*, Dordrecht, Institute for Historical Justice and Reconciliation – Republic of Letters Publishing, 2011.

Dubravka Stojanović*, History textbooks Mirror their Time, in Warfare,Patrriotism, Patriarchy*, Belgrade, Center for Antiwar Actions 1994 .

Kosta Nikolić, et al., *Istorija za 8. razred*, Belgrade, Zavod za izdavanje udžbenika 2005.

Politic or Policy?Transition and the Politics of History Education in South east Europe, Gottingen, Eckert. Die Schriftenreihe, V&R unipress 2009.

Helsinki Committee for Human Rights in Serbia, *Self-Isolation: The Reality and the Goal*, Belgrade, Annual report:Serbia 2007 – 2008.

Politic or Policy?Transition and the Politics of History Education in South east Europe, Gottingen, Eckert. Die Schriftenreihe, V&R unipress, 2009.

Mirsad Tokaca, 'L'importanza di ogni vittima', *Diario europeo,* IV/1,2008.

Сажетак: Овај рад се бави питањем стабилности, усмерења и преданости политичких елита у њиховом напору да се смире сукоби и помире народи – што је неопходан услов за „разоружавање" бурне историје и градивни материјал за регионалну безбедност. Важан део процеса помирења, регионалне безбедности и разбијања политичких митова у региону бивше Југославије састојао би се од започињања, подржавања и праћења процеса ревизије, спровођења службених евалуација наставног материјала, вршења анализе уџбеника и спонзорисања обуке за ауторе. Такође, треба напоменути да мостови између академског света и света образовне праксе, између историјске учености и дидактичке и педагошке струке у виду организовања тренинг семинара, конференција и летњих школа, функционишу као преносни појас за ширење демократских вредности, мира и стабилности на просторима држава бивше Југославије. На овој листи есенцијалних предуслова, политичкој елити треба додати образовне институције као независно тело професионалне струке – докле год постоји разлика између њих.

Кључне речи: Грађански рат, Србија, Југославија, уџбеници историје, национализам, учење.

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ADAPTIVE CAPACITY ES AND AUTOMATED ITC SYSTEMS OF DISTANCE LEARNING IN MATHEMATICS AND PROGRAMMING

Summary: Development and application of modern ITC systems in education, educational software (ES), make that contents of the educational process, and also tools for the presentation thereof, are no longer barriers to the development of the application of the concept of distance learning into practice in Science and Mathematics teaching. In traditional interaction, especially in the natural sciences and informatics, the contents are presented, explained, and substantiated, and the reactions of listeners gave teacher provided information on the effectiveness of exposure. New concepts of education this type of interaction is not favored. Teaching is conducted at a time and at the place that corresponds to the listener's course without interaction of participants in the educational process. In distance learning listeners correspond with a previously created presentations and tutoring systems. In these circumstances, the traditional challenges, both for students and for teachers, especially in the study of natural sciences and theoretical computer science is the evidence and the problem how listeners of the course can learn to use a coherent chain of logic. Therefore, in automated education systems and ES, modules of assistants (tutors, helpers) in the implementation of evidence in the study of natural and computer sciences is very important because it gives the student immediate feedback. Existing modules are not indicating irregularities and weaknesses of the concept (inadequate access to learning, analysis, exercises, problem solving) and the same are rejecting without analysis. Such rejection (cold and without explanation) can cause negative effects such as demotivation and resentment. Growth of self confidence is important, especially for cognitive concept such as knowledge and understanding. Therefore, adaptive capacity automated educational system towards individual characteristics of the listener is very important. The ability of system is especially important in corrective roles in the process of distance learning with regard to the further development and stimulation analytical capabilities.
Key words: emotional intelligence (EI), educational software (ES), distance learning (DL), database of knowledge, information and communication technology (ICT).

Introduction

Different between traditional campus-based study requires students to live in, or travel to and study by distance learning (DL) courses at home are that students

which study by DL can take theirs learning materials completely online at any time of the day and from anywhere in the world and stay at home. Benefits of DL are that enables to fit study around personal and professional life. Generally all the programs of study aim to enable to achieve the following:

- Develop a deep understanding of the nature and impact of current challenges faced by the science and IT industry, so that you know what is expected from a mature professional.
- Develop an awareness of the methodologies and technologies that are available within mathematical science and computer science to address these challenges, so that you can evaluate and analyze specific situations and make informed choices.
- Foster confidence, convey knowledge and develop practical skills in the use of some of these technologies.
- Provide experience of individual project work.
- Develop interpersonal communication, decision-making, and problem-solving skills, so to use this on imaginative way.

The base challenger for both teachers and students are how to study and learn proofs of mathematics science and theoretical informatics. This is especially evident in the case of application of ITC and ES technique into DL technologies. If proofs start done in wrong direction, how to correct it, or how to do these corrections (rejects) by classic way without negative effects such as demotivation and resentment? Because of that, in the future, all ES and DL techniques will have main advantage of a proof assistant. This idea was borne with developing new video games. Analogy between proof assistants and video games is that it gives the students immediate feedback. E.g., video games have modules, which suggest a way to bridge some gaps. Those modules we are cooling a proof assistant. This module does not replace a teaching assistant, who explain why a proof is wrong and what you must to do about it (Nipkow, 2012). A proof assistant helps if you haven`t sufficient practice, or long after teaching student tray to do homework but the course has moved on.

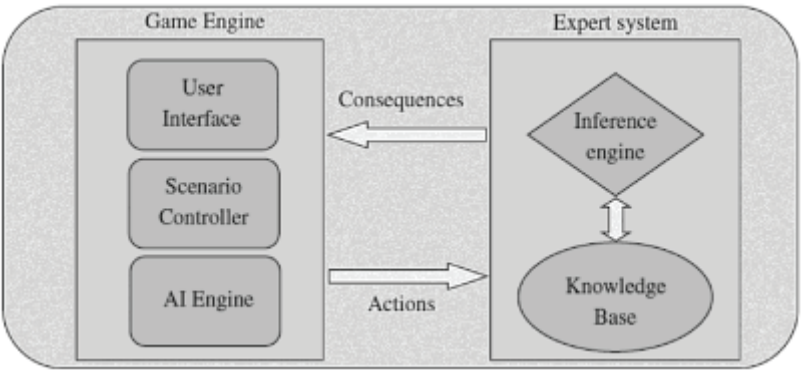

Fig.1. Serious game architecture (Petit dit Dariel, et al. 2013)

DL techniques must have solutions for mathematical or informatics theory of higher cognitive functions, including concepts, emotions, instincts, understanding, imagination and intuition. Mechanisms of the knowledge instinct are proposed, driving our understanding of the world (Perlovsky, 2007). At the start of course, the mathematical descriptions must be complemented with detailed conceptual discussions so the content of the introduction topics can be understood without necessarily following mathematical details. The key of success is to recognize relate mathematical results and computational examples to cognitive and philosophical discussions of the mind. Relating a mathematical theory to psychology, neurobiology and philosophy will improve our understanding of how the mind works and how to start use theory of proofs and control flows of them.

Today, DL strategies uses different concepts to describe a cognitive model like one based on the Systemic approach and one on the Autopoiesis theory. The syntactical definition of the model consists of logical propositions but the semantic definition includes, besides the usual truth value assignments, what we call emotional flavors, which correspond to natural phenomenons translated into cognitive terms. The combination between logical propositions and emotional flavors allows the student to learn and memorize relevant propositions that can be used for reasoning. These propositions are represented in a specific format which is enriched with annotations that explicitly connected with terms, axioms, theorems and especially with experiences from databases of knowledge, as historical log file of attempts. Based on those, algorithms of DL software can describe problem and help to present how learn a proposition from postulates and the early experiences of attempts of students in the proofs in the same environment with same problems.

Individual differences and DL

DL software development in the future will take care of a range of individual difference variables that have potential relevance to specifically designed Web-based learning packages. These include: cognitive style, emotional state, working memory efficiency, anxiety, gender, and current knowledge. In general terms, the conditions under which the variables are important, and the potential interaction between them in affecting learning performance. The roles of the variables within the context of Web-based learning are then examined. Technical developments in ITC technology that allow materials that can accommodate learning preferences by responding to the student's choices and learning performance combined with a better understanding of individual differences in learning, emotional intelligence and emotional states should result in improved educational effectiveness (Grimley, et al., 2007).

DL techniques have relative importance and interaction, and the practical application to the particular characteristics of web-based learning. The environment of DL learning must accept the individual differences and decides to under which conditions they are make better results in learning process and compare these with those conditions

when they have little or no effect. The variables are then examined in combinations to see how they may interact with one another in affecting learning outcomes. Finally, strategies developed by individuals to overcome or compensate for missing skills or knowledge in their learning repertoire and possibilities. DL learning offers a special learning environment, which has characteristics that differ from traditional learning modes and materials. These characteristics include, for example, the mode of presentation in terms of verbal and pictorial and diagrammatic format, the choice between spoken and textual format, the rate of presentation, the opportunity for on-going assessment of learning performance and the provisions of feedback on progress, etc. (Grimley, et al., 2007).

DL technologies support a variety of tools and techniques for gathering information, learning, memory and reasoning. One of them, the simplest, and at the same time is Web-based learning can range from putting topics into a search engine and then selecting from those found, on the one hand, to on the other, using specifically designed learning materials for, say, a university course.

In addition to all these challenges in the design and development of the DL technology, challenging problem is the development of tools that make existing learning techniques in terms of storage and reproduction of knowledge complement new tools that would facilitate the training of cognitive processes of students as a function of analysis and presentation of evidence. Cognitive style is seen as the default approach that an individual takes when processing information. Two fundamental dimensions of style must be considered – the Verbal-Imagery and the Wholist-Analytic:

- Verbal-Imagery style is seen as an individual's preference in terms of how information is represented during thinking – verbally or in terms of images. On this basis an individual may be categorized as either a Verbaliser or an Imager.
- Wholist-Analytic style is the inclination of an individual to prefer to integrate information into a whole versus separating information into its constituent parts – the wholist approach or the analytic. Here an individual may be seen as either a Wholist or an Analytic.

How students respond to the DL knowledge representation techniques can only find out if you have feedback. Reaction may be the second hallmark of sound context, visual context or problem-solving tasks, tests etc. Audiovisual nature of speech perception in the human machine dialogue is reflected in two phenomena. First, watching the speaker, especially speaker's face and lip movement which are synchronized with articulated speech, enhances and facilitates the perception of speech, especially in the noisy environment or in situations of lower speech intelligibility.

Because of that the new most important tool in DL techniques in the learning mathematics and theoretical informatics is proof assistant. The main advantage of proof assistant is that is gives immediate feedback bout of, student and system. Based on the feedback and the identified differences among students in approaching the problem the system will respond appropriately through proof assistant and correct or induce the flow of evidence and conclusions in accordance acquired knowledge and coherent chain of logic.

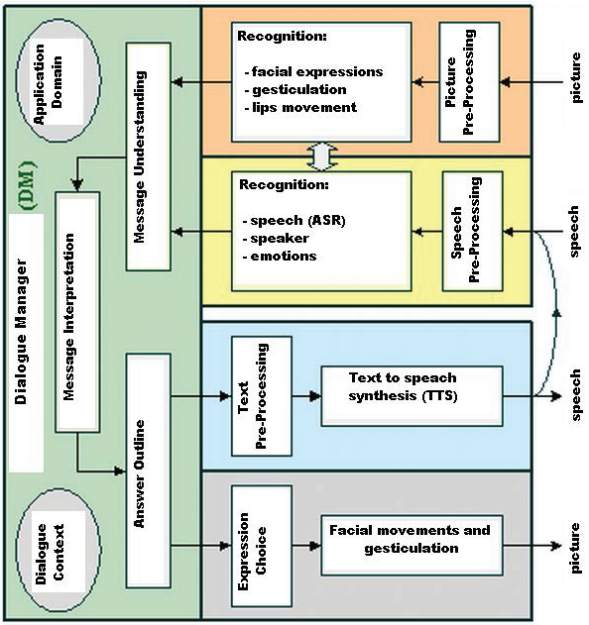

Fig.2. Functional model of the machine in the verbal dialogue (Bosch, 2003)

Artificial intelligence applications in DL

The term "intelligence" has been in use for a long time, a widely-accepted definition for the term does not seem to exist. Many researchers agree that "intelligence" or "natural intelligence" are terms used to describe a property of a person's mind that encompasses many related abilities, such as the capacities to reason, plan, solve problems, think abstractly, comprehend ideas, use languages, and learn. According to Dictionary (http://dictionary.reference.com/), intelligence is defined as:

1. A capacity for learning, reasoning, understanding, and similar forms of mental activity; aptitude in grasping truths, relationships, facts, meanings, etc.
2. A manifestation of a high mental capacity.
3. The faculty of understanding.
4. Knowledge of an event, circumstance, etc., received or imparted; news; information.
5. The gathering or distribution of information, esp. secret information.
6. An interchange of information.

Artificial Intelligence (AI) is defined as the intelligence of machines and it is a branch of computer science that aims to create intelligence. Russell and Norvig (2003)

define AI as "the study and design of intelligent agents" where an intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success. Intelligence may be defined in a gradual way. Intelligence may be understood by defining the concepts step by step (Kalyuga, 2009). Artificial intelligence applications in DL can to bridge the gap between student and educator with computer applications. One of the most important functions of distance learning systems is determining the student knowledge level and performance clearly. In traditional education systems, students can be assessed in single-stage via tests and homework studies, which consist of multiple-choice questions. However, this method cannot provide accurate results since it is not able to evaluate student knowledge level and question difficulty level. In studies of learning and teaching, as well as efficacious evolution of technology, importance of active participation, critical thinking, social presence, collaborative learning and two way communications are also underlined for quality learning. In DL systems you have problem with this. In DL assessment systems, students must be assessed with their current knowledge levels which is changing depend on different topics and communication adjust to ITC environment. A student may have different knowledge levels in different topics. System has to use this differences to increase student knowledge level each topic with preparing exams which is suitable to current student level.

So, expert systems as an application of artificial intelligence are interactive decision tools that are created on the basis of knowledge gathered from the expert and which utilize information of events and experience to solve complex problems (Baykal & Beyan, 2004). This system contains such concepts as: learning environments, e-learning, accessibility, adaptability, adaptively, ambient intelligence, system smartness and user modeling. A learning environment is a setting that is arranged to enhance the learning experience. In order for learning to take place there are three essential components of any learning environment: pedagogical and psychological functions (learning activities, teaching situations, learning materials, assessment, etc.), appropriate technologies (how the selected tools are connected with the pedagogical model) and social organization of education (time, place and community). From another perspective a learning environment can be defined as constructivist in nature, enabling the learners to engage in "sense-making" about extensive information. On this view, the learning environment comprises four components: an enabling context, resources, a set of tools and scaffolds. In addition, realistic contexts motivate learners, and involve them in complex, real-world tasks (Deperlioglu, et al. 2014).

Artificial intelligence applications in DL have procedures for adapting levels between levels of learner expertise and optimal instructional techniques and procedures. The appropriate design models for learning complex skills are put on different layer with varying levels of learner control in such models. The relations between levels of learner task-specific expertise and optimal levels of instructional guidance are then discussed. Real-time monitoring missing. A cognitive conflict between instruction-based conceptual models and learners' internal knowledge structures may increase processing demands on limited working memory, thus causing the effect. To eliminate such conflicts, instructional design of DL techniques should take into ac-

count expert-novice differences and knowledge of processes of cognitive transition from novice to expert states (Adams, et al. 2009).

Experience with DL software at Faculty of Education in Sombor

Development of a model of e-learning for computer science class teachers is of high significance in the development of education adapted to the needs of a knowledge society and to realize their scientific contributions to the subject area. The main scientific contribution of the proposed research is to build a system for the management of the educational process in the field of e-learning through the implementation of different models of e-learning and continuous evaluation and adaptation of the models (Obrić, et al. 2013). When interacting with an automated system of education, the listener course experiencing many different emotions. Positive emotions arising during the educational process have a strong positive impact on learning for two reasons: first, positive emotions in general allow for more creative and flexible thinking process and also increase motivation, so that listeners rate as a whole more effort than give up. Another reason is that the student knowingly wants to maintain and possibly increase the intensity of positive emotional state (which in this case comes from the education system) and thus maintain concentration and motivation for learning. In the case of externally generated positive emotions that are not directly related to the learning process and I have an automated system, the student is not necessarily motivated and linked to the maintenance of concentration on learning. There is less motivation. The positive effect of these emotions is therefore less strong, and can even turn into a negative if emotions are too intense (deconcentration).

Emotions that appear in the test group during the study were monitored as a function of events, i.e. chronology of work and obligations of students throughout the semester. This aspect is particularly interesting because the typical events characterize the working and living environment, ambience students during this period. This means that certain emotions are more and more frequently present. Negative emotions (in the sense that they interfere with cognitive processes) occur in phases of intense commitments themselves student. These are the periods before the test or exam. Overall, strong emotions, both positive and negative, can block the parts of the brain that are involved in the process of thinking, and thus prevent the listener course to concentrate, remember, and analyze. Can conclude that the automated systems of education must ensure optimal conditions for learning, compensation emotions, distinguishing emotions by type, intensity and origin of different emotional states listener courses (Miljković, et al. 2014).

In addition to the external factors, semester, or forward commitments, it was observed that students who regularly attend classes, consultation and use available automated systems for teaching and exercises (additional tutors), have a higher level of knowledge and greater security and composure. Equanimity is reflected in the fact that in them is mostly of a single emotion (of systematized tracking). Their emotional

state is closest to neutral. Making the diagram changes the intensity and type of emotion in relation to the time domain semester, it was observed that the curve that shows the level of knowledge and curves that describe the emotions have a certain regularity, and they also describe cognitive processes (development and use), which is especially important in the learning process in the field of mathematics and computer science.

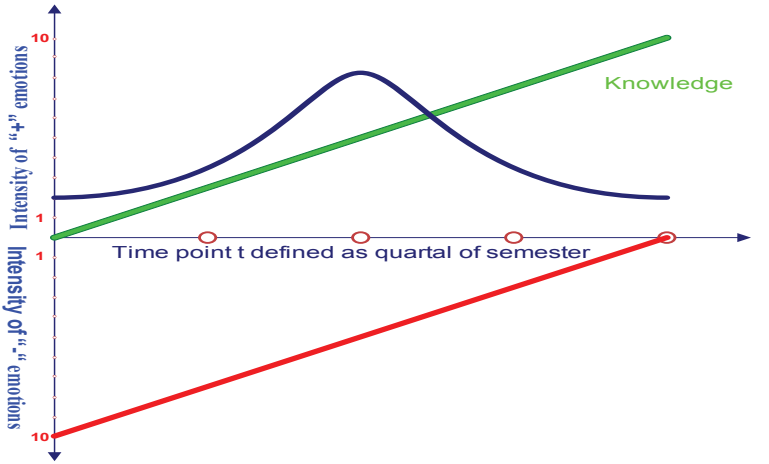

Fig. 3. Diagram of the level of knowledge, changes in the type and intensity of emotions students with successful completion course as a function of forward characteristics of the semester

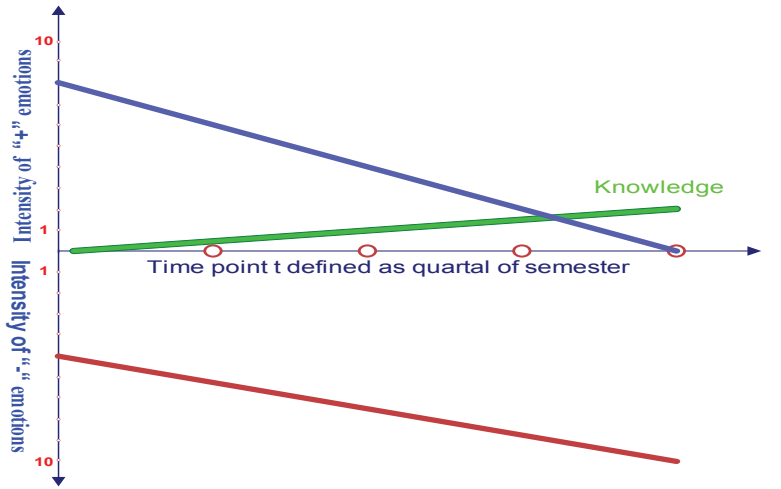

Fig. 4. Diagram of the level of knowledge, changes in the type and intensity of emotion the student with an unsuccessful completion course as a function of forward characteristics of the semester

A presented diagram suggests that necessary that systems for distance learning have equipment like automatic emotional speech recognition (ESR) system. For the successful implementation of the ESR, system required four components: communication component, a component for analyzing emotional state, the routing component (solution) queries with compensator emotional states and knowledge base. Algorithm that would meet all these requirements, the functions of teaching and adapt "flow" of providing services to individual listener course must be viewed in the time domain (environment) like feedback and action of to them.

The choice of an adequate model of presentation material are the main objective of a system for learning. Application of appropriate algorithms for predicting and monitoring the emotional state of students as the key to learning to recognize the psychological and physical state of the listener, is indisputable. When it detects the type of emotional state selects the appropriate model "tutor" (type of presentation material). This will affect the ultimate effects of the work of the educational software, and with the help center for automated call processing, service delivery and provision of information, with built-in algorithm for multicriteria approach to identifying the expected emotional state and emotionally intelligence system users.

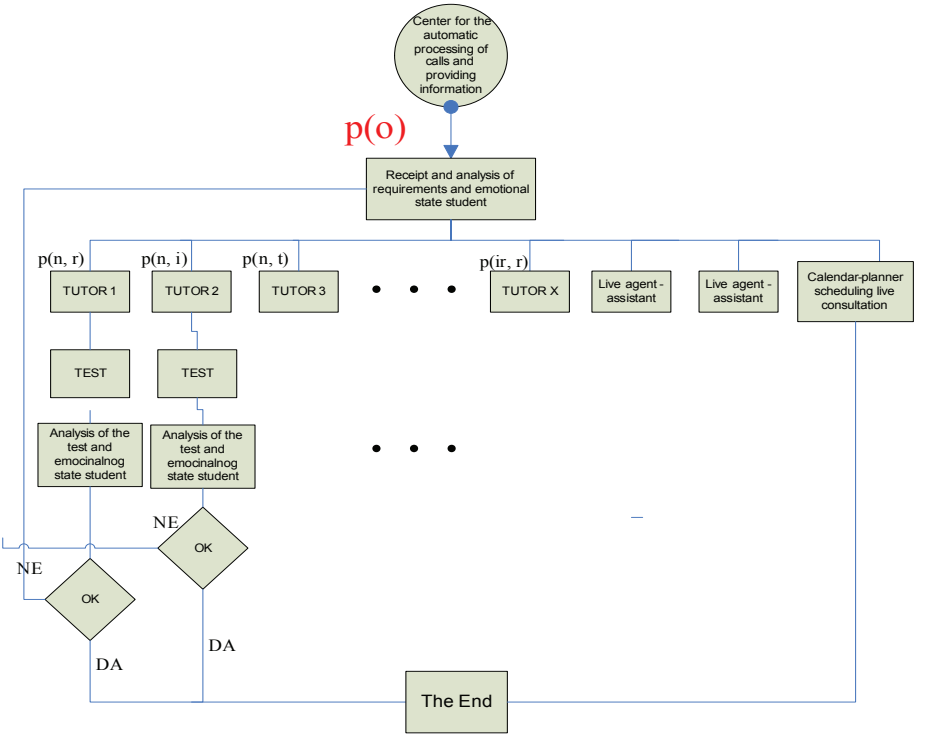

Fig.5. Experimental block model of DL software at the Faculty of Education in Sombor

„Reasoning "algorithm to compensate for the emotional state is reduced to a few steps:

1. According to the statistics for the current surround, searching the knowledge base solution and a plan implemented for the expected balance and intention. We are looking for also the data for sub-goals that are realized or unrealized, as well as sub-goals that need to be implemented at a time.
2. Analysis of emotion and determination values for each emotion (gradation)
3. The choice of methodology presentation (types tutor or living agent)
4. Monitoring changes in emotions and adapting to the new circumstances of the presentation
5. Timing of test-checking stored information and knowledge
6. Test with monitoring of the emotional changes
7. Calculate the maximum value for each emotion as current emotions at the time
8. Evaluation of the results of the test with an explanation based on current emotions presentation.
9. Case 1→listener is slightly raised level of happiness, and the result is a little satisfaction in performing the task.
10. Case 2→ the listener is not to raise the level of happiness, which means that it is very sad and fearful because they cannot take the exam on time.

...

Case x→ listener gets angry and lost concentration and control of emotions, forwarding links "live agent".

After successful execution of the test, the base algorithms of emotional and state will have a new model for a given scenario emotional state of listeners and the system will calculate the most valuable emotional changes that preceded the successful completion of the task. Also, if in this time (t), the listener achieve targets B and C, but failed in the aim of A, the system will compare the intensity of emotions that we have developed and evaluated the performance of the script, as an alternative to failure. The aim of the system is not at any cost only successful completion of the task, but also fair length and mode of communication (due to conservation of concentration and willingness of the listener to actively participate in the work). System in knowledge base may contain phase algorithms. If the goal is hardly feasible, seek the interphase, which in several integrative steps in a certain time period, to ensure the successful implementation of training programs, ie. over the targets B and C in a period of time, it is expected that they will be implemented and the target A.

The choice of an adequate model of presentation material is the main objective of a system for learning. Application of an appropriate algorithm for predicting and monitoring the emotional state of clients, as a key to learning process, decision making, presentation and demonstration, and mathematical modeling of the system.

Conclusion

In summary: the students had mastered both formal and informal proofs and had better undarstanding of semantic material. The overall feedback from the course was pozitive, in the final exam, the result were significantly above average. The only negative comments concerned the amount of time the student spent on their homework ("too time consuming").

So, we can say that artificial intelligence applications, automatic emotional speech recognition (ESR), tutor system for proofs in DL system are indispensable, and the results of this conceived system is far above expectations, and more importantly their application is irreplaceable in the system for the study of mathematics and computer science.

References

Nipkow, T. (2012). Teaching Semantics with a Proof Assistant: No More LSD Trip Proofs. Volume Editors: V. Kuncak, A. Rybalchenko (2012). Verification, Model Checking, and Abstract Interpretation (pp. 24-38). 13th International Conference , VMCAI 2012, Philadelphia, USA 2012, Springer

Petit dit Dariel, O.J., et al. (2013). Developing the Serious Games potential in nursing education, France, (Article In Press) Nurse Education Today

Leonid Perlovsky, (2007). Modeling Field Theory of Higher Cognitive Functions, Air Force Research Center, USA 2007, Idea Group Inc.

Michael Grimley *University of Canterbury, New Zealand* Richard Riding *University of Birmingham* (2009). Individual Differences and Web-Based Learning, Cognitive and emotional processes in web-based education: integrating human factors and personalization , Constantinos Mourlas, Nikos Tsianos and Panagiotis Germanakos (eds.), Chapter 1, pp. 1-24, Pennsylvania, USA 2009, IGI Global

L. Bosch, (2003). Emotions, speech and the ASR framework, Speech Communication 40, pp. 213-225, NORTH-HOLLAND 2003, European Association for Signal Processing (EURASIP) and of the International Speech Communication Association (ISCA)

http://dictionary.reference.com/, 24.08.2014.

Slava Kalyuga, (2009). Adapting Levels of Instructional Support to Optimize Learning Complex Cognitive Skills, Chapter XI, pp. 246-270, Pennsylvania, USA 2009, IGI Global

N. Baykal, T. Beyan, (2004). Fuzzy Logic Expert Systems and Controller, Bıcaklar Kitabevi, Ankara, 2004.

Omer Deperlioglu, et al. (2014). Intelligent Questioning System Based on Fuzzy Logic, Artificial Intelligence Applications in Distance Education, Utku Kose, Durmus Koc, Chapter 5, pp. 72-96, Pennsylvania, USA 2015, IGI Global

Ray Adams, Andrina Granic (2009). Cognitive learning approaches to the design of accessible e-learning systems, Fostering Interactivity through Formative Peer Assessment in (Web-Based) Collaborative Learning Environments, Jan-Willem Strijbos, et al., Chapter 12, pp. 209-228, Pennsylvania, USA 2009, IGI Global

Milan Obrić, Rajko Pećanac, Tomaž Bratina (2013), Postulates for Modeling an E-Learning System of Informatics for Class Teachers, The New Educational Review Vol. 33, No. 3, pp.185-194, Torun 2013, Wydawnictwo Adam Marszalek

B.Miljković, M.Žižović, O.Iskrenović-Momčilović (2014), APPLICATIONS OF EMOTIONAL INTELLIGENCE IN THE EDUCATIONAL PROCESS SUPPORTED BY ICTs, International Conference InfoKomTeh 2014 "The new vision of future technologies", pp. 99-106, Ljubljana 2014, EDUvision

Сажетак: Развијање и примена модерних ИКТ система у образовању, образовни софтвер (ОС), који чине садржај образовног процеса као и средство за презентацију истог, не представљају више баријеру у развијању примене концепта учења на даљину у пракси наставе природних наука и математике. У традиционалној интеракцији, посебно у природним наукама и информатици, садржај је презентован, објашњен и поткрепљен, а реакције слушалаца дају наставнику безбедне информације о ефективном излагању. Нови концепт образовања не фаворизује овакав тип интеракције. Настава се реализује у времену и на месту које одговара слушаоцима курса без интеракције учесника у образовном процесу. У учењу на даљину слушаоци одговарају претходно креираним презентацијама у туторским системима. У тим околностима, традиционални изазови, подједнако за наставнике и ученике, посебно у настави природних наука и теоретске компјутерске наставе је доказ и проблем како слушаоци курса могу да уче користећи кохерентни ланац логике. При томе, у аутоматизованом образовном систему и ОС, модули асистената (тутори, помоћници) у имплементацији чињеница у учењу природних и компјутерских наука је веома важна, јер одмах даје ученику повратну информацију. Постојећи модули не указује на неправилности и слабости концепта (неадекватан приступ учењу, анализе, вежбе, решавање проблема) и исти се одбацују без анализе. Такво одбијање (хладно и без образложења) може изазвати негативне ефекте као што је демотивација и огорченост. Раст самопоуздања је важна, посебно за когнитивне концепте као што су знања и разумевања. Стога је способност прилагођавања аутоматизованих система образовања према индивидуалним карактеристикама слушаоца веома важна. Способност система је нарочито важно у корективним улогам у процесу учења на даљину у вези са даљим развојем и стимулацијом аналитичких способности.

Кључне речи: емоционална интелигенција (ЕИ), образовни софтвер (ОС), учење на даљину (УД), база знања, информациона и комуникациона технологија (ИКТ)

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PERMUTATIONS IN LOWER GRADES OF PRIMARY SCHOOL

Summary: The fundamental goals of mathematical education is to develop thinking and reasoning skills, enable solving mathematical problems and application of this knowledge in various everyday situations. Mathematics curriculum for primary school in Serbia contains large number of topics supporting these goals, but this curriculum could be improved. For instance, combinatorics represents one of the areas which may help pupils to attain these goals, but it is currently not a part of the program. In this paper, we propose a model of a mathematical class introducing permutation in an easy and interesting manner. This paper also discusses correlations of topics concerning permutations to other primary school subjects.
Key words: permutation, lesson plan, problem solving, correlation

1. Introduction

Consider the problem: "Name all the ways in which three children can sit in the back seat of a car?" This problem of arranging three elements in an array is an easy task which can be solved by anyone, including kids in preschool. The next question would be: "How many different ways did you find?"

Above problems belong to mathematical field called combinatorics. Tasks pertaining to the area of combinatorics appear in certain textbooks for primary school, but it is mostly for talented pupils and without systematical introduction study of the subject. Combinatorics is not taught in primary school and it is not present in any existing curriculum for teaching mathematics in primary school in Serbia. Considering that combinatorial problems develop and improve intellectual competence in logical reasoning and analysis, as well as metacognitive skills, we believe that combinatorics, at least its basics, is appropriate even for pupils in lower grades of primary school.

In this paper, we propose a lesson plan for a math class in which basics of combinatorics are treated. The suggested lesson is "*Arranging elements in an array"* which belongs to topic named "Permutations".

Why combinatorics?

Combinatorics is everywhere around us and combinatorial problems represent the problems in real life. Pupils' awareness that knowledge and skills acquired in class can be applied outside of school strengthens their motivation and activity. Combinatorics as a subject does not require too much mathematical background. Therefore, lessons could be implemented through games. Through such games pupils meet challenges, which arouse curiosity and desire for solving problems, and increase the efficiency of learning.

Including combinatorial problems would be very useful in teaching mathematics in lower grades of primary school. It is a fact that solving such problems contributes to the quality of mathematical reasoning, encourages pupils to think mathematically about everyday problems, stimulates pupils' interest and desire for studying mathematics, and increases their attention and concentration. A problem solved brings the pleasure of success. Much of the current research supports above statements and many countries national programs have been introduced combinatorics on all school levels. For instance, see [1-5], [7] and references therein.

In the proposed lesson model children play games of arranging elements in an array, in particular, they permute given elements. Here, pupils can use different items for arranging or they themselves could be the objects of arranging. Manipulating certain items improves inference skills and contributes to development of abstract thinking. Arranging objects requires making and developing a strategy, and also carrying out a previously made plan. This develops metacognitive skills, enhances intellectual abilities, and strengthens children persistence in work.

About the lesson plan for a math class

The main goal of proposed lesson is to teach children how to arrange objects in a row. On abstract level we talk about permutations. We are given n elements and want to see, or to count, all possible ways of arranging them. In applications, this problem is present in many real life situations. Here are some examples:

- Ivana will travel to Greece with her parents. She asked her friends Ena, Beta and Nina to take care of her pets: dog Max, cat Luna and parrot Smokey. Three friends agreed that each of them will take care of one animal. Name all the ways in which Sara can assign animals to her friends.
- Vesna's mother, neighbor Tom, and uncle Milan finished shopping at the same time. They should stand in line in front of a cashier desk. Name all possible ways in which they can stand in line.

- Three brothers - Milisav, Dušan and Branko got three pieces of candy: a snickers bar, a kinder egg and a biscuit. Each of them needs to take one piece of candy. What are possible ways for sharing sweets?
- Three actresses Julia, Janet, and Jacky will play a princess, a maid and a witch in the next theater show. How can they split the roles?
- Sanja travels to Osjek, Subotica and Novi Sad with her parents. What are all the possible orders in which she can visit these cities?

Contents that we propose in this paper are easily accessible to children, interesting and come from their everyday environment. The main problem given to pupils is how to arrange three elements on three places.

In Section 2, we give a complete plan for a lesson "*Arranging elements in an array"*. Our lesson plan is appropriate for implementation in the third or fourth grades of primary school, but it can be easily adjusted to even lower grades. The proposed lesson, in which new contents (permutations) are presented, consists of simple examples and problems. Later on, in Section 3, we suggest more complicated problems which can be used for later lessons or in lessons for mathematically more advanced pupils. Also, in Section 3, we offer possible correlations to other classes. In Section 4, conclusions and additional remarks are given.

2. The Lesson Plan

Our lesson model consists of the following phases: introductory, operational, verification, homework, and evaluation phase. Introductory phase serves as motivational and presents the main goal of the teaching unit. Operational phase is the one in which the class should acquire teaching and learning objectives. In verification phase, pupils repeat the contents of the operational phase, while the teacher assesses their level of adopted knowledge. At the end of the lesson, teacher assigns homework. The evaluation phase serves for the assessment of class progression.

Methodological information about the lesson	
Grade	Third or fourth
Area	Combinatorics
Topic	Permutations. Permutations without repetition.
Lesson	Arranging elements in an array
Duration of lesson	From 40 to 55 minutes
Main aim	Learn how to arrange elements in a row.

Methodological information about the lesson	
Teaching and learning objectives	Learn how to arrange three elements in an array through games. Develop persistence and studying habits. Enjoying problem solving.
Variety of activities	Verbal and textual methods, experiments, games
Classroom organization	Frontal work, group work, individual work
Resources required	Poster paper, chairs, tiles
Correlation	Serbian language, Music, Arts, Science and Social studies

Lesson Plan		
Lesson steps	**Pupil Activities**	**Teacher Activities**
<u>Introductory phase</u> Talk about class schedule: • its purpose, • what we learn from it, etc. • posing the problem	Listen and talk to the teacher.	Talk to pupils, ask questions.
Problem 1.: *If there are three classes tomorrow: Serbian language, Mathematics and Physical education, what are the possible class schedules?*		
Pupils name possible arrangements on their own.	• think about possible schedules • name possible schedules • look for missing ones	• write schedules that pupils name on the board • follow if all schedules are written • motivate pupils to find all possible schedules
Teacher presents prepared poster paper (Graph 1).	• compare schedules written on board with schedules on the poster • recognize that there are six possible schedules and rewrite all schedules in their notebooks	• motivate pupils to draw conclusions about strategy for naming all possibilities • note the introduction of abbreviated class names
Emphasize lesson goals and name the title: *Arranging elements in an array*.	Pupils write the title in notebooks.	Write the title on the board.

<table>
<tr><td colspan="3"><u>Operational phase</u>
Problem 2. a)
Two friends, Ana and Bojana are going to a school play. They find two available chairs in the first row. What are the possible seating arrangements for Ana and Bojana?</td></tr>
<tr><td>Improvise a real situation: take two chairs, put them in front of the class and choose two pupils to act as Ana and Bojana. Possible seating arrangements are as follows:
• Ana, Bojana
• Bojana, Ana</td><td>• look for possibilities
• conclude that there are two possible arrangements
• name all possibilities
• write solution into notebooks</td><td>Motivate pupils to look for solutions and find out that there are two ways to arrange sitting.</td></tr>
<tr><td>Abbreviation: Instead of Ana use the A and letter B instead of Bojana and rewrite two arrangements as:
• AB
• BA</td><td>Write abbreviated solution into notebooks.</td><td>Explain abbreviation.</td></tr>
<tr><td colspan="3">Complicate the situation:
Problem 2. b)
If Vanja comes with a new chair and wants to join Ana and Bojana, what are the possible seating arrangements?</td></tr>
<tr><td>Bring another chair, and select one more pupil.</td><td></td><td>Select another pupil.</td></tr>
<tr><td>Discuss and name seating arrangements for three friends.</td><td>• observe and name the possible seating arrangements
• selected pupils show all observed arrangements
• write the schedules in their notebooks</td><td>• direct pupils how to find all possible seating arrangements
• write on the board each new seating position</td></tr>
<tr><td>Explain strategies of naming all arrangements (Graph 2).</td><td>• listen
• write the schedules in notebooks using abbreviation</td><td>Explain strategies.</td></tr>
<tr><td colspan="3">Derive conclusion about the learned:
We can arrange three elements in three places in six different ways.</td></tr>
<tr><td>Divide pupils in groups. Each group receives a paper with Problem 3 given in Table 1.</td><td>• solve tasks in groups
• when finished group explains the solutions</td><td>• circulate between groups
• help if necessary
• check solution accuracy</td></tr>
</table>

Problem 4 (*Table 2)* should be given only to groups who complete ***Problem 3*** faster than other.		
When ***Problem 3*** is solved by all groups, present solutions for ***Problem 3.***	• present solutions • speak in a mathematically clear, precise and correct manner	• listen • correct if necessary
Verification phase Pupils work individually. ***Problem 5.*** *If we have four classes tomorrow: Serbian language, Physical education, Music and Arts, how many different schedules can we create so that Music is the last class?*		
• Note: if one class is in a fixed position, we arrange three remaining classes in already defined ways. • Don't forget to write Music at the end of every schedule.	• analyze the problem • compare this problem with the previous one • note similarities and differences • write schedules in notebooks	Direct pupils to note similarities to previous problems.
When majority solves the problem, discuss it.	• discuss the problem • one pupil presents the solution of the problem • the other pupil writes the solution on the board	• lead and follow discussion • receive feedback • correct if necessary
Homework phase *Draw different rainbows using three different colors (each color once).*	Write homework in their notebooks.	Give instructions on doing homework.
Class evaluation phase Summary of main points. Discuss the class.	Pupils evaluate the class with ☺ and ☹.	Assess class progression.

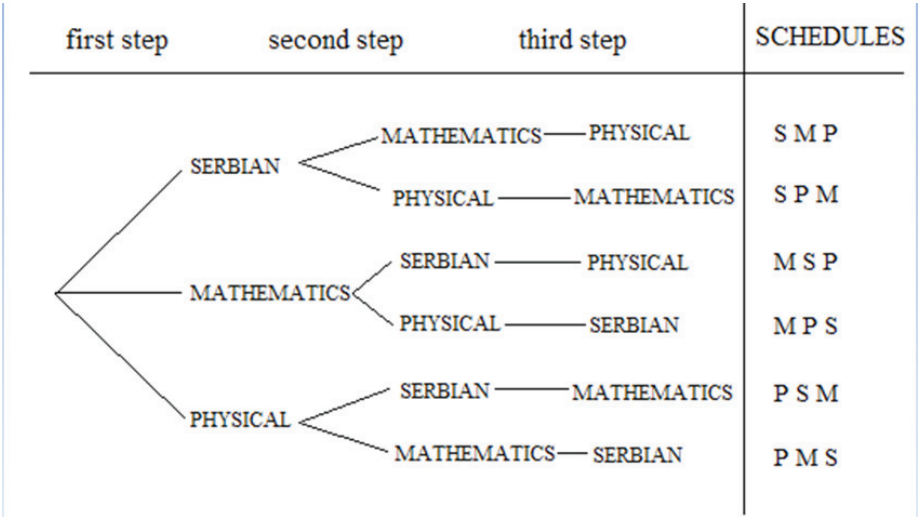
In *Graph 1* we see schema of choosing classes. At the beginning, in step one, we choose which subject will be the first class in the tomorrows schedule. It can be any one of three: Serbian language (Serbian), Mathematics or Physical education (Physical). In step two, we choose which one of the remaining two subjects will be the second, and in the step three, we take the remaining one for the third class in the schedule.

If the first chosen class is Serbian language, then the second class can be Mathematics or Physical education. If we choose Mathematics for the second class, then the third must be Physical education, and if Physical is the second, then Mathematics is the third. This gives two possible schedules:

- SMP (Serbian language, Mathematics, Physical education) and
- SPM (Serbian language, Physical education, Mathematics).

Similarly, if Mathematics is the first class, then for the second class we choose between Serbian language and Physical education, and after that the third class is uniquely determined. It gives two new possibilities for a schedule:

- MSP (Mathematics, Serbian language, Physical education), and
- MPS (Mathematics, Physical education, Serbian language).

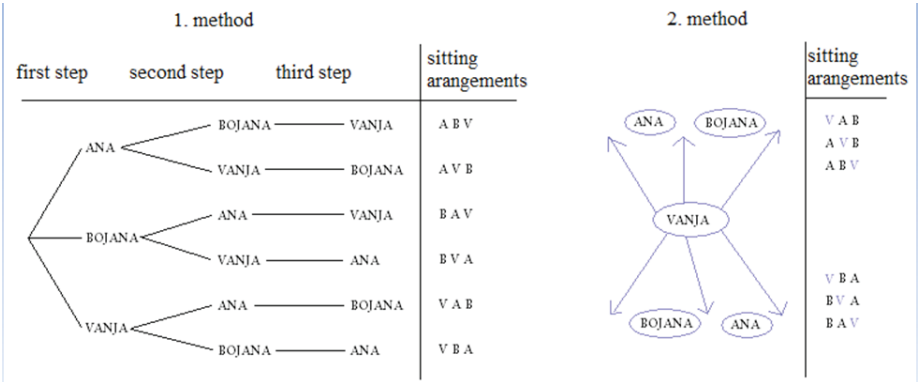


Graph 1: All possible schedules for three given subjects

Finally, if Physical education is chosen as the first class, then we have two options for the remaining two classes: Mathematics followed by Serbian or vise versus. Therefore, there are two additional new possibilities:

- PSM (Physical education, Serbian language, Mathematics), and
- PMS (Physical education, Mathematics, Serbian language).

In total, there are six possible schedules for these three classes.



Graph 2: Two methods for naming possible arrangements

1st method: At the beginning, we put chairs in the row. In step one we choose which friend will be in the first chair. In step two we choose which one of the remaining two friends will be in the middle, and in step three, the remaining girl will sit in the third chair. Note that this is a method already presented in Graph 1.

There are six possible seating arrangements for three girls: ABV, AVB, BAV, BVA, VAB and VBA.

2nd method: First, let us consider two girls (for example, Ana and Bojana) with two chairs. There are two possibilities for their seating arrangement:

- Ana on the left side and Bojana on the right (AB)
- Bojana on the left and Ana on the right (BA).

When Vanja joins them with one more chair, she can put her chair in the case AB: left from Ana (VAB), between Ana and Bojana (AVB), or right from Bojana (ABV), or in the case BA: left from Bojana (VBA), between Bojana and Ana (BVA), or right from Ana (BAV).

Three girls can sit in three places in six different ways.

In *Table 1* and *Table 2* tasks are given in the first column. Tasks should be prepared on pieces of paper and divided into the groups. Solutions for teachers are in the second column.

Table 1: Problem 3

Take a piece of paper and divide it into four parts. On each part of the paper write one of four digits: 1, 3, 5 and 6.	
Tasks:	Solutions:
a) Using digits 1 and 3 write all two-digit numbers.	13 31
b) Using digits 1, 3 and 5 write three-digit numbers starting with 5.	513 531
c) Using digits 1, 3 and 5 write all three-digit numbers.	135 315 513 153 351 531
d) Using all given digits write four-digit numbers ending with 5.	1365 3165 6135 1635 3615 6315
e) Using all given digits write all even four-digit numbers.	1356 3156 5136 1536 3516 5316
f) Using all given digits write all numbers greater than 6000.	6135 6315 6513 6153 6351 6531

Table 2: Problem 4

Filip, Nikola and Marko are jumping off the high diving board into the pool.				
Tasks:	Solutions:			
a) What are the possible ways for these three boys to jump into the pool?	FNM FMN	NMF NFM	MFN MNF	
b) What are the possible arrangements if Marko wants to jump before Nikola?	MNF	FMN	MFN	
c) What are the possible orders if Filip doesn't want to jump the first?	NMF NFM	MNF MFN		
d) If Oliver comes and wants to join his friends, what are possible orders of jumping?	ONMF ONFM OMNF OMFN OFMN OFNM	NOMF NOFM NMOF NMFO NFOM NFMO	MONF MOFN MNOF MNFO MFON MFNO	FONM FOMN FNOM FNMO FMON FMNO

3. Additional Aspects

Previous section gives the lesson model for a math class for the third or fourth grade of primary school where combinatorial contents are introduced. However, we believe it would be possible to introduce combinatorial contents even in lower grades. Also, there are always pupils with more advanced mathematical skills who would be able to solve problems such as *Problem 4*, or even more complicated problems. Therefore, it makes sense to consider introducing both simplified and complicated problems to schools.

In operational phase of a lesson model given in previous section, instead of taking three chairs in front of the class, one can divide pupils in groups of three, and let them find out and write down all possible sitting arrangements. This can be done in classes of physical education, for example. There are many more possibilities for correlation of combinatorics with other classes.

This section is devoted to the above issues.

Simplifications…

Arranging three elements in a row is an easy task which can be given to kids in the lowest grades of primary school, but also to children in preschool. In particular, it is important to develop mathematical skills in this early period, which would establish a solid base for development of functional knowledge. Instead of numbers, children can arrange magnets, cards, share fruit or different toys, etc. Let us consider an example.

Three friends in kindergarten, Maja, Ljubica, and Sofija want to share three different pieces of fruit: an apple, a pear and a banana. In how many different ways can they do it? Kindergarten teachers should have actual pieces of fruits for children to share. They should play and count different possibilities for sharing. If they know how to write they can mark solutions, or they can draw them - there are many possible ways of presenting solutions in this way, and it would be interesting to devote special attention to it.

…and complications

It can be seen in lesson plan for unit "*Arranging elements in an array"* that for groups who solve problems quickly and successfully, teachers should have additional problems. These problems could be more complicated than previous, especially if teachers spot those pupils who are more mathematically advanced. Relationship of talented pupils with mathematics depends strongly on the quality of teaching. Teachers should additionally motivate talented pupils, guide and encourage them. In *Table 3*, we propose an advanced version of *Problem 1* and *Problem 3*, as well as solutions and explanations.

Table 3: Problems for talented pupils

	Complications	Solutions	Explanations
Problem 1	Ana does not want to sit next to Bojana.	A V B B V A	Vanja must sit in the middle.
	Bojana wants to sit next to Ana.	ABV, VBA BAV, VAB	This problem is opposite to the previous. Vanja cannot sit in the middle. Bojana or Ana have to sit in the middle.
Problem 3	Using digits 1, 3 and 5 write three-digit numbers less than 333.	135, 153, 315	Three-digit number less than 333 cannot start with 5. Two numbers starts with 1, and if number starts with 3, it must be 315 (351 is greater than 333).
	Write four-digit numbers where digit 6 is right behind digit 3.	1 36 5 5 1 36 1 5 36 5 36 1 36 1 5 36 5 1	We can think of the digit 6 to be "glued" to digit 3, and move them together. Problem reduces to arranging numbers 1, 36 (glued) and 5 in a row.
	Write four-digit numbers where digit 6 is next to digit 3 and which are less than 3000.	1 36 5 1 5 36 1 63 5 1 5 63	Numbers must begin with 1, so it is fixed in the first place. "Glue" digits 3 and 6 to make one element, but be careful, it could be: 36 or 63.

Correlations with other subjects

Correlation of two subjects means to connect contents from the syllabi of both subjects and realize them within one class. Correlating mathematics with other subjects seems to be not such difficult task. Mathematical problems (especially in lower grades) should be related to objects, people and situations familiar to children. This way, children will learn mathematical content based on their own knowledge and experience, as well as personal interests.

Contents of combinatorics are especially applicable to correlating mathematics to other subjects. In particular, arrangement of elements can be easily incorporated in many teaching units. We suggest several problems from real life situations, related to different school subjects. All these problems require using and developing logical thinking.

Physical education

Example 1: During the first part of the class, girls are working on the beam and boys are working on the loom, and in the second part they change activities.

Example 2: There are three pupils in one group. Every group throws a heavy ball as far as possible. One student is throwing the ball, the second measures the distance (correlation with Nature Science) and the third writes the result (improve writing skills). After that, they change roles.

Example 3: Lea, Sara and Mia are leading the school race. It is clear that the three of them will win medals and the only question is how they will share it. What are the possibilities for sharing gold, silver and bronze medal?

Example 4: In Physical education class, pupils are divided into three groups: Ninjas, Knights and Ghosts. They should play three different games: basketball, ‘’between two fires” and soccer. Name all possible ways to pair groups with activities.

Nature and Social studies

Example 1: Pupils take an excursion trip to Belgrade. The plan is to visit Kalemegdan, the Zoo and St. Sava’s temple (at the Vračar plateau). What are the possible arrangements of visiting these three sights?

Example 2: Considering that Zoo is located near Kalemegdan, what are the logical arrangements of visits in *Example 1*? Pupils should conclude that visiting St. Sava’s temple should be the first or the last.

Example 3: Emma is left home alone and she must feed her animals: the dog, chickens and pigs. What are the possible orders of feeding the animals?

Art

Example 1: Paint three different shapes with three different colors. Present all possible situations.

Example 2: Draw three connected horizontal rectangles six times. Paint them in all possible arrangements, using black, yellow and red color (one color for each rectangle). When all possibilities are drawn, mark the rectangle which represents the

flag of Germany. Using the other colors, each pupil gets the other countries' flags (correlation to Social studies).

Music

Example 1: One group is singing and the other is playing flutes. After that, groups change roles.

Example 2: Petar, Miloš and Nikola want to put together a rock band for the school's New Year's show. Each of them will play either guitar, bass guitar, and drums, and Ivana will sing.

a) If all three of them can play any instrument how can they organize band?
b) If Petar must play drums how then can they organize band?

4. Conclusions and Remarks

Mathematical education aims to develop logical thinking and reasoning, to enable pupils to solve math problems and to use their knowledge in life situations. Contents for teaching mathematics in lower grades of primary schools in Serbia, currently do not include contents from combinatorics, but we strongly believe that it would contribute to accomplishing these goals. Motivated by this idea, we have proposed a lesson model and sequence of combinatorial problems that can be easily incorporated into existing programs.

This paper has attempted to show the possible ways of including combinatorial topics into teaching programs. In the lesson model "*Arranging elements in an array"*, two ways of explaining the problem of arranging are offered. Also, sequence of problems which pupils should solve in groups and individually is given. The paper has also offered variations of problems which can be introduced for younger pupils, even for children in preschool. In addition, it is possible to make problems more complicated to fit talented pupils, examples of which are also given here. Finally, we offer examples for possible correlations with other school classes.

Therefore, we have shown that combinatorial contents are appropriate for lower grades of primary schools, where teacher teaches all school subjects and can easily correlate between them.

Finally, we would like to note that it would be useful to check our hypothesis related to the following facts:

1. Pupils enjoy and like solving problems in combinatorics.
2. Implementation of combinatorics improves logical thinking and reasoning and also enhances pupil's functional knowledge.

If these two hypotheses are true, one of the most important question arises: What would the process of implementation of combinatorics in school system in Serbia entail? What are the steps to be taken and obstacles to overcome?

These are the questions open for further research.

References

[1] Biryukov, P. (2004). Metacognitive Aspects of Solving Combinatorics Problems. *International Journal for Mathematics Teaching and Learning*, Retrieved from http://www.cimt.plymouth.ac.uk/journal/
[2] Burghes, D., Robinson D. (2010) *Lesson Study: Enhancing Mathematics Teaching and Learning* CIMT (Centre for Innovation in Mathematics Teaching), University of Plymouth. Retrieved from http://www.cfbt.com
[3] DeBellis, V., Rosenstein, J. (2004). Discrete Mathematics in Primary and Secondary Schools in the United States*, ZDM, Vol. 36 (2)*, 46-55.
[4] Meluškova, J., Šunderlik, J. (2014). Pre-service Teachers` Problem Posing in Combinatorics, In. (Eds.) Šedivý, O., Švecová, V., Vallo, D., Vidermanová, K. *Acta Mathematica 17: Conference Proceedings 12th Mathematical Conference in Nitra*, (pp. 115-122). Department of Mathematics, Faculty of Natural Sciences, Nitra. Retrieved from http://www.nmk.fpv.ukf.sk/2014/proceedings.php
[5] Ministry of Education Singapore, (2012) *Primary Mathematics teaching and Learning Syllabus*. Retrieved from http://www.moe.gov.sg/education/syllabuses/sciences/
[6] Oparnica, Lj. (2014). *Kombinatorika i verovatnoća*, Sombor, Pedagoški fakultet.
[7] Semadeni, Z. (1984) Action Proof's in Primary Mathematics Teaching and in Teacher
Training, *For the Learning of Mathematics, Vol. 4, No. 1* , 32-34.
[8] http://www.mensa.rs/sr/sigovi/ntc/sistem-ucenja/prvi-deo/
[9] http://www.zuov.gov.rs/novisajt2012/naslovna_nastavni_planovi_programi.html

Сажетак: Основни циљ математичког образовања је да развија мишљење и закључивање, оспособљава за решавање математичких проблема и примену знања у различитим свакодневним ситуацијама. Наставни програм математике за основне школе у Србији садржи велики број тема које подржавају ове циљеве, али се програм може унапредити. На пример, комбинаторика је једна од области која може помоћи да се постигну ови циљеви, али није укључена у постојећи програм. У овом раду предлажемо модел школског часа математике у коме се уводе пермутације на лак и занимљив начин. Такође, представљене су корелације са другим предметима.
Кључне речи: пермутације, модел часа, решавање проблема, корелације

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COMPARATION BETWEEN PROBLEM SOLVING AND CLASSICAL FORM OF TEACHING IN THE CASE OF DIVISIBILITY OF NUMBERS

Summary: Today, one of very important directions in mathematical education research is research of essence teaching methodology known as problem solving. With theory of divisibility students got in touch for the first time in sixth grade of elementary school. That is relatively very early, but research gave us a result that learned rules, often, are not used later in education to solve some of the problems that might be very easily solved by them. In this paper we wanted to see how students deal with divisibility problems in secondary school and made comparison between classical teaching methods with problem solving methods on some examples from theory of divisibility.
Key words: divisibility, classical teaching, problem solving methods

1. Interactive learning with problem solving

Present time, and time that is yet to come, demands universal and efficient educational system, which shall be able to respond to challenges of scientific-technology revolution. Modern teaching requests the teacher to be: intelligent organizer and wise interpreter of teaching activities, researcher and developer of student's work, to know his students well and to be their intellectual leader. Teacher of modern and future time is not someone who only gives lectures and question materials that had been taught, authority that knows and can do anything but is becoming a researcher and strategist of teaching and learning, pedagogical diagnostician, organizer of student activity, initiator of changes in teaching process and tutor of new generations. In everyday teaching practice, the necessity for mathematical modeling has been shown, especially when it is about standard, small models that are easy to research and fit well with actual curriculums. One of the important aspects of research in

mathematical teaching methods is essence and application of problem solving method. It's a commonly known opinion nowadays that the class is not efficient unless the students are not involved actively and independently, if they don't solve problems for which besides knowledge, they need to have wit, clarity and certain amount of creativity. The idea of problem solving method is not new but was recently a little bit abandoned in practice. In literature we can find more definitions of teaching by problem solving. Problem solving method in teaching process is a form of efficient learning that has further characteristics:

1. Existing of difficulty, new situations and conflicts between known and unknown.
2. Advised, focused creating and as much as possible independent activity by which student aims to find the relationship between given data and finding new ways of solution to create new knowledge and to form new generalizations, that can be applied in new learning situations. (R. Ničković, 1971).

Problem solving is creating activities by which in contact with special demands, it requests finding a new solutions. The problem in teaching starts when students find obstacles and difficulties that enables realization of their aims or wishes and when they need to find a way how to overcome that. Teacher before all has to create student's interest by creating problem situation. He can do that in the following ways:

- Teacher loudly and clearly sets problems to students;
- Teacher creates situation where he demands from students that they understand and formulate the problem themselves;
- Teacher creates situation with more or less pointed out problem which during analysis needs to take students to the next problem, which has been predicted by teacher;
- Teacher creates situation with more or less pointed out problem which during analysis needs to take students to the next new problem, which has not been predicted completely by teacher.

The way that the class shall take course during problem solving depends on nature of topics as well as problem task, former student knowledge and their experiences in problem solving. The class structure of problem solving can be divided in several phases.

1. At the beginning teacher says something about working task in form of a problem with the aim to create problem situation. That is phase of creating the problem situation.
2. Teacher encourages students to think, suggesting hypothesis for searching the possible problem solution.

3. They break down the problem, divide global problem to its components, smaller logical units.
4. Approaches to directly solving of the problem, checking hypothesis.
5. Making final conclusions.
6. At the same class or later, in new problem situations, students check created knowledge and recognize validity of created knowledge in new cases. Here teacher tries to emphasize only important moments, cause relations between phenomena and the factor of it, essence of phenomena and not the details.

2. Number divisibility

The term of divisibility is one of the simplest but atthe same time one of the most important in number theory. Natural numbers are closed for addition, subtraction and multiplication, while division is not. And exactly that question, the question of divisibility in set of natural numbers is a base of big part of theory of numbers.

***Definition**:*

Let and are integers. We say that is divisible by, that means that divides, if there is integer such is We wrote that.

If we say that is divisor of, and is multiple of.

First time in our curriculum divisibility was mentioned in the sixth grade of primary school. After interpretation of new teaching unit students should be able to know how to write any number as a product of primes, to factorize number, recognize numbers that are divisible by 2,3,4,5,6,9,10 and 15. They should be able to find least common multiple and greatest common divisor and know the difference between composite number and primes and relative prime numbers. So, to divisibility and rules of divisibility students are introduced very early, but the fact is that those learned rules later are rarely used as a help in solving some of tasks. As a proof for that fact we conduct research on the following task.

Task 1

If we divide 351 and 466 by the same number we got remains 11 and 6 respectively. Find divisor!

We conduct our research in first, second and fourth grade of grammar school, and in mathematical elections groups. All students were tested in the same way. Without any introduction students got papers with the above mentioned task that should be done.

***Results of testing**:*

Grammar school „Mesa Selimovic“, Tuzla

Class	Number of students	Task solved	%
Ic – grammar school	25	3	12
Ie - grammar school	23	2	8,69
If-mathematical class	15	2	13,3
III-elective mathematical class	25	1	4
IVh-grammar school	19	2	10,52
IV-elective mathematical class	21	2	9,52

Table 1 Results of introduction task of Tuzla's students.

Catholic school center „Saint Joseph“, Sarajevo

Class	Number of students	Task solved	%
Ia – grammar school	21	3	14,29
Ib - grammar school	21	3	13,63
IIa - grammar school	25	2	8
IIIa -grammar school	25	3	12
IIIb-grammar school	22	4	18,18
IIIc -grammar school	20	1	5

Table 2 Results of introduction task of Sarajevo's students.

As we can see from the results of testing, there is a very small number of students who finished the task correctly. Also, most of them got the answer right by simple guessing and with use of the calculator. Only three students managed to solve the problem using the formula of. So, no matter what the topic was, something that they have done in primary school, they didn't use it in their secondary education. On the other side, we noticed a very big interest in this way of work. Even students, who have problems with mathematics, have shown interest to solve the problem. That's why we

thought that this example could be used in problem solving method. Good teaching has to be the one which excites the students toward subject. If teaching is not followed by emotional excitements of students, its effects shall be weak, formed knowledge shall stay dead and formal, so on the first occasion they shall be forgotten. Teacher is the one who as an organizer of teaching processes, creates those opportunities situations in teaching process, of course if that is possible, considering some other factors that influence teaching process.

3. Organization and research process

For implementation of problem solving method we decided for the first year of secondary school, because they are the closest to the topic from elementary school and they had relatively even distribution of marks from mathematic during school year, as we can see it from the Table 3 below.

Class	A	B	C	D	F
Ia	4	8	4	2	3
Ib	6	9	2	2	3
Ic	5	8	4	4	2
Ie	7	6	5	5	2
If	5	6	6	4	3

Table 3.Students marks in mathematics.

In two classes Ia and Ie (group 1), we have done classical presentation of the new unit, repeated divisibility and representation of number a in form a=bq+r, rules of divisibility, LCM, GCD and Euclid's algorithm and we showed some simple examples and we gave three tasks for students to solve.

1. Find the smallest natural number which in division by 2 gives remain 1, in division with 3 gives remain 2, in division by 4 remain 3 and in division by 5 remain 4.
2. Remain in division of some natural number n by 66 is 14, and in division by 77 is 55. What is remaining when we divide n by 20?
3. Salesman was asked how many apples were in the basket. He answered: „If I count them by two, three, four, five, or by six, always is one left behind,

but if I count them by seven none remains.“ Find the smallest number of apples that satisfies those conditions.

In other two classes Ib and Ic (group 2), we set the problem situation in the way that we at the beginning of class gave students those three tasks, let them talk a little bit about tasks and try to solve them on their own and tell their impressions and then we showed them theoretical basics like in the first group involving tasks from the beginning.

In the last class If (group 3), we set tasks at the beginning, shortly talked about them, gave students written materials where they could find all theoretical basics for this topic with some similar examples, which could be useful in solving given tasks.

After short period of time we talked with students about those ways of teaching in group 2 and 3. Conclusions about the work in group 2 were: From the beginning students were involved in thinking actively, to listen carefully to professor, knowing ahead what is expected from them. Teacher led them one to another and at the same time upgraded and supplemented their ideas. Group 3 said that they liked the approach in which they had the freedom, that it was convenient to them, they could process the materials and research using literature like books and also from the internet. It is important to mention that students first worked individually and then in small groups so in this way we also had a team work.

After two weeks we tested those three groups with similar tasks.

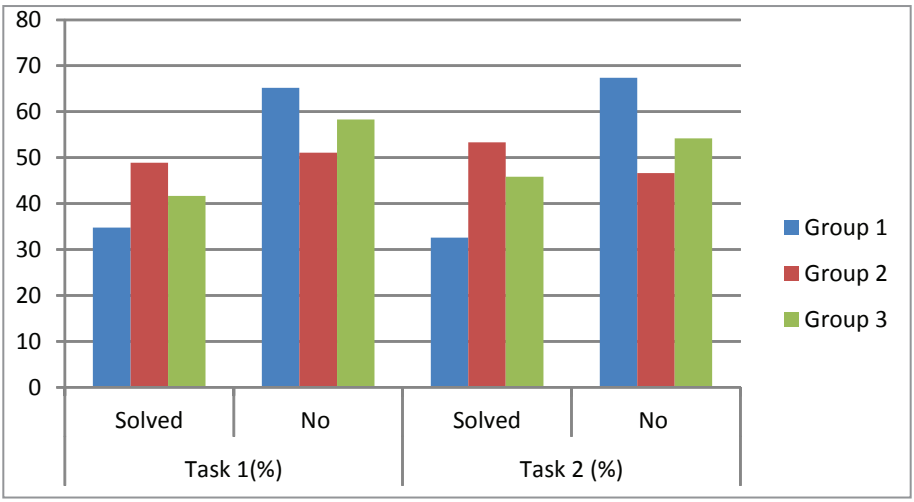
1. Find all natural numbers with three digits which in division by 7 give remainder 2, in division by 9 remainder is 4 and in division by 12 the remainder is 7.
2. We have some books on the table and we need to put them in boxes. If we pack them by 4, 5 or 6 eachtime two books will stay unpacked, but if we pack them by 7 there will be no books on the table. How many books are on the table at least?

4. Results of testing

The results of testing can be seen in the following table.

Group	Task 1	Task 2	Task 1 (%)	Task 2 (%)				
	Solved	No	Solved	No	Solved	No	Solved	No
1	16	30	15	31	34,78	65,22	32,61	67,39
2	22	23	24	21	48,89	51,11	53,33	46,67
3	10	14	11	13	41,67	58,33	45,83	54,17

Table 4 Results of testing and the percentage of those results



Picture 1 Visualization of results

As we can see in Picture 1 the best result was achieved by group two in both tasks, then group three and the worse result had the first group. The reasons that students from the group two were the best, can be found in the fact that they had time to exchange some ideas after we gave them a problem, and after we explained some similar problems they could talk a little bit more, so at the point that they should do their research they had some ideas what to research. Also they could find some similar examples and some theorems that the teacher didn't even mentioned. So, we managed to wake up their interests. The group 3 has had a worse result then group 2, so we shouldn't ignore the teacher's influence as a creator of class and ideas and not to have faith that all the students are able and willing to do research on they own.

First group, settled in formal education, did their tasks leaning from what they got from the teacher and probably a very small number of them even tried to do some research to improve their knowledge.

5. Conclusion

Quality teaching must be in a way that it creates interest toward topics. If teaching is not followed by emotional excitements of students its effects will be weak, created knowledge will remain dead and formal and so it will be forgotten in a short time. Teacher is the one who creates those situations when it is possible to consider some other factors which influence the teaching process. Ideas and freedom in developing them are crucial to personality development. Classic teaching, which mainly reduces to interpretation, frontal form of presentation and occasionally group work should be

slowly and as much as possible, replaced by some other forms and methods. One of them is certainly problem solving and research. Even though they are not empirically tested and tested in practice all the aspects and levels of interactive learning in problem solving method, it is possible to talk about some advantages of this didactical innovation. Some of them are:

- Bigger motivation of students;
- Possibility of cooperation;
- Research approach to solving problem;
- Development of critical thinking;
- Better understanding of essence and principles;
- Increasing amount of knowledge;
- Achieved knowledge is permanent and possibility of using that knowledge is bigger.

Some ideas for topics in primary school that can be used for problem solving method

- Divisibility of natural numbers.
- Theorem of three inside angles in triangle.
- Solving systems of two equations with two unknowns.
- Diagonal in n-angle.
- Addition of angles in n-angle.
- Tales theorem.
- Squaring and its properties.
- Square roots and its properties.
- Pythagoras's theorem.
- Use of Pythagoras's theorem.

Some ideas for teacher in high school

- Area of triangle and Heron formula.
- Similarity theorems.
- Analytic formula for area of triangle.
- Gradation and roots.
- Polynomial factorization.
- Characteristics of solutions of quadratics equation.
- Biquadratic Equations.
- Quadratic function.
- Plotting inverse function.
- Condition of tangency for lines of second order.
- Binomial theorem.
- Arithmetic and Geometric sequences.
- Derivation rules.
- Derivation of elementary function.

And at the end we should not forget that problem solving is complex teaching system.

Because of its complexity and difficulty it takes more time for application.

That's why it is understandable that problem solving cannot be used in every class and for that we need to create smaller sets of mathematical contents and to work on them we have to make a very good preparation.

But when it is possible then we have to do it (at least try to).

References

J. Đorđević, 1997, *Nastava i učenje u savremenoj školi*, Učiteljski fakultet, Beograd.

W. Glasser, 1994, *The quality school teacher*, Harper Perennial, New York.

V. Kadum, 2005, *Učenje rješavanjem problemskih zadataka u nastavi* (*matematike*), Pula, IGSA.

Z. Kurnik, 2002, *Problemska nastava*, Matematika i škola **15**, 196-202.

R. Ničković, 1970, *Učenje putem rješavanja problema u nastavi*, Zavod za udžbenike, Beograd.

I. Niven, H. S. Zuckerman, H. L. Montgomery, 1991, *An Introduction to the Theory of Numbers*, John Wiley, New York.

I. Osmić, R. Tomić, 2008, *Didaktika*, Selimpex, Srebrenik.

V. Stojanović, 1988, *Matematiskop 3*, Odabrani zadaci za učenike srednjih škola, I dio, Matematiskop, Beograd.

R. Teodosić, 1970, *Problemska nastava*, Nastava i vaspitanje **3**, 258–269.

Сажетак: У данашње време један од важних смерова у истраживању математичког подучавања је проучавање суштине методологије подучавања познате као проблемска настава. Са теоријом дељивости ученици се сусрећу у шестом разреду основне школе. То је релативно врло рано, али истраживањем смо дошли до сазнања да се научена правила често и не користе после у образовном циклусу, да би се решили неки од проблема, који би се врло лако могли помоћу њих решити. У овом раду желели смо показати како се ученици баве проблемима дељивости у средњој школи и направити поређење између класичног модела подучавања са методом проблемске наставе на неким примјерима из теорије дељивости.

Кључне речи: дељивост, класични облик подучавања, метод проблемске наставе.

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SELF-REGULATED LEARNING AS A NEW EDUCATIONAL PRACTICE THAT BRINGS BENEFITS TO STUDENTS AND THEIR INSTRUCTOR: A CASE OF AN UNDERGRADUATE OPTICS COURSE

Summary: Self-regulated learning (SRL), a new form of learning practice by active engagement for both students and their instructor, was implemented within an undergraduate optics course at a public university in Bosnia and Herzegovina. Two student groups participated in a new learning environment organized for the first-time taught optics course syllabus. SRL participants were the second-year students in the two successive academic years (2012-2013 and 2013-2014), during the spring semester. The optics course was structured into two modules. The content of first module, consisted of several common themes of geometrical optics, has been covered by the standard lecturing method. After that, an exam was organized to evaluate students' learning outcomes. After such a traditional teaching practice, less then 30 % of students were passing the first examination of gained knowledge. Second optics module was organized as a self-regulated learning student experience, covering two experimental solving tasks on geometrical optics and three wave optics tasks combined by theoretical, experimental and problem-solving approach for finding the analytical and experimental solutions. Students were asked to use different learning materials by themselves and to communicate with their instructor via the Moodle e-learning platform. The SRL implementation brought benefits to both students and instructor, rising students' interests for study field, especially for designing hands-on experiments and analytical solutions, based on knowledge integration of physics, mathematics, and computer science. SRL results show that 95 % of students passed their second exam earning mostly the highest grades, revealing their satisfaction with the SRL application and showing a great enthusiasm to present their original contributions.
Key words: learning outcomes, optics course module, self-regulated learning

Introduction

After the Ministers' meeting in Prague in 2001, lifelong learning skills were proclaimed as an essential element of the European Higher Education Area. This is an opportunity to enhance self-regulation as a teaching-learning method to prepare students for time after graduation from university (Bologna Process, 2010). Since

the public universities in Bosnia and Herzegovina have implemented the Bologna model of study, it is necessary to prepare the students for lifelong learning according to the Prague documents. A useful way to have prepared students for their future is self-regulated learning. Barry J. Zimmerman's proposal (2002) is useful educational framework for lifelong education especially for building opportunities for some significant future professional positions of interested individuals. Self-regulation of learning (SRL) was defined by Zimmerman (2000; 2002; 2008) as activity that includes self-regulated learners to practice and achieve cognitive, metacognitive and motivational dimensions of the learning process. Self-regulated students need to be taught by teachers and peers how to set their learning goals, self-motivation, evaluation and reflection to improve their learning (Zimmerman, 2002). Zimmerman (2002) has presented an overview how to become self-regulated learners through three-phase structure and the SRL functions:

(1) Forethought phase (task analysis and self-motivation beliefs):
(2) Performance phase (self-control and self-observation), and
(3) Self-reflection phase (self-judgment and self-reaction).

Bolhius and Voeten (2001) emphasize the importance of the role of educators for introducing SRL in the teaching-learning process by a non-traditional teaching method of building students' knowledge through active learning in the areas in which they participate. A slightly different phase structure of SRL was proposed by Paul R. Pintrich (2004). According to him, conceptual SRL framework goes through four phases of its implementation: (1) planning and goal setting to activate knowledge on the tasks and context; (2) developing metacognitive awareness; (3) controlling and regulating of the self and task or context, and (4) reaction and reflection to different aspects of the self and task or context.

This study presents design and results of a SRL implementation in Optics university course, in two successive academic years, with two groups of second-year students who were guided by their instructor. The study participants learned how to implement the SRL conceptual framework in learning Optics. Their experiences according to motivation, interest, reflection and emotion are presented in short.

Purpose

A main purpose for including the SRL module in Optics syllabus was intention to increase student effectiveness of learning, and to start to prepare students for lifelong learning. Main aim was directed for developing students' self-regulated learning skills and knowledge in an actual physics study curriculum because such approach has never been implemented before. At the same time, it was an opportunity to "elevate student levels of motivation" (Zimmerman, 2002) to learn for better learning skills and outcomes in optics that were absent in many students. Student results of the SRL

implementation were used to gain a picture of their learning outcomes, and to answer two research questions:

RQ1: How do students perceive their level of learning skills and learning outcomes after the SRL implementation in Optics course?

RQ2: Do students achieve better exam results after the SRL Optics module implementation?

Methods

Procedures

The Optics course was structured into two modules. First module was implemented in traditional teaching manner as teacher-centered one. The instructor (the first coauthor, Z.H.) was lecturing over an eight-week period on Geometrical Optics, using the Power Point presentations for giving instructions about: (1) Measurements of the speed of light; (2) The ray-model of light; (3) Phenomenon of the reflection of light and the law of reflection; (4) Phenomenon of the refraction of light and the law of refraction; (5) Index of Refraction; (6) Total internal reflection; (7) Dispersion and Prisms; (8) Mirrors and Lenses, (9) Optical instruments and (10) Photometry.

In the ninth week of semester students passed their first exam (Test 1) based on several conceptual questions and five problem solving tasks (the maximum score was of 30 points).

Second Optics course module lasted over a six-week period and was designed as a self-regulated student experience in learning Optics. Students were asked to find the analytical and experimental solutions of five given assignments. They were asked to use different learning materials on their own choices from different resources (university or own library and Internet) and different sources (books, journal articles, websites, YouTube experiments, etc.). Students communicated with instructor via Moodle e-learning platform. Five student assignments were given in two different forms, one for covering three experimental problems (on geometrical optics, diffraction of light and polarization of light), and other form dealing with the wave optics assignments including theoretical, and problem-solving tasks. What students learned in the second module was evaluated by second exam test (Test 2), accounted with 30 points, too. At the end, during the sixteenth week students took their final exam in Optics course (Test 3) for gaining 30 points more. The rest of 10 points of Optics exam scores students could earn within 15 in-class meetings, each 90-minute long according to their problem-solving activities and homework supported and evaluated by teaching assistant. Each student has had an opportunity to gain 10 bonus points for any original SRL experimental contribution.

Instructor's intervention during second Optics course module was a SRL module introduction and four weekly two-hour lecturing with discussing sessions focusing on wave optics phenomena (polarization, interference and diffraction of light waves).

In the same time instructor organized five weekly one-hour in-class sessions in which students discussed their individual solutions with peers in groups of 4-5 students. Each group, through its representative, had to complete a group solution based on group-members consensus. The solution was sent in digital form to the instructor.

SRL content created in the Optics syllabus context, related to the SRL assignment instructions, is presented in Box 1, and the solving steps are shown in Box 2.

Box 1. Basic assignment instructions

To complete student assignments, recommendation is to use the knowledge and skills in optics, mathematics and experimental physics in the following schedule:

(1) to send each individual SRL task solution within seven days after its the Moodle e-platform announcement;

(2) to send SRL task solution by each group (groups of 4-5 students) within three days after in-class discussion session;

(3) to discus in the groups individual solutions to make a consensus based group solution for sending to the instructor.

(4) to study carefully every instructor's solution (called "expert solution") published after personal and group phases;

(5) to write and send an individual reflection after comparison of individual, group and instructor's solution in light what new is learned.

Important notes

Do not do any plagiarism. If you use two or more words from any sources you must put the words in quotation marks and indicate where they came from. If you use any picture, graph, drawing, you must indicate its sources.

Each student and group should deliver each assignment by e-mail to instructor solved and presented in digital formats (MS Office Word 2003, MS Paint, video material, JPG photographs, etc.).

Box 2. Assignment solving steps

Step 1: to search for learning material related to the assignment contents on own, and to focus on proper ones to be useful for finding a correct task solution;

Step 2: to make a situations model for finding solution as a student's proposal to represent his/her intentions (knowledge needed to construct a situation model, sketches, schemes, and other helping information);

Step 3: to prepare a mathematical model or experimental setting to find an algorithm of assignment solution using general knowledge in mathematics and physics to connect related physical quantities relevant for given assignment tasks;

Step 4: to implement own mathematical model or experimental setting according to his/her situation model;

Step 5: to connect experimental or theoretical assignment solutions with a real everyday situation.

Step 6: to give an evaluation how is carried out the six-step solving process and own effectiveness of solving approach.

After final exam students provided their feedbacks using SRL survey created by researchers.

Participants

Optics course syllabus was realized with two student groups of second-year physics students at a public university in Bosnia and Herzegovina in two successive academic years (2012-2013 and 2013-2014), during the spring semester. Table 1 shows the basic statistical data of 45 study participants. The SRL module in Optics was chosen by these students, representing 98% of students who have taken Optics course during aforementioned academics years.

Table 1. *The SRL participant data*

Student group	Academic year	Number of students		
		Total	Female	Male
SG1	2012-2013	28	22	6
SG2	2013-2014	17	15	2

Instruments

Assignments

Five SRL student assignments were created by researchers that were published via Moodle e-platform each week to be used by students. The related themes and questions of these tasks were following.

Assignment 1: An experimental problem for creating experimental hands-on device to measure the water index of refraction.

Assignment 2: A problem-solving task on photometry.

Assignment 3: An experimental problem related to diffractometer construction using CD and DVD as diffraction gratings as hands-on elements when monochromatic light falls on them.

Assignment 4: A problem solving task on polarization of light.

Assignment 5: An experimental problem related to polarizing device construction based on doubly refracting materials or polarization foils consisted of several (2-5) polarizers.

SRL Survey

SRL survey consists of the seven item-group questions and three open-ended questions. All 40 items of the seven item-groups are rated on 5-point Likert-type scales and should be administrated after the Optics final exam for all of SRL module participants. The purpose of the survey is to gather information regarding students' attitudes

toward SRL implementation at level of own motivation, cognition, objectives and emotion. By answering the eighth and the ninth survey question, the students should stress what they like and what they do not like within the second Optics module. Responding to the tenth survey question, the students can recommend their ideas and suggestions toward better Optics syllabus structure for future generations.

Of 45 students who were invited to answer SRL survey questions, 95% of them responded anonymously and 5% of them gave their names. In two item-groups there are questions to collect answers as student feedbacks about their abilities to learn on their own using different learning materials to complete assignment solutions as successful and correct ones.

Results

SRL module in Optics syllabus and SRL survey were conducted to obtain an insight into the differences of students' learning skills and knowledge gained through traditional learning approach (in first module) and the SRL features (in second module), measured via exams' results. From that, one can derive an overall picture of students' participating in two Optics modules. Student achievements showed benefits for both students and instructor. SRL Optics module helped all students to discover their own abilities to make a plan, a mathematical model, a connection between things they learned and a relation with real everyday situation recognized and found. The SRL module helped the instructor to have more satisfied students who actively participated in each assignment with an evident success in how to select and use their own different learning materials, by activating themselves to find a proper solution that can be evaluated as correct or close to correct one. At the same time, both instructor and students found a strong benefit to learn how to get students working without any fear that can be negatively criticized by the instructor. The SRL participant scores showed high averages on the five-point scales (-2 is the smallest and 2 is the biggest value on the Likert scales) according to each survey item. In general, according to their feedbacks, the students felt a very positive impression, with a small dose of disappointment because they were not always able to prepare a mathematical model appropriate to obtain a solution that would be as successful as it was found in each "expert solution".

This article presents a selection of SRL Optics module results from an already large database that researchers owned. These results show a transformation of students' mental abilities, starting with lower testing results and progressing into a higher academic performance skills (writing, discussing, critical thinking, etc.) for gaining much better exam scores.

Result comparison of students' knowledge evaluation

Students' achievements, showed throughout the three forms of knowledge evaluation (T1, T2, and T3), are presented in the Table 2.

Table 2. *Student test results (T1-T3)*

SG	AY	N	NPE					
			Test1	MS	Test2	MS	Test3	MS
SG1	2012-2013	28	11	10(33%)	28	28(93%)	28	25(83%)
SG2	2013-2014	17	2	7(23%)	17	29(97%)	17	23(77%)
	Total	45	13		45		45	

Notes: SG = Student Group; AY = Academic Year; *N* = number of students; *NPE* = number of students who passed the exam; MS = mean score (maximum is 30 points of each test).

By analyzing the data in Table 2, one can see that there has a significant difference between numbers of students who passed all three exams. First exam (T1) was conducted after a traditional teaching learning way and students' results were very low (29% of students gained the passing exam scores). Later, after SRL Optics module was completed, the students were 95% successful, what can be concluding looking at their second exam (T2) results. At the final exam, a similar success was achieved, too. Thus, here it is quite clear that both the students and instructor should be satisfied with the results achieved in the second module of learning Optics. On the other hand, the average number of points achieved by students at each of evaluation phase showed a low students' efficiency at the first evaluation, but much greater efficiency according to the second and final exam.

A selection of the SRL Survey results

Of all the results obtained through SRL survey implementation, a set of data of two groups of survey items is selected and presented (Table 3 and Table 4).

Table 3. *Percentages of students' rating of the sixth group of SRL survey items*

Question	LIKERT SCALE (N=45)					
	-2	**-1**	**0**	**1**	**2**	Mean
Q6.1. I have made the problem-solving independently in a manner of expert solution.		6%	12%	59%	23%	1
Q6.2. I have solved the experimental problems independently in a manner of expert solution.			8%	58%	34%	1,2
Q6.3. To solve the SRL assignments, I have taken more time and effort than preparing myself for the first exam.		6%	12%	29%	53%	1,3
Q6.4. I am satisfied with my own efforts to complete my SRL assignments.			2%	29%	69%	1,7

Question	LIKERT SCALE (N=45)					
	-2	**-1**	**0**	**1**	**2**	Mean
Q6.5. I think I should receive all 60 points as the SRL module scores.			2%	18%	80%	1,8
Q6.6. I am pleased with the extra points that were assigned to me.			7%	12%	81%	1,7
Q6.7. My SRL reflections I said and wrote quite honestly, stating without fearing to present my views and opinions.				6%	94%	1,9

Table 4. *Percentages of students' rating of the seventh group of the SRL survey items*

Question	LIKERT SCALE (N=45)					
	-2	**-1**	**0**	**1**	**2**	M
Q7.1. Overall rating of my own involvement in the SRL module.	1%	0	15%	33%	51%	1,8
Q7.2. Overall rating of the SRL module implementation.	0	0	2%	18%	80%	1,8
Q7.3. Overall rating of the SRL module content.	0	0	0	4%	96%	1,95
Q7.4. Overall rating of the expert solutions of the SRL assignments.	0	0	0	2%	98%	2
Q7.5. Overall rating to communicate with instructor via e-mail.	0	0	0	0	100%	2

Note: -2=strongly disagree; -1=disagree; 0=neutral; 1=agree; 2=strongly agree, and M= mean value at Likert scales.

A selection of student reflections regarding SRL implementation

All students expressed their positive attitudes and emotions related to the SRL module in Optics. Analyzing the contents of student reflections, it can be concluded that the students estimated that the SRL module in Optics was more effective than traditional implementation of the first Optics module. Several typical students' reflections are as following:

> *I: My opinion is that this is the best learning method that I met during my study. Firstly I was independent to create a way to get something to learn, how I can train or measure without fear that it will not accept my instructor. I like this teaching-learning approach that gives me an opportunity to compare my work with my peers and with my instructor as an expert.*

II. When it happened that my solution to the same assignment was almost the same as solutions of my peers and my instructor, I felt happy and satisfied that I've done something good.
III. I would like to recommend this learning method as SRL is to my other instructors. It is important that I can participate like scientist with a full freedom to look how I will find a way to solve my assignment. Especially, I like very much to do some experiments with material that I have around me.

Students' satisfactions are visible from presented reflections related to the SRL Optics module implementation. It is important to emphasize that all students who participated in SRL passed second exam what had never been a case for generations before SRL implementation with physics students in Optics course. It brought almost 100% of doing well exam results and confirmed the SRL module in Optics as a successful one.

The students stated in their reflections that learning experiences were new ones that they had never had before. They highlighted the importance to be more actively involved in the learning process and they liked such approach to be more self-motivated and assured in assignment preparation with lesser amount of negative thoughts on how it will be evaluated by instructor.

Nevertheless, both the students and instructor considered that group work was not completely successful enough. It was due to the students' lack of knowledge and experience on group teaching-learning practice. The group work should be under instructor's revision for future SRL implementation into all six SRL steps in the practice of its procedures mentioned above. 98% of the students considered that the SRL Optics module implementation as very useful one and desirable in other physics study courses. The students gave the highest score for each expert solution that they found as completely helpful to learn always something new related to different contexts (solution structure, motivation to search the learning materials, critical thinking, knowledge application, knowledge integration, ...).

According to time management in Optics course, the 85% of students suggested that future Optics course implementation should be all as SRL. The students found themselves highly motivated to learn and to prepare experiments on their own rather then in a traditional course implementation. In addition to above, physics students brought up issues related to lack of material needed to construct experimental setups for more in-class activities.

Conclusion

Self-regulated learning is a very useful teaching-learning approach because it gives an occasion to prepare learners for life-long learning and better learning outcomes. It brings to the instructors and students an opportunity to increase students'

interest in the learning subject matters, and higher motivation to learn on their own guided by the instructors. At the same time, the SRL as teaching-learning method can increase students' active learning in and out of classroom learning environment, preparing the students to be more successful individuals during university study and after their graduation. Instructors can make an accurate picture of each student achievement and improvement in courses' content knowledge and learning outcomes.

Among the students' reflections is found a confirmation that students had an opportunity to evaluate own contribution and points of their weakness in the understanding of some learning contents.

The analysis of the SRL Optics module data shows that the physics students considered their Optics course arrangement as one of possibilities to ensure more effective teaching and learning.

From the above, it can be summarized that the physics students see the SRL Optics course module positively as an important way to develop their personal goals to be well prepared as self-regulated learners, orientated to take own responsibility to gain knowledge and skills by "controlling their motivation and emotion" to meet their interests, learning strategies and more effective learning process outcomes (Wolters & Rosenthal, 2000). The students' motivation and affect can be thing of student "goal orientation (purpose for doing task), self-efficacy (judgments of competence to perform a task) perceptions of task difficulty, task value beliefs (beliefs about the importance, utility, and relevance of the task), and personal interest in the task (liking of content area, domain) " (Pintrich, 2004).

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References

Bolhuis, S. & Voeten, M. J. M. (2001). Toward self-directed learning in secondary schools: what do teachers do? *Teaching and Teacher Education*, *17*(7), 837-855.

Bologna Process-European Higher Education Area (2010). Lifelong Learning. Retrieved September 22, 2014 at http://www.ehea.info/article-details.aspx?ArticleId=14.

Pintrich, P. R. (2004). A Conceptual Framework for Assessing Motivation and Self-Regulated Learning in College Students. *Educational Psychology Review, 16* (4), 385-407.

Wolters, C. A., & Rosenthal, H. (2000). The relation between students' motivational beliefs and their use of motivational regulation strategies. *International Journal of Educational Research, 33*(7), 801-820.

Zimmerman, B. J. (2000). Self-efficacy: an essential motive to learn. *Contemporary Educational Psychology*, *25*, 82-91.

Zimmerman, B. J. (2002). Becoming a Self-Regulated Learner: An Overview. *Theory into Practice*, 41(2), 64-70.

Zimmerman, B. J. (2008). Investigating self-regulation and motivation: historical background, methodological developments, and future prospects. *American Educational Research Journal*, *45*(1), 166-183.

Сажетак: Саморегулисано учење (СРУ), нова форма наставне праксе која ангажује и студенте и њихове наставнике, је имплементирана у курс ооптике на основним студијама на државном универзитету у Босни и Херцеговини. Две групе студената су учествовале у новом окружењу за учење које је први пут организовано према силабусу оптичког курса. У истраживању су учествовали студенти СРУ друге године студија у току две студијске године (2012-2013 и 2013-2014), за време летњег семестра. Оптички курс је структурисан у два модула. Садржај првог модула, који је састављен од неколико главних тема из геометријске оптике, реализован је по стандардној наставној методи. Након тога је организован испит ради евалуације исхода учења студената. После такве традиционалне наставне праксе, мање од 30% студената је прошло први испит. Други оптички модул је био организован као саморегулисано учење студената, које се састојало од два експериментална задатка из геометријске оптике и три оптичка задатка користећи комбиновани приступ, теоријски, експериментални и решавање проблема, у циљу налажења аналитичких и експерименталних решења. Студенти су замољени да користе различите материјале за учење самостално и у комуникацији са својим наставницима путем Moodle платформе за е-учење. СРУ доноси много користи студентима и њиховим наставницима, повећава интересовања студената за студијски предмет, посебно за дизајнирање hands-on експеримената и аналитичких решења, који су засновани на знању и интеграцији физике, математике и компјутерским наукама. СРУ учење је показало да је 95% студената прошло свој други испит углавном са највишим оценама што открива њихову сатисфакцију у примени СРУ и показује велики ентузијазам у представљању њихових оригиналних доприноса.

Кључне речи: исходи учења, модулски курс оптике, саморегулисано учење.

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ANALYSIS OF THE EFFECTS OF A SPECIFIC E-LEARNING MODEL IMPLEMENTATION ON A PROGRAMMING COURSE

Summary: This paper analyzes the effectiveness of the phase model - 5 Steps in e-learning over the Internet applied to a group of students of mathematics who followed the elective course Programming 2. The course goal was to teach students object-oriented programming in C #. The aim of our research was to verify the proposed model in practice and to explore whether there are differences in the behavior, way of learning, achievements and motivation in two parallel groups of students, one of which was classically taught in the classroom, and the other over the Internet course. The applied phase model has demonstrated its strengths and weaknesses and provided justification for its use, which opens the way for further research of its application to other target groups and subjects.
Key words: e-learning, Internet, phase model, object-oriented programming C#, efficient learning

1. Introduction

The students nowadays expect lectures to be presented with the modern means of education, which rely on the ubiquitous communication technology. "*Our common future depends on releasing [young people's] potential. ... We cannot predict what's ahead, but we know that tomorrow's world will be complex and fast-changing, and that there will be major challenges ahead.*" [10]. How do we prepare young people for challenges in business and life? E-learning might be one of the answers. To advance the effectiveness of the learning process, a five phase model was developed [9]. In this paper is presented an teaching experiment, performed in an undergraduate course on object oriented programming. The course was delivered in the traditional way, and also as an E-course using the five phase model, to two groups of studets. The students' progress and effects of the course were observed, analyzed and compared between the two groups. Comparison results, as well as our experiences and remarks are presented.

2. Experiment location

The experiment was performed at the Faculty of Sciences, Department of Mathematics and Informatics, during the summer semester of the school year 2012/2013. The elective course *Programming 2*, available to the undergraduate students of the first, second and third year, was chosen for this experiment. An equivalent E-course was created, based on the traditional course, using the same teaching materials, textbook and additional references. The E-course was deployed on the Moodle LCMS ver 1.9 at the Department, and it was available from January 2013 until October 2013. The students were divided into two groups, the control group that was taught in a traditional way in the classroom, and the experimental group, that took the E-course.

3. Research goal

The goal of our research was to assess performance of the five phase model in practice, and to evaluate its effectiveness when applied to an undergraduate course at the university.

4. Participants

There were a total of 72 students who took the course Programming 2. The experimental group consisted of 21 students who voluntarily chose to take the E-course. The control group (C group) consisted of 51 students, who took the traditional course in the classroom. The sample was appropriate.

5. Setting

The course *Programming 2* was delivered in 10 lectures during the semester. The control group attended 2 lecture classes and 2 exercise classes per week. The lectures were delivered by the professor, who used a computer and a projector to present the material, carry out examples and take down notes, which were later uploaded on a file storage accessible to the students. References to additional reading [7], [8] were mentioned where appropriate. The students were expected to take their own notes and participate in discussions at the end of each lecture. During the in-class exercises, which were supervised by a teaching assistant, the students were given exercises for individual work. Homework was also assigned, and bonus points were rewarded to students who completed it correctly and in time. The professor and the teaching assistant were available for consultation during scheduled office hours. The students could also use e-mail to either schedule individual consultation or ask questions.

The experimental group attended the course on Moodle. The course was divided in 10 topics, corresponding to the 10 lectures presented to the control group. Each week a new topic was published, which contained learning materials, a test, homework, discussion forum and a glossary. The learning materials consisted of text with examples and instructional videos, which were recorded and posted to YouTube specifically for the course [6]. The students were instructed to read the materials, watch the videos and run the provided examples. Instead of in-class exercises, homework was assigned, with two weeks deadline. Besides office hours and e-mail, the experimental group could also use instant messaging and videoconferencing software to talk to the professor and the teaching assistant.

Class attendance was registered for the control group. The experimental group's access to the Moodle course was automatically recorded by the system.

6. The five phase model

Stemming from the extensive teaching experience of the first author, gained through development and delivery of numerous professional development online courses for school teachers, traditional classes and classes on the Internet, the five phase model was established. It consists of the following phases:

- Preparation
- Motivation
- Guidance
- Discovery
- Independent work on a project

The basic idea behind the model is to deliver the course to the students, building their skill and self-confidence, while gradually reducing the amount of guidance and insisting on self-study. By the end of the course, the students should be able to independently carry out a small scale project. This way, the important ability for autonomous learning is developed.

The course Programming 2 was divided into ten lectures, based on books [3] and [4]. The first four lectures covered procedural programming and are at the beginner's level. They were followed by five intermediate level lectures, covering data structures, object oriented programming, files and graphics. The final lecture built upon the previous topics, and also instructed how to build and use class libraries. Instructor interpretation of content was provided throughout the course.

Preparatory phase took place at the beginning of the course. The students were informed on course goals, the two delivery modalities offered, the deadlines and the grading method. Each student then enrolled either the control group or the experimental group. The control group then proceeded with the classical course in the classroom.

The experimental group attended the course online on Moodle, based on the five phase model. The students were motivated with an oral presentation in class and a motivational text on Moodle:

"*In the video [2] you will see various famous and successful people, who all have had computers since childhood and learned to program back then. Do not be afraid, they were not born geniuses. Their first programs were simple too. But we want to show you that programming is a very useful skill, because it teaches you to think and to really understand what is going on inside the computer. Most computer users today are but consumers of content made by someone else. Children are conditioned to persistently download and install new apps, expecting each new app to be better and more fun than the last one. At that, they are not developing any useful skills and the only benefit goes to app vendors and marketing agencies whose ads overwhelm us from the free apps. On the other hand, the real feeling of achievement comes from writing your own program. Then you begin trying to make it better, nicer, more complex and so you become a creator rather than consumer. You have a chance to be content creators, or at least to learn to evaluate the quality of programs you encounter. Man is free is he has a choice. To have a choice, he must be able to compare."*

The remaining three phases continued during the run of the course. The guided phase encompassed the first five lectures. Learning materials were delivered wholly, including text, code samples, comments, references to textbooks, links to instructional videos, completed examples and independent online resources. Additional comments by the professor were also included.

The following four lectures were presented during the discovery phase. The amount of given materials was reduced, and the students were instructed to autonomously discover the information needed to complete the assigned homework. The professor and the teaching assistant were available for discussion, comments and guidance, but only on request from the students.

In the last lecture, the students were assigned several small-scale projects, which they worked on either individually or in small groups. Two weeks deadline was imposed for the project completion.

At the end of each lecture, a short test was given, the aim of which was to prepare the students for midterm exams and the final exam. There were a total of 10 tests.

7. Survey

Initial course survey was conducted in the first class, before the students were divided into groups. The main goal of the survey was to determine the students' motives for and against joining the experimental group. Out of 72 students, 51 responded to the survey.

The terms "online learning", "virtual classroom" "mobile learning" and "hybrid learning" were known to 26, 8, 2 and 1 students respectively. Only four students

have previously attended any course on the Internet. Their observations are interesting: "(The course was) interesting, but not entirely practical. That, of course, depends on how well the online course is prepared and presented", "My experience was mostly positive, but the teacher-student relationship was lacking, and the relaxed atmosphere from the classroom was not there", "Courses (I attended) were usually given for the first time and not very well organized".

The students accessed online learning resources from home (29 students), from student accommodation (8 students) and from the university campus (2 students).

The students' reasons not to participate in the experimental group are of great importance, as they can indicate weaknesses of online learning, as well as students' opinions, beliefs and possible misconceptions regarding this mode of learning. The multiple choice question "I do not wish to attend the online course Programming 2 because…" yielded the following answers:

1. I feel that I will learn better in traditional classes (38%)
2. Face to face contact with teacher is better (29%)
3. This way, I am learning in class (27%)
4. I am afraid I will not understand online material (23%)
5. Attending the online course will not help me pass the exam easier (20%)
6. I never attended an online course and do not know what it is like (17%)
7. I feel that I will need to invest more effort into following the online course (11%)
8. I do not want to spend too much time in front of a computer (8%)
9. I do not have a computer / internet access (5%)
10. Other answers, such as: "attending in-class exercises is easier", "I can manage my time better with a classical course", "I do not like webcams".

Survey results suggest that the students are not familiar enough with e-learning and its benefits. Some of them may have the fear of the unknown and/or exhibit a certain lack of confidence, which may prompt them to choose the proven path and take the classical course. However, their doubts about online courses are not entirely ungrounded. A participant in an online course is entirely dependent on the materials delivered by the teacher, and on the teacher's timely responses to queries. The responsibility of the teacher is clearly greater in the online course than in the classroom, as the lack of effort on the teacher's part affects all participants and can have a significant impact on the outcome of the course.

8. Testing

Both groups' knowledge was assessed during the run of the course. The experimental group was given graded tests and homework. The control group was graded during in-class exercises and with extra credit assignments. Final tests for both groups

were the same: three compulsory midterm exams (after the fourth, seventh and tenth lecture) and a final exam. Results are shown in Table 1.

Table 1*: Comparison of grade average scores after the midterm exams*

Group	Midterm 1 (max 17 points)	Midterm 2 (max 25 points)	Midterm 3 (max 25 points)
Control	**11.63**	**20.51**	**12.84**
Experimental	**13.33**	**22.33**	**15.41**

We discussed the midterm exams with both groups. The experimental group found the tests and homework useful in preparations for the midterm exams. Most of the control group did the extra credit assignments before the first and second midterm exams. However, they did not invest the same effort preparing for the third midterm exam, as the end of the semester was approaching and they had to study for other final exams.

9. Analysis of achievement

Out of 51 students in the control group, 48 actively attended the classes, and 39 passed the final exam at the end of the semester. Out of 21 students in the experimental group, 18 actively participated in the online course, and 17 passed the final exam at the end of the semester.

Comparison of students' grade average scores in Programming 1 and Programming 2 shows that both groups had approximately the same score in Programming 1, but the experimental group performed better in Programming 2 (Table 2).

Table 2*:* Comparison of grade average scores between groups

Grade average	Programming 1	Programming 2
Experimental group	**8,28**	**8,47**
Control group	**8,30**	**7,60**

10. Communication with the students

There were several means of communication at disposal during the course: discussion forums, Moodle messaging, instant messaging and videoconferencing programs. Web conferences were also planned, but this idea was not realized due to lack of motivation and poor technical conditions on the part of the students. Teacher-student communication was infrequent in general.

The bulk of the communication took place in the off-topic forum, despite it being advertised as "a place to discuss anything except the course". The students perceived this forum as less binding and used it to ask questions about the organization of the course such as homework deadlines, exam dates and grades. It does not surprise that this forum was visited nearly ten times more often than on-topic forums. The professor prepared the glossary with more than 200 terms. However, when the professor started a discussion asking the students to add new terms, there were no comments from the students and no new words were added.

Table 3*:* Number of access of course activity

Activity	Accesses
On-topic forums	**109**
Off-topic forum	**967**
Course rules	**79**
Chat room	**44**
Glossary	**532**

On-topic forums for lectures 1, 7 and 8 contained only one topic, posted by the professor: "Is there anything in the learning materials that needs to be explained?". The students' replies were scarce, and besides one question about homework, all agreed that the materials were comprehensible. One student asked for permission to attend the lectures in classroom, besides the online course. There was some student activity in the forums for lectures 2 and 3. Discussions were started about the material, test and homework. However, there were no other students' replies. Nothing was posted in forums for lectures 4, 5, 6, 9 and 10 and our impression was that the students gave up on participating in forums. In direct talk with the students we learned that they did indeed communicate, but avoided the forums on Moodle and used other social networks or telephone instead. It is worth noting that active students, who actively participated in forums, scored 9 or 10 in the final test.

11. Course evaluation

A questionnaire was handed out at the end of the course obtain the students' own perception of the programming course they completed. Respondents were asked to use a five-point Likert scale to express their opinions on a number of statements pertaining to the course. We noticed that the experimental group showed a higher level of satisfaction than the control group. This is a remarkable result, considering the fact that courses in programming are generally considered difficult and have low completion rates. Students of mathematics encounter many difficulties while learning how to program [5].

Table 4: *Course evaluation*

	Experi-mental group	Control group
Course topics are well chosen and designed	**4,29**	**3,74**
Learning materials are clear and well prepared	**3,93**	**3,58**
Additional reading materials are well chosen and appropriate	**4,07**	**3,16**
Course contents encourage communication between students	**4,07**	**3,47**
The pace and depth of learning are appropriate	**4,36**	**3,66**
Teacher-student relationship motivates learning	**4,43**	**3,92**
Course goals are clearly defined / known to me from the beginning	**4,43**	**3,87**
Exercises are fairly graded	**4,57**	**4,29**
Grading criteria are clearly defined and consistent throughout the course	**4,21**	**3,82**
Students have a clear and continuous access to their achievement results	**4,71**	**4,29**
Course plan is extensive and demanding	**3,29**	**3,63**
The quality of the course is high	**4,43**	**3,89**
The course fulfilled my expectations	**4,21**	**3,68**
Rate the course overall	**4,29**	**3,89**

12. Main observations

For most of the students who participated in our experiment, this was the first encounter with computer programming and especially object-oriented programming, aside from the compulsory course Programming 1, which was taught on MatLab.

Both groups were taught the exact same course, based on the same materials. The modes of teaching delivery and teacher-student communication were different between the two groups.

The students may have an impression that it is easier to attend the course in classroom, because it does not take a lot of effort to passively watch the teacher deliver the materials and demonstrate the examples. However, course at the university level are difficult and the exams cannot be passed in this way.

The students are not familiar with online courses. They are reluctant to give up the traditional approach to learning for the unknown one, because they fear that they may be less successful.

A relatively small number of students volunteered for the online course. They had special interest in programming and / or greater self confidence.

The materials on Moodle were accessed more often in the beginning of the course, and the number of accesses declined towards the end of the course. The number of completed tests and homework assignments also declined towards the end of the course. This can be attributed to the students becoming more proficient with Moodle and to the increasing number of distractions, such as midterm exams in other subjects.

Teachers have great responsibility in the establishment of online communication with the students, as well as in the preparation and delivery of the online courses. Errors are easily corrected in face to face communication. However, the students may download the electronic materials only once and never check back for updated or corrected versions.

There was a communication between the students from the two groups. Electronic learning materials were sought after and passed on.

The students in the experimental group were satisfied with the online course, from the technical viewpoint as well as from the pedagogical and methodical viewpoint. Survey ratings support this conclusion.

Students are shy and reluctant to ask questions or start discussions about the course. This applies to both groups of students. There were very few forum posts by the students, and the teacher-student communication in the classroom was but nonexistent. It is obvious that this problems needs to be further examined and addressed in the future.

13. Conclusions

The results of our experiment confirm that e-learning using the five phase model is feasible and at least as successful, if not better, as the traditional way of teaching and learning. Student motivation and encouragement for self study and communication still need to be addressed. Building confidence and self-esteem in students is one of the ultimate goals of every successful teacher, and the technology can be employed to this end.

The students rated the online course better than the traditional one. However, considering the small sample, there is a need for further research.

References

[1] Herceg, Đ., Todorić, D. (2013): *Preparation of Teaching Materials for a C# Course*, Proceedings of the International Conference of Information Technology and Development of Education ITRO 2013, Technical Faculty “Mihajlo Pupin”, Zrenjanin, pp. 412-416

[2] Đ. Herceg (2013): *Zašto da naučim da programiram?,* Blog: http://djordjeherceg.wordpress.com/2013/03/03/zasto-da-naucim-da-programiram/, posećen 3.3.2013.
[3] J. Sharp, J. Jagger (2008): *Microsoft Visual C#.NET Step by Step*, Microsoft Press, Redmond, Washington
[4] J. Sharp, J. Jagger (2009): *Microsoft Visual C#.NET korak po korak*, CET, Beograd.
[5] Todorić, D., Herceg, Đ. (2011): *Teaching Introductory Programming in C# and Small Basic*, Proceedings of the International Conference of Information Technology and Development of Education ITRO 2011, Technical Faculty "Mihajlo Pupin", Zrenjanin, pp. 124-129
[6] YouTube, http://www.youtube.com/channel/UCh28UJxUjI9Dy_PP8xhKYng (accessed September 2014).
[7] J. Sharp (2012): *Microsoft Visual C# 2012 Step by Step*, O'Reilly Media, Inc.
[8] Microsoft: *Mala škola programiranja u C#*, (accessed May 2013) http://www.microsoftsrb.rs/download/obrazovanje/pil/Mala_skola_programiranja_Csharp.pdf
[9] Petrović M., Egić B. (2012): *Online Teacher Education – Example, Research, Observations*, in proceedings from International conference on Applied Internet and Information Technologies-ICAIIT, University of Novi Sad, Technical faculty „Mihajlo Pupin", Zrenjanin, 26. October 2012, (pp. 149-154), ISBN 978-86-7672-188-7
[10] Ighodaro C. (2011): *Partnering With Microsoft to Transform Education in Africa*, British Council , November 2011, link posećen 01.09.2012, preuzeto sa linka: http://blogs.technet.com/b/microsoft_on_the_issues_africa/archive/2011/11/08/partnering-with-microsoft-to-transform-education-in-africa.aspx

Сажетак: Рад се бави анализом ефикасности примене фазног модела – *5 Корака* за е-учење преко Интернета примењеног на групу студената математике који су пратили изборни предмет Програмирање 2. Овај предмет има за циљ да научи студенте објектно-орјентисаном програмирању у програмском језику C#. Циљ је био проверити предложени модел у пракси и истражити да ли постоје разлике у понашању, начину рада, постигнутим резултатима и у мотивацији код две паралелне групе студената, од којих је једна радила класично у учионици, а друга преко Интернет курса. Примењени фазни модел је показао своје предности и слабости као и да постоји оправдање за његову примену чиме се отвара простор за даља истраживања у циљу његове примене на друге циљне групе и предмете.
Кључне речи: е-учење, Интернет, фазни модел, објектно-оријентисано програмирање C#, ефикасно учење

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CORRELATION ANALYSIS OF THE PROGRAM CONTENT OF MECHANICS AND THERMODYNAMICS BY PHYSICS STUDENTS

Abstract: One of the important issues of methodology of teaching is linking knowledge and the formation of knowledge in different subjects. In which manner the students will possess the interrelated concepts and knowledge depends on whether the nature of the content of teaching and the concept of the learning process enable connectivity, systematization of knowledge, i.e. the formation of students' knowledge system (Antonijević, 2006). The establishment of the "pyramid of concepts", or spotting and highlighting the causal relationship between concepts and phenomena directly affect on the quantum and quality of knowledge.
The aim of this paper is to examine the perception of physics students on recognizing the degree of connection between the subject of Mechanics and Thermodynamics. These subjects are taught to the first year of undergraduate study of physics in the first and second semester. Tendency of this study was to examine the extent to which students perceive connections between subjects, as well as to gain insights do they know how to recognize the causal links between them.
The sample consisted of 2nd year undergraduate students of Physics, of the Faculty of Sciences, University of Novi Sad (generation of 2009/10, 2010/11) who passed both subjects. The sample consists of 136 students.
Keywords: perception, student of physics, connections between subjects, "pyramid of concepts"

Introduction

The aim of the modern institutional education and teaching as its primary organized form is the formation of a complete and logically consistent system of knowledge and concepts among students, as well as the outcomes of the educational process in the classroom (Antonijević, 2006/a). The extent to which the student will possess the knowledge and interrelated concepts depends on whether the nature of the content of the teaching and learning process concept enables connec-

tivity systematization of knowledge and formation of students' knowledge systems (Antonijević, 2006/b). The literature (Maresić, 2009) alleges that teaching of natural sciences subjects together and coherently contribute to the development of students' competence in the field of natural sciences and mathematics. Analysis of the content of the curriculum and textbooks confirm compliance among subjects in the field of natural sciences and mathematics (Antonijević, 2006/b). In the study (Antonijević, 2006/b), was find the correlation between mathematical knowledge, concepts and operations and teaching biology for fifth grade. However, despite the fact that according to the analysis of the content of the curriculum and the textbook shows the correlation between subjects, students often do not notice. On the nature and levels of knowledge in the content of teaching and the curriculum, textbooks and teaching process is directly dependent on the scope and depth of knowledge that the students possess, as well as the links and correlation between the students' knowledge established. The pursuit of the educational system is that pupil / student is able to "perceive" the whole study of a science at a given level, and is able to classify and compare the concepts according to the degree of generality. Systematization of knowledge and underlinig special and individual knowledge under general builds "pyramid of concepts". Establishing a "pyramid of concepts", ie identifying and highlighting the causal correlation between concepts and phenomena directly affect kvanutum and quality of knowledge (Antonijević, 2006/b). The aim of this paper was to investigate the perception of physics students about recognizing the degree of connection between the subject of Mechanics and Thermodynamics.

Methodology

The subject and the research problem is to examine the perception of physics students about recognizing the degree of correlation between the subject of Mechanics and Thermodynamics. According to the literature (Antonijević, 2006 / v), there are three segments in the line of dependence and interdependence of knowledge in the classroom, and connect knowledge in the classroom. The first segment represents the theoretical concepts of teaching, the second segment consists of the curriculum and textbooks, and the third segment is the teaching process. Within these three segments realization of educational is determined and immediate realized within the underlying correlation teaching material, ie linking knowledge. In this study including all three segments.

The aim of the research is to examine the perception of physics students about recognizing the degree of correlation the subject of Mechanics and Thermodynamics. Both subjects were listen into the first year of undergraduate studies, Mechanics in the first semester and Thermodynamics in the second semester. The pursuit of this paper is to examine the extent to which students perceive correlation between objects, and to see that you know how to recognize the causal link between the given objects.

Research tasks

1. Content analysis to determine whether there is a correlation between the subjects.
2. Determination of students perceive about the correlation between program content of Mechanics and Thermodynamics.
3. Determination if the score in Mechanics affect to students perceive of connection between program content.
4. Determination if different types of energy affect on the understanding of the concepts in Thermodynamics.
5. Determination if understanding of the law of conservation and collisions has impact on the understanding of the laws of Thermodynamics.

Research hypotheses

1. Content analysis will show the correlation between the subjects.
2. 2. The majority of students sees correlation between the subjects.
3. There is a dependence on the concluding score of the Mechanics and perceptions of students about the correlation between the subjects. Students who are more conclusive assessment of Mechanics recognizes the clear correlation between the subjects.
4. The majority of students recognizes correlation of the adopted terms of different types of energy and understanding of the concepts of Thermodynamics.
5. The majority of students recognizes the dependence of understanding of the law of conservation of collision and impact on the understanding of the laws of Thermodynamics.

Techniques, tools and methods of research

This study were used the two techniques: the first theoretical analysis of the content of the second survey physics students. The first technique is an analysis of the content of the curriculum Mechanics and Thermodynamics, while the second techniques used to assess students' opinions about the physical connection between the cases.

For statistical analysis we used factor analysis of variance, Chi- square test and descriptive statistics. Data were analyzed and presented using Statistics and Exel.

The research sample

The sample consisted of 136 undergraduate students of physics on the second year at the Faculty of Sciences, University of Novi Sad (generation of 2009/10, 2010/11) who passed both subjects.

Results

Theoretical analysis of the content of the curriculum Mechanics and Thermodynamics

Subjects Mechanics and Thermodynamics of the curricula of the Faculty of Sciences, University of Novi Sad compulsory subjects for all study groups on the Department of Physics. Subjects can listen to the first year of undergraduate studies. The curriculum of subjects Mechanics are taking place in the first semester, while teaching contents of the subject Thermodynamics planned for the second semester. Programme content objects Mechanics and Thermodynamics are conducted within the theoretical and practical classes. Theoretical study of both subjects is carried out with the weekly pool of three hours, while the practical classes are conducted through calculational and experimental exercises. Within experimental exercises, students practice verified physical principles and improve their manual skills, while within the calculational exercises deal theoretical examples.

The aim of the subject of Mechanics is the study of the physical principles that describe the movement of the macro physical body. Areas included program content Mechanics are: kinematics and dynamics of a material point, Newton's laws, Galileo's principle of relativity, rotational motion, noninertial coordinate system (the effect of rotation of the Earth on the movement of the body), the laws of conservation of nature (work, energy, collisions), static and dynamics of rigid bodies, rotation of the body about the free axis, gravity, the theory of relativity, vibrations and sound basis and fluid Mechanics . The outcome of this case means that the student after completion of the learning content of the course students should have developed:

- General skills: Student's osposobnjen that properly performed experimental exercises and to process the results of experimental exercises in physics and to solve calculational tasks.
- Subject-specific skills: the successful mastering of this course students acquire knowledge of the basic physical principles of Mechanics , oscillations and waves.

The aim of Thermodynamics is to introduce and describe the thermal properties of matter, the concept of temperature and heat transfer in gaseous systems multitude of molecules and the basic laws of Thermodynamics and statistical physics. Outcome of the course is that after the completion of the learning content of the course students should have developed:

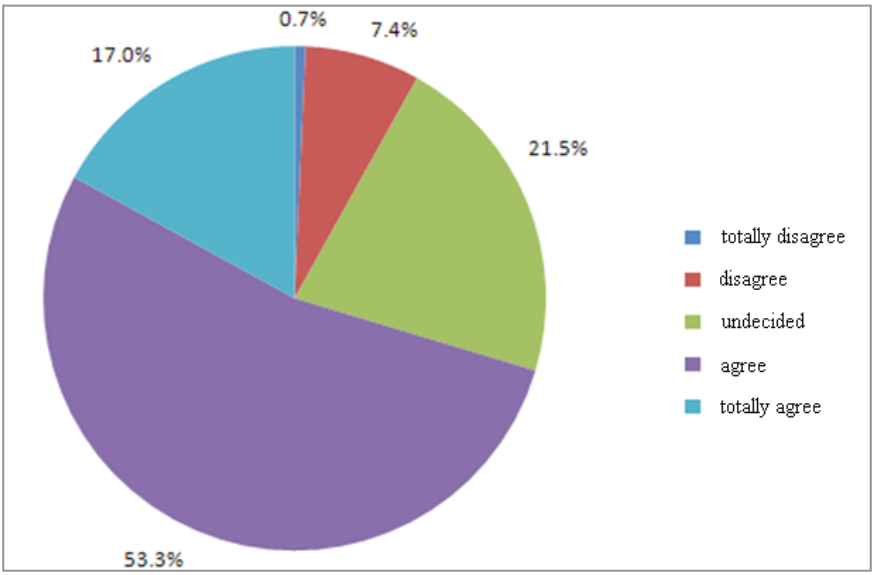
- General skills: Proper presentation of experimental exercises and analysis of results. Solving calculational problems.
- Subject-specific skills: Acquiring knowledge about the basic concepts of Thermodynamics, temperature and heat, the mechanism of heat exchange, work and heat machines, the concept of entropy, system of a large number of particles and the difference between the ideal and real gases. Adopted

curriculum should be the basis for understanding the higher courses of physics, energy and condensed matter physics.

According to a content analysis of the subjects is shown that there is a correlation between the subjects. The examples of correlation between subject are: the definition of work, the law of conservation of energy, collisions, power and others. Work in Mechanics is defined as a product distance traveled bodies and forces that cause movement. In the Thermodynamics, the force, ie operation is defined via the pressure applied to a given fluid. The laws of conservation of energy in Mechanics can be defined for bodies suffer a change in position while the legality of Thermodynamics data can be expressed by the first law of Thermodynamics. Defining the elastic and inelastic collision Mechanics can be used in comparative concept of the kinetic theory of gases and Thermodynamics of the definitions of ideal and real gases. Definition of forces in Mechanics can be used to define the power heaters. This correlation is demonstrated through correlation of related concepts and operations. Based on the content analysis confirmed the initial hypothesis that there is a correlation between the subjects. So, it follows a logical sequence of vertical integration of knowledge, which is consistent with the existing "knowledge pyramid" and building on the same.

Perceptions of students about the correlation between the subjects

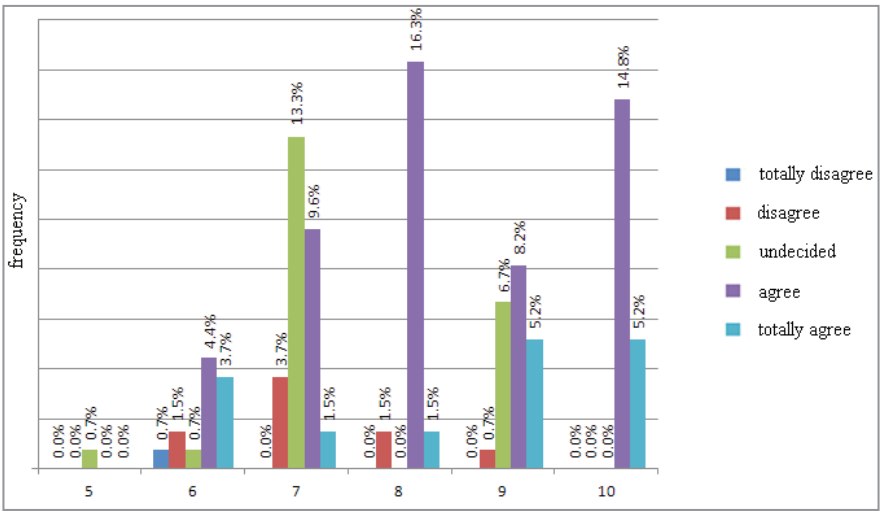
The graph 1 shows the perceptions of students about the connection of teaching content Mechanics and Thermodynamics.



Graph 1. Perception of correlation between programs of Mechanics and Thermodynamics

As shown in graph 1, about 53% of the respondents agreed that knowledge of Mechanics affects the understanding of the content of Thermodynamics, 17% are in full agreement, approximately 22% are undecided in their assessment of the evidence, while 7% did not agree with the aforementioned. Based on the obtained reveals that about 70% of the respondents in accordance with the statement of the knowledge and skills of Mechanics affects the understanding of the content of Thermodynamics. The resulting finding is in agreement with the initial hypothesis that the majority of students sees correlation between the subjects.

The histogram 1 shows the dependence of the concluding assessment of the Mechanics and perceptions of students about the correlation between the subjects.

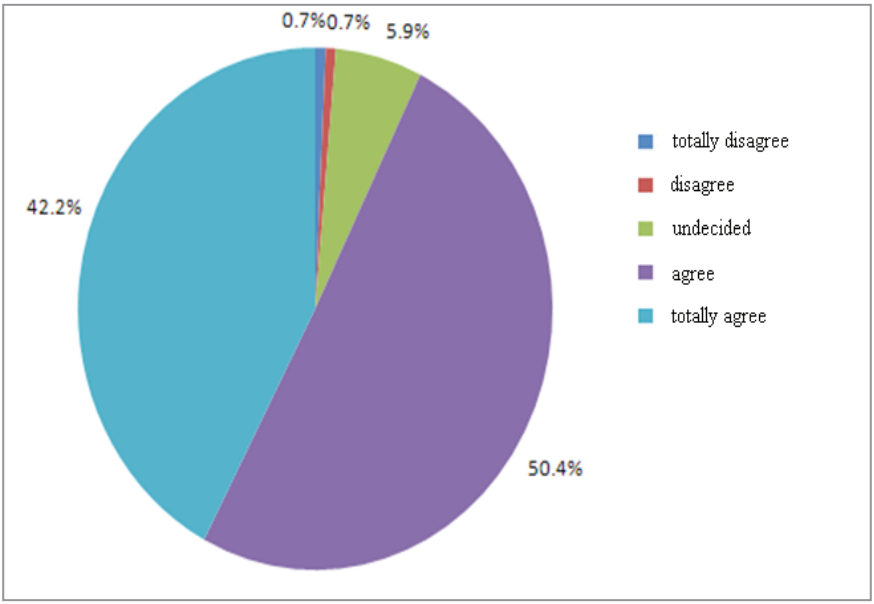


Histogram 1. Impact of concluding score of the Mechanics of the perception of students about the correlation between the subjects

As theChi- square test showed that the p-value of $p = 0.0000 < 0.05$ do not reject the null hypothesis of independence of characteristics "score Mechanics " and "correlation between the programs of Mechanics and Thermodynamics", but notes that there is a correlation between these characteristics.

Based on the descriptive statistics reveals that the percentage of students who recognize the correlation program content Mechanics and Thermodynamics increases with the concluding score of the Mechanics . It is interesting that a certain percentage of students who, as a concluding assessment of the Mechanics have seven (7) was hesitant in saying that there is a correlation between subject content. Based on the obtained results it can be argue that confirmed the initial hypothesis that there is a dependence on the concluding score of the Mechanics and perceptions of students about the correlation between the subjects.

The graph 2 presents the impact of the adopted terms of different types of energy on understanding the concepts of Thermodynamics.

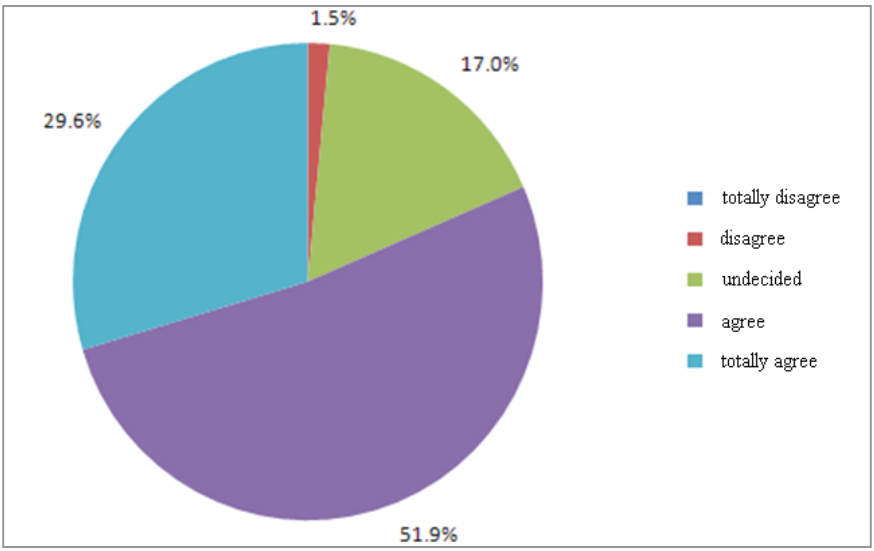


Graph 2 . Adopted terms of different types of energy affect the understanding of the concepts of Thermodynamics

As shown on the graph 2, about 50% of students surveyed agreed with the statement that the adopted terms of different types of energy affect the understanding of relevant concepts from Thermodynamics, while about 42% is entirely consistent with the testimony given, and only about 6% of the undecided. So, over 90% of respondents sees a clear correlation the definition of different types of energy in Mechanics and their application in analog Thermodynamics. As an example of a clear connection can be specified defining work that is performed on an ideal gas. Based on the obtained results showed that students of physics observed correlation concepts of energy and concepts of Thermodynamics. The resulting finding is in agreement with the initial hypothesis that the majority of students recognizes correlation of the adopted concepts of different types of energy and understanding of the concepts of Thermodynamics.

In this study, it is also obtained that students who are in agreement with the statement that the adopted terms of different types of of energy as part of the programming Mechanics affect the understanding of relevant concepts of Thermodynamics are in agreement that the knowledge and skills of Mechanics affects the understanding of the content of the Thermodynamics ($p < 0.05$).

The graph 3 is the effect of understanding the law of conservation and impact on the understanding of the laws of Thermodynamics.



Graph 3. Understanding the law of conservation of collision and impact on the understanding of the laws of Thermodynamics

As shown on the graph 3, over 50% of students surveyed agreed with the statement that understanding the law of conservation of the collision affects the understanding of the laws of Thermodynamics, about 30% are in full agreement, and 17% were undecided. It is interesting that no student has not chose for a category that is not fully agree with the above statement. So, over 80% of respondents recognized that the understanding of the conservation law and of the concepts of elastic and inelastic collisions of particular importance for the understanding of the laws of Thermodynamics. Based on the obtained results showed that students perceived the close correlation of physics to understand the laws of conservation of the collision and understanding the laws of Thermodynamics. The resulting finding is consistent with the initial hypothesis that the majority of students recognize that dependence understanding of the law of conservation of collision and impact on the understanding of the laws of Thermodynamics. Also was found that students who are in agreement with the statement that understanding the law of conservation and of the concepts of elastic and inelastic collisions of particular importance for the understanding of the laws of Thermodynamics in agreement that the knowledge and skills of Mechanics affects the understanding of the content of Thermodynamics ($p < 0.05$).

Conclusion

The pursuit of this study was to examine the extent to which students perceive correlation between the subjects, and to see how students perceivecausal connections and correlations between the subject. By analyzing the content of the curriculum of

physics shows that there is a direct correlations between knowledge and concepts of Mechanics and Thermodynamics. Based on the analysis of content can be considered accomplished the task of teaching Mechanics and Thermodynamics, which consists in the need for students in the learning process of adopting knowledge which should form an integral part of a complete and logically consistent system of knowledge.

The majority of students perceived that the knowledge and skills of Mechanics affects the understanding of the content of Thermodynamics. Also was found that the majority of students observed correlation definitions of different types of energy in Mechanics and their application in analog Thermodynamics. Most students agree that an understanding of the law of conservation and of the concepts of elastic and inelastic collisions of particular importance for the understanding of the laws of Thermodynamics.

Testing students' opinions about the connection between teaching content is important because in this way we get feedback on the understanding of the teaching material, the material of the "pyramid concepts" and overall cognitive development of students.

Acknowledgements: The paper was written under the project The quality of the educational system in Serbia's European perspective (No. 179010) funded by the Ministry of Education, Science and Technological Development.

References

Antonijević, R. (2006/a) Karakteristike strukture i sistema znanja u nastavi, *Didaktika i metodike*, Vol. 52, br. 7-8, str. 545-557

Antonijević, R. (2006/b): Povezanost znanja u nastavi, *Pedagogija*, Vol. LXI, br. 1, str. 71-86

Antonijević, R. (2006/v) Povezanost znanja u nastavnom programu i procesu nastave, *Didaktika i metodike*, Vol. 52, br. 3-4, str. 230-241

Maresić, I. (2009) Diplomski rad *Metodički Pristup Koreliranim Sadržajima u Prirodoslovlju*, Sveučilište u Zagrebu, Prirodoslovno-Matematički Fakultet, Fizički Odsjek, Zagreb, Voditelj diplomskog rada: Doc. Dr. sci. Darko Androić

Сажетак: Једно од важних питања методика наставе јесте повезивање знања и формирање система знања у настави. У којој мери ће ученик поседовати међусобно повезана знања и појмове, зависи од тога да ли је природом садржаја наставе и концепцијом процеса сазнавања омогућено повезивање, систематизовање знања, односно формирање система знања код ученика (Антонијевић, 2006/б). Успостављањем „пирамиде појмова", односно уочавањем и истицањем узрочно-последичних веза међу појмовима и појавама директно се утиче на квантум и квалитет знања.

Циљ овог рада јесте испитивање перцепције студената физике о уочавању степена повезаности предмета Механике и Термодинамике. Предмет Механика се слуша у првом семестру прве године основних студија, а предмет Термодинамика у другом семестру прве године основних студија. Значи, тежња рада је да се испита у којој мери студенти уочавају повезаност међу предметима, као и да ли умеју да уоче узрочно-последичне везе између датих предмета.

Узорак чине студенти II године физике основних академских студија на Природно-математичком факултету, Универзитета у Новом Саду (генерације 2009/10; 2010/11) који су положили оба предмета. Узорак броји 136 студената.
Кључне речи: перцепција, студенти физике, повезаност наставних садржаја, „пирамида појмова“

УПУТСТВО ЗА ТЕХНИЧКУ ПРИПРЕМУ РУКОПИСА

Часопис *Норма* објављује оригиналне научне, прегледне и стручне чланке, као и студије, прилоге, грађу, хронику и библиографију, из области науке о књижевности, педагогије, дидактике и методика разредне и предметне наставе, под условом да нису претходно објављени или понуђени за објављивање некој другој публикацији. Уколико је рад претходно био изложен на научном скупу у виду усменог саопштења (под истим или сличним насловом), податак о томе треба да буде дат у посебној напомени, по правилу, при дну прве странице чланка. Радови у часопису објављују се на српском или енглеском језику. Радови на српском језику биће штампани на екавском или ијекавском књижевном наречју, ћириличним, односно латиничним писмом, уколико аутор инсистира на томе. Приспели рукописи пролазе поступак анонимног рецензирања од стране два рецензента.

Рукопис би требало да буде исправан у погледу правописа, граматике и стила. Радови на српском језику, понуђени часопису *Норма,* стандардизују се у складу с измењеним и допуњеним издањем *Правописа српскога језика* Митра Пешикана, Јована Јерковића и Мата Пижурице (Нови Сад: Матица српска, 2010). Осим правописних норми, утврђених овим правописом, аутори у припреми рукописа за штампу треба да се придржавају и следећих начела за припрему текста:

Изглед и обим рада

Рукопис чланка треба да има следеће елементе: а) наслов рада, б) име и презиме аутора, назив установе у којој је аутор запослен, в) резиме, г) кључне речи, д) текст рада, ђ) литературу и изворе, е) резиме на енглеском језику, ж) прилоге. Овај редослед датих елемената уједно је и обавезујући. Радови који представљају краће прилоге, грађу, приказе и сл. поред основног текста садрже име аутора и наслов.

Наслов рада треба што верније и што прецизније да реферише о садржају рада. У интересу је аутора да користе речи прикладне за индексирање и претраживање. Уколико таквих речи у наслову нема, пожељно је да наслов прати поднаслов, који би био информативнији у погледу садржаја. Наслов треба да се налази на средини странице, обележен верзалним словима.

Име и презиме аутора штампа се изнад наслова, уз леву маргину, верзалом. Имена и презимена домаћих аутора увек се наводе у изворном облику, независно од језика рада. *Назив и седиште установе* у којој је аутор запослен наводи се испод имена и презимена аутора. Ако је аутора више, мора се назначити из које установе потиче сваки од наведених аутора. Функција и звање аутора не наводе се. Службена адреса и/или електронска адреса аутора даје се у ендноти, која је звездицом везана за презиме аутора. Ако је аутора више, даје се само адреса првог аутора. Подаци о пројекту, односно назив програма у оквиру којег је чла-

нак настао, као и назив институције која је финансирала пројекат или програм, наводе се у посебној ендноти, која је двема звездицама везана за назив установе у којој је аутор запослен.

Поред тога, почетна страна рада треба још да садржи и *резиме* и *кључне речи*. У резимеу на српском језику, који не би требало да премаши 1500 словних знакова, неопходно је укратко представити предмет истраживања, циљ, примењену методологију, као и резултате научног истраживања. Резиме дати испод наслова, с левом маргином увученом 1 cm у односу на основни текст (односно подједнако увученом као први одељак основног текста). *Кључне речи* (до десет речи) наводити испод резимеа, с истим поравнањем као и резиме. Препоручује се да се оне одреде с обзиром на терминолошке речнике датих струка, као и то да учесталост кључних речи (с обзиром на могућност лакшег претраживања) буде што већа. Осим тога, неопходно је резиме и кључне речи превести на енглески језик, на крају текста. Уколико аутор није у могућности да обезбеди коректан превод, треба да напише резиме на језику на коме је написан и рад, а уредништво *Норме* обезбедиће превод. Уколико је рад написан на страном језику, резиме и кључне речи треба превести на српски језик.

Текстови треба да буду писани фонтом Times New Roman, 12 pt, проред 1,5, с маргинама од 2 cm са сваке стране. Табеле, цртежи и дијаграми дају се као засебни документи, а у самом тексту се, римским бројевима, јасно означава место на коме ови прилози треба да се налазе. Табеле се прилажу у MS Excel формату (.xls), а цртежи и дијаграми у графичком .tif формату, резолуције 300 dpi. Читави радови (тј. основни текст рада, списак референци, резиме, кључне речи, као и *Summary* и *Key words*) не би требало да буду дужи од 30 000 словних знакова, рачунајући притом и празна места. Редакција задржава право да објави и прилоге који премашују предвиђени обим уколико то захтева поступак научне елаборације садржаја.

Навођење у основном тексту рада

а) Наслови посебних публикација (монографија, зборника, часописа, речника и сл.) који се помињу у раду штампају се курзивом на језику и писму на којем је публикација која се цитира објављена, било да је реч о оригиналу или о преводу.

б) Пожељно је цитирање према изворном тексту (оригиналу) и писму. Уколико се цитира преведени рад, треба у одговарајућој напомени навести библиографске податке о оригиналу.

в) Презимена страних аутора у тексту наводе се транскрибовано (прилагођено српском језику), сходно правилима измењеног и допуњеног издања *Правописа српскога језика*, а када се страно име први пут наведе, у загради се даје оригинални начин писања у угластој загради, нпр. Нил Гејмен [Neil Gaiman], осим уколико је име широко познато (нпр. Јан Амос Коменски), или се изворно пише исто као у српском (нпр. Цветан Тодоров).

г) Упућивање на библиографску јединицу у основном тексту рада обележава се тако што се у загради наведе презиме аутора и година издања текста који се наводи – уметнутим библиографским скраћеницама у изворном облику и писму (Lévi-Strauss 1958), (Савић 2003). Уколико се дословно наводи извор, потребно је уз референцу навести и број странице (Савић 2003: 157). Када навод захвата неколико суседних страна цитираног текста, између бројева страна ставља се примакнута црта (Rosandić 2005: 332–334). Ако се навод односи на несуседне стране, бројеви страна одвајају се зарезом (Петровић 2008: 355, 453, 461).

д) Уколико се један аутор наводи више пута, наводи се према години издања, од најстаријег ка најновијем раду. Уколико се пак наводи више издања истог аутора из исте године, уз годину се додају словне ознаке „a, b, c…“, на пример (2001a, 2001b), како у основном тексту, тако и у попису литературе.

ђ) Уколико библиографски извор има два аутора, у уметнутој библиографској напомени наводе се презимена оба аутора (Дотлић, Каменов 1996), за библиографску јединицу чији је пуни опис: Дотлић, Љубица и Емил Каменов *Књижевност у дечјем вртићу*. 1. изд. Нови Сад: Змајеве дечје игре – Одсек за педагогију Филозофског факултета, 1996.

е) Уколико пак извор има три или више аутора, у уметнутој библиографској напомени наводе се презимена прва два аутора, док се презимена осталих аутора замењују скраћеницом et al. Примера ради: Осим тога, појам „доживотног образовања“ приписује се Џону Дјуију, али овај концепт почиње се шире користити тек пошто га је преузео и популаризовао UNESCO (Düerr et al. 2002).

ж) Цитати из дела на страном језику, у зависности од функције коју имају у раду, могу се наводити на изворном језику или у преводу, с тим да одабрани начин цитирања мора се доследно примењивати.

з) Ако се у загради упућује на радове два или више аутора, податке о сваком следећем раду треба одвојити тачком са запетом, нпр. (Rosandić 2005; Николић 2009).

и) Фусноте, обележене арапским цифрама (иза правописног знака, без тачке или заграде), дају се при дну странице у којој се налази део текста на који се фуснота односи. Могу садржати мање важне детаље, допунска објашњења, коментаре на текст навода и сл. Оне саме не користе се за навођење библиографских извора цитата или парафраза датих у основном тексту, будући да томе служе упућивања на литературу у заградама.

ј) За прилоге преузете с интернета у основном тексту наводи се, осим презимена аутора, и година када је прилог преузет (Егорова 2011), док се пун библиографски опис даје у попису литературе на крају рада.

к) Уколико је реч о зборнику радова, ставља се у загради презиме аутора цитираног рада (Бариħ 1972: 124).

Цитирана литература

На крају рада даје се списак референци, који треба да обухвата само и искључиво референце наведене у тексту. Библиографске јединице (референце) наводе се по азбучном или абецедном реду презимена првог или јединог аутора како је оно наведено у парентези у тексту. Прво се описују азбучним редом презимена првог или јединог аутора радови објављени ћирилицом, а затим се описују абецедним редом презимена првог или јединог аутора радови објављени латиницом. Ако опис библиографске јединице обухвата неколико редова, сви редови осим првог увучени су удесно за два словна места (висећи параграф). Презимена страних аутора наводе се у оригиналу само уколико је и цитирани текст преузет с језика оригинала.

Референца у књизи треба да садржи презиме, име аутора, наслов књиге написан у курзиву, издавача, место издања и годину издања, овим редоследом: Презиме, име аутора. *Наслов књиге.* Податак о имену преводиоца, приређивача, или некој другој врсти ауторства. Податак о издању или броју томова. Место издавања: издавач, година издавања. На пример:

Петковић, Новица. *Огледи из српске поетике*. 2. изд. Београд: Завод за уџбенике и наставна средства, 2006.

Rank, Oto. *Mit o rođenju junaka: pokušaj psihološkog tumačenja mita*. Preveo s nemačkog Tomislav Bekić, Novi Sad: Akademska knjiga, 2007.

Уколико библиографски извор има два или више аутора принцип навођења у попису литературе је следећи:

Дотлић, Љубица и Емил Каменов. *Књижевност у дечјем вртићу*. 1. изд. Нови Сад: Змајеве дечје игре – Одсек за педагогију Филозофског факултета, 1996.

Фототипска издања наводе се с подацима како о првом, тако и о поновљеном издању:

Презиме, име аутора. *Наслов књиге.* Место првог издања, година првог издања. Место поновљеног, фототипског издања: издавач, година репринт издања.

Пример:

Мразовић, Аврам. *Руководство к славенскому красноречију.* Будим, 1821. Нови Сад – Сомбор: Матица српска – Учитељски факултет, 2002.

Литература у зависном формату (ред у часопису, тематском зборнику, текст из периодике и сл) наводи се по следећем принципу:

Презиме, име аутора. „Наслов текста у публикацији“. *Наслов часописа* број свеске или тома (година, или потпун датум): стране на којима се текст налази.

Ćalović, Dragan. „Teorija medija kao naučna disciplina: predmet i ciljevi“. *Kultura: časopis za teoriju i sociologiju kulture i kulturnu politiku* br. 124 (2009): 143–152.

Барић, Хенрик. „Трагика у песми о Хасанагиници“. *Народна књижевност*. ур. Владан Недић. Београд: Нолит, 1972, 119–125.

Монографска публикација доступна online наводи се по следећем принципу:

Презиме, име аутора. *Наслов књиге*. <адреса с интернета>. Датум преузимања.

Пример: Rhyman, Geoff. *253: a novel for the Internet about London Underground in seven cars and a crash* < http://www.ryman-novel.com> 10.10.2011.

Текст из серијске публикације, доступне online, наводити по моделу:

Презиме, име аутора. „Наслов текста.“ *Наслов периодичне публикације*. Датум периодичне публикације. Име базе података. Датум преузимања.

Левич, А. П. „Общая теория систем как метатеория теоретического научного знания и темпорологии.” *Пространство и время*: физическое, психологическое, мифологическое. Москва: КЦ «Новый Акрополь» (2006): 70-88. <http://www.chronos.msu.ru/RREPORTS/levich_metateoria.htm> 13.10.2011.

У основном тексту рада даваће се скраћени облик адресе (Левич: 2011)

У библиографском опису цитиране литературе користи се MLA начин библиографског цитирања (Modern Language Association Style) као један од најфреквентнијих и општеприхваћених начина цитирања. Стога, ради предупређивања евентуалних недоумица око правилног начина цитирања, ауторе упућујемо на интернет-адресу <http://library.concordia.ca/help/howto/mla.php>

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Норма излази два пута годишње.

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