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- Information technologies in education development
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CORRECTION OF THE JOURNAL ITRO 2011

Two technical mistakes have been made in the journal ITRO 2011 Vol. 1 No. 1

- The following paper written by the authors Dejan Savicevic, Zdravko Ivankovic, Branko Markoski, Zoran Milosevic was included in the contents of papers - **CONTEXTUAL CONDITIONS OF LEARNING AND TEACHING IN EARLY CHILDHOOD** – on the page 59. Unfortunately, by mistake, instead of this paper it was printed the paper **PEDAGOGIC DIAGNOSTICS AS DETERMINANT OF DIFFERENTIATION OF PROGRAMME MODELS IN KINDERGARTENS** written by the authors Dejan Savicevic, Zdravko Ivankovic, Maja Cvijetic, Predrag Pecev and Petar Vasiljevic.

- In the paper **THE STRATEGY FOR IMPROVING CULTURAL VALUES OF THE YOUNG BY MEANS OF EDUCATIONAL SOFTWARE** by the authors Dragana Glusac, Dijana Karuovic, Radovan Sljapic, Marina Vidovic, Marijana Meng, Mladen Kosovac, by mistake were cited the sources [4] and [5] on the pages 93-97 without any references in the paper, so they are rejected as citation.

Conclusion

Both papers will be published again in this number of the Journal.

Editors

CONTENTS

ACADEMIC PERFORMANCE INDEX IN HIGHER EDUCATION - A MODEL IN INDIA

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Abstract – In this paper academic performance index in higher education applied in India is presented. Academic performance index is quantitative approach to measurement quality of teaching staff, i.e. their competence level. According to academic performance index that is applied at whole India level, at Gujarat Indian state for each teaching staff member there is self-appraisal form to be used for reporting.

I INTRODUCTION

Financing of higher education institutions in India is organized within three modalities:

- Funded by University Grants Commission (UGC) and maintained by the State Governments
- Co-financed by University Grants Commission and partly self-financed
- Completely self-financed (privately held)

University Grants Commission established regulations regarding qualifications for appointment of teachers and other academic staff in universities and colleges since year 1956 from Ministry of Finance and later in year 2000 and revised in year 2008. Current version is applied since year 2010 [1]. These regulations explain qualifications for candidates' eligibility to promotion to teaching positions in employment and under Career Advancement Scheme. These qualifications are related to teaching staff (university and college teachers) as well as principals (directors of educational institutions) and librarians.

These regulations have special concern regarding specific scientific and professional disciplines within UGC regulations [1] and within separate regulations:

- For teachers in the Faculties of Agriculture and Veterinary Science, the norms /Regulations of Indian Council of Agricultural Research;
- For Faculty of Medicine, Dentistry, Nursing and AYUSH, the norms/Regulations of Ministry of Health and Family Welfare, Government of India;
- For Faculty of Education, the norms/Regulations formulated in consultations with National Council of Teacher Education;
- For Engineering and Technology, Pharmacy and Management/Business Administration, the norms/Regulations formulated in consultations with All India Council for Technical Education

Within regulations regarding qualifications for appointment of higher education institutions' employees, a quantitative approach is established for competence level measurement - Academic performance Index (API). Academic performance index is measurement scheme for presenting academic qualifications and work results in aim to measure quality of teaching staff. There are several areas of work that is measured and presented by this index. This way each member of teaching staff's work is evaluated and therefore it is considered during academic career with employment and promotion to higher academic positions [1]. According to academic performance index that is applied at whole India level, at Gujarat Indian state there is special self-appraisal form [2] that each teaching staff member should use for reporting to education authorities and could use for self-evaluation of academic work quality.

II RECRUITMENT AND QUALIFICATIONS

"The minimum qualifications required for the post of Assistant Professors, Associate Professors, Professors, Principals, Assistant Directors of Physical Education and Sports, Deputy Directors of Physical Education and Sports, Directors of Physical Education and Sports, Assistant Librarians, Deputy Librarians, Librarians will be those as prescribed by the UGC in these Regulations.

The direct recruitment to the posts of Assistant Professors, Associate Professors and Professors in the Universities and Colleges shall be on the basis of merit through all India advertisement and selections by the duly constituted Selection Committees as per the provisions made under these Regulations to be incorporated under the Statutes/Ordinances of the concerned university. The composition of such committees should be as prescribed by the UGC in these Regulations.

Subject to the availability of vacant positions and fitness, teachers such as Assistant Professor, Associate Professor and Professor only, may be re-employed on contract appointment beyond the age of superannuation, as applicable to the concerned University, college and Institution, up to the age of seventy years." [1]

A. Assistant professor

"The minimum requirements of a good academic record, 55% marks (or an equivalent grade in a point scale wherever grading system is followed) at the master's level and qualifying in the National Eligibility Test (NET), or an accredited test (State Level Eligibility Test - SLET/SET), shall remain for the appointment of Assistant Professors. NET/SLET/SET shall remain the minimum eligibility condition for recruitment and appointment of Assistant Professors in Universities / Colleges / Institutions. *Provided* however, that candidates, who are or have been awarded a Ph. D. Degree in accordance with the University Grants Commission (Minimum Standards and Procedure for Award of Ph.D. Degree) Regulations, 2009, shall be exempted from the requirement of the minimum eligibility condition of NET/SLET/SET for recruitment and appointment of Assistant Professor or equivalent positions in Universities / Colleges / Institutions. NET/SLET/SET shall not be required for such Masters Degree Programmes in disciplines for which NET/SLET/SET accredited test is not conducted. A minimum of 55% marks (or an equivalent grade in a point scale wherever grading system is followed) will be required at the Master's level for those recruited as teachers at any level from industries and research institutions and at the entry level of Assistant Professors, Assistant Librarians, Assistant Directors of Physical Education and Sports. A relaxation of 5% may be provided at the graduate and master's level for the Scheduled Caste/Scheduled Tribe/Differently-abled (Physically and visually differently-abled) categories for the purpose of eligibility and for assessing good academic record during direct recruitment to teaching positions. The eligibility marks of 55% marks (or an equivalent grade in a point scale wherever grading system is followed) and the relaxation of 5% to the categories mentioned above are permissible, based on only the qualifying marks without including any grace mark procedures. A relaxation of 5% may be provided, from 55% to 50% of the marks to the Ph.D. Degree holders, who have obtained their Master's Degree prior to 19 September, 1991. Relevant grade which is regarded as equivalent of 55% wherever the grading system is followed by a recognized university shall also be considered eligible. The Ph.D. Degree shall be a mandatory qualification for the appointment of Professors and for promotion as Professors. The Ph.D. Degree shall be a mandatory qualification for all candidates to be appointed as Associate Professor through direct recruitment. The period of time taken by candidates to acquire M.Phil. and/or Ph.D. Degree shall not be considered as teaching/ research experience to be claimed for appointment to the teaching positions." [1]

B. Associate professor

Requirements for promotion to position of associate professor are: "Good academic record with a Ph.D. Degree in the concerned /allied/ relevant disciplines. A Master's Degree with at least 55% marks (or an equivalent grade in a point scale wherever grading system is followed). A minimum of eight years of experience of teaching and/or research in an academic/research position equivalent to that of Assistant Professor in a University, College or Accredited Research Institution/industry excluding the period of Ph.D. Research with evidence of published work and a minimum of 5 publications as books and/or research/policy papers. Contribution to educational innovation, design of new curricula and courses, and technology – mediated teaching learning process with evidence of having guided doctoral candidates and research students. A minimum score as stipulated in the Academic Performance Indicator (API) based Performance Based Appraisal System (PBAS)."

C. Professor

Requirements for promotion to position of professor are:

"An eminent scholar with Ph.D. qualification(s) in the concerned/allied/relevant discipline and published work of high quality, actively engaged in research with evidence of published work with a minimum of 10 publications as books and/or research/policy papers. A minimum of ten years of teaching experience in university/college, and/or experience in research at the University/National level institutions/industries, including experience of guiding candidates for research at doctoral level. Contribution to educational innovation, design of new curricula and courses, and technology – mediated teaching learning process. A minimum score as stipulated in the Academic Performance Indicator (API) based Performance Based Appraisal System (PBAS)." [1]

Or:

An outstanding professional, with established reputation in the relevant field, who has made significant contributions to the knowledge in the concerned/allied/relevant discipline, to be substantiated by credentials.

D. Principal

Requirements for promotion to position of principal (director of educational institution) are "A Master's Degree with at least 55% marks (or an equivalent grade in a point scale wherever grading system is followed) by a recognized University. A Ph.D. Degree in concerned/allied/relevant discipline(s) in the institution concerned with evidence of published work and research guidance. Associate Professor/Professor with a total experience of fifteen years of teaching/research/administration in Universities, Colleges and other institutions of higher education. A minimum score as stipulated in the Academic Performance Indicator (API) based Performance Based Appraisal System (PBAS)." [1]

III CODE OF PROFESSIONAL ETHICS

E. Teachers and their responsibilities

"Whoever adopts teaching as a profession assumes the obligation to conduct himself / herself in accordance with the ideal of the profession. A teacher is constantly under the scrutiny of his students and the society at large. Therefore, every teacher should see that there is no incompatibility between his precepts and practice. The national ideals of education which have already been set forth and which he/she should seek to inculcate among students must be his/her own ideals. The profession further requires that the teachers should be calm, patient and communicative by temperament and amiable in disposition.

Teachers should: (i) Adhere to a responsible pattern of conduct and demeanour expected of them by the community; (ii) Manage their private affairs in a manner consistent with the dignity of the profession; (iii) Seek to make professional growth continuous through study and research; (iv) Express free and frank opinion by participation at professional meetings, seminars, conferences etc. towards the contribution of knowledge; (v) Maintain active membership of professional organizations and strive to improve education and profession through them; (vi) Perform their duties in the form of teaching, tutorial, practical, seminar and research work conscientiously and with dedication; (vii) Co-operate and assist in carrying out functions relating to the educational responsibilities of the college and the university such as: assisting in appraising applications for admission, advising and counseling students as well as assisting the conduct of university and college examinations, including supervision, invigilation and evaluation; and (viii) Participate in extension, co-curricular and extra-curricular activities including community service." [1]

F. Teachers and the students

"Teachers should: (i) Respect the right and dignity of the student in expressing his/her opinion; (ii) Deal justly and impartially with students regardless of their religion, caste, political, economic, social and physical characteristics; (ii) Recognize the difference in aptitude and capabilities among students and strive to meet their individual needs; (iv) Encourage students to improve their attainments, develop their personalities and at the same time contribute to community welfare; (v) Inculcate among students scientific outlook and respect for physical labour and ideals of democracy, patriotism and peace; (vi) Be affectionate to the students and not behave in a vindictive manner towards any of them for any reason; (vii) Pay attention to only the attainment of the student in the assessment of merit; (viii) Make themselves available to the students even beyond their class hours and help and guide students without any remuneration or reward; (ix) Aid students to develop an understanding of our national heritage and national goals; and (x) Refrain from inciting students against other students, colleagues or administration." [1]

G. Teachers and colleagues

"Teachers should: (i) Treat other members of the profession in the same manner as they themselves wish to be treated; (ii) Speak respectfully of other teachers and render assistance for professional betterment; (iii) Refrain from lodging unsubstantiated allegations against colleagues to higher authorities; and (iv) Refrain from allowing considerations of caste, creed, religion, race or sex in their professional endeavour." [1]

H. Teachers and authorities

"Teachers should: (i) Discharge their professional responsibilities according to the existing rules and adhere to procedures and methods consistent with their profession in initiating steps through their own institutional bodies and/or professional organizations for change of any such rule detrimental to the professional interest; (ii) Refrain from undertaking any other employment and commitment including private tuitions and coaching classes which are likely to interfere with their professional responsibilities; (iii) Co-operate in the formulation of policies of the institution by accepting various offices and discharge responsibilities which such offices may demand; (iv) Co-operate through their organizations in the formulation of policies of the other institutions and accept offices; (v) Co-operate with the authorities for the betterment of the institutions keeping in view the interest and in conformity with dignity of the profession; (vi) Should adhere to the conditions of contract; (vii) Give and expect due notice before a change of position is made; and (viii) Refrain from availing themselves of leave except on unavoidable grounds and as far as practicable with prior intimation, keeping in view their particular responsibility for completion of academic schedule." [1]

I. Teachers and non-teaching staff

"Teachers should: (i) treat the non-teaching staff as colleagues and equal partners in a cooperative undertaking, within every educational institution; and (ii) help in the function of joint staff-councils covering both teachers and the non-teaching staff." [1]

J. Teachers and guardians

"Teachers should:(i) Try to see through teachers' bodies and organizations, that institutions maintain contact with the guardians, their students, send reports of their performance to the guardians whenever necessary and meet the guardians in meetings convened for the purpose for mutual exchange of ideas and for the benefit of the institution." [1]

K. Teachers and society

" Teachers should:(i) Recognize that education is a public service and strive to keep the public informed of the educational programmes which are being provided; (ii) Work to improve education in the community and strengthen the community's moral and intellectual life; (iii) Be aware of social problems and take part in such activities as would be conducive to the progress of society and hence the country as a whole; (iv) Perform the duties of citizenship, participate in community

activities and shoulder responsibilities of public offices; (v) Refrain from taking part in or subscribing to or assisting in any way activities which tend to promote feeling of hatred or enmity among different communities, religions or linguistic groups but actively work for National Integration." [1]

IV TEACHING DAYS AND WORKLOAD

Within University Grants Commission regulations [1] there is prescribed many other aspects of teaching work and activities, as well as regulations regarding payment and leave (off-duty times) causes (like attendance to symposium, child care etc.) and allowed number of days.

L. Teaching days

"The Universities/Colleges must adopt at least 180 working days, i.e. there should be a minimum of 30 weeks of actual teaching in a 6-day week. Of the remaining period, 12 weeks may be devoted to admission and examination activities, and non-instructional days for co-curricular, sports, college day, etc., 8 weeks for vacations and 2 weeks may be attributed to various public holidays. If the University adopts a 5 day week pattern, then the number of weeks should be increased correspondingly to ensure equivalent of 30 weeks of actual teaching with a 6 day week." [1]

TABLE I. TEACHING DAYS IN INDIA, ACCORDING TO UGC [1]

	Number of weeks: 6 day a week pattern		Number of weeks: 5 day a week pattern	
Categorization	**University**	**College**	**University**	**College**
Teaching and Learning Process	30 (180 days) weeks	30 (180 days) weeks	36 (180 days) weeks	36 (180 days) weeks
Admissions/Examinations preparation for Examination	12	10	8	8
Vacation	8	10	6	6
Public Holidays (to increase and adjust teaching days accordingly)	2	2	2	2
Total	**52**	**52**	**52**	**52**

M. Workload

"The workload of the teachers in full employment should not be less than 40 hours a week for 30 working weeks (180 teaching days) in an academic year. It should be necessary for the teacher to be available for at least 5 hours daily in the University/College for which necessary space and infrastructure should be provided by the University/College. Direct teaching-learning process hours should be as follows:

- Assistant Professor 16 hours
- Associate Professor and Professor 14 hours

A relaxation of two hours in the workload may, however, be given to Professors who are actively involved in extension activities and administration. A minimum of 6 hours per week may have to be allocated for research activities of a teacher." [1]

V ACADEMIC PERFORMANCE INDEX

Based on the teacher's self-assessment, academic performance indicators (APIs) are proposed in recruitments and career advancement scheme (CAS) promotions of university / college teachers and is organized in three categories:

- Category I - teaching, learning and evaluation related activities
- Category II - co-curricular, extension and professional development related activities.
- Category III - research and academic contributions.

The minimum API score required by teachers is different depending on categories, levels of promotion and between university and college. The self-assessment score is based on verifiable criteria and is finalized by the screening/selection committee.

TABLE II. CATEGORY I ACTIVITIES AND API SCORES

S. No.	Nature of Activity	Maximum Score
1	Lectures, seminars, tutorials, practicals, contact hours undertaken taken as percentage of lectures allocated[a]	50
2	Lectures or other teaching duties in excess of the UGC norms	10
3	Preparation and Imparting of knowledge / instruction as per curriculum; syllabus enrichment by providing additional resources to students	20
4	Use of participatory and innovative teaching-learning methodologies; updating of subject content, course improvement etc.	20
5	Examination duties (Invigilation; question paper setting, evaluation/assessment of answer scripts) as per allotment.	25
	Total Score	**125**
	Minimum API Score Required	**75**

TABLE III. CATEGORY II ACTIVITIES AND API SCORES

S. No.	Nature of Activity	Maximum Score
1	Student related co-curricular, extension and field based activities (such as extension work through NSS/NCC and other channels, cultural activities, subject related events, advisement and counseling)	20
2	Contribution to Corporate life and management of the department and institution through participation in academic and administrative committees and responsibilities.	15
3	Professional Development activities (such as participation in seminars, conferences, short term, training courses, talks, lectures, membership of associations, dissemination and general articles, not covered in Category III below)	15
	Minimum API Score Required	**15**

Category III - research and academic contributions have several subcategories:

- Research publications
- Research projects
- Research guidance
- Training courses / Conference papers

TABLE IV. CATEGORY III -RESEARCH PUBLICATIONS [1]

S No.	APIs	Engineering/Agriculture/ Veterinary Science/Sciences/Medical Sciences	Faculties of Languages Arts/Humanities/Social Sciences/Library/ Physical education/Management	Max. points for University and college teacher position
III A	Research Papers published in:	Refereed Journals *	Refereed Journals*	15 / publication
		Non-refereed but recognized and reputable journals and periodicals, having ISBN/ISSN numbers.	Non-refereed but recognized and reputable journals and periodicals, having ISBN/ISSN numbers.	10 / Publication
		Conference proceedings as full papers, etc. (Abstracts not to be included)	Conference proceedings as full papers, etc. (Abstracts not to be included)	10/ publication
III (B)	Research Publications (books, chapters in books, other than refereed journal articles)	Text or Reference Books Published by International Publishers with an established peer review system	Text or Reference Books Published by International Publishers with an established peer review system	50 /sole author; 10 /chapter in an edited book
		Subjects Books by National level publishers/State and Central Govt. Publications with ISBN/ISSN numbers.	Subject Books by / national level publishers/State and Central Govt. Publications with ISBN/ISSN numbers.	25 /sole author, and 5/ chapter in edited books
		Subject Books by Other local publishers with ISBN/ISSN numbers.	Subject Books by Other local publishers with ISBN/ISSN numbers.	15 / sole author, and 3 / chapter in edited books
		Chapters contributed to edited knowledge based volumes published by International Publishers	Chapters contributed to edited knowledge based volumes published by International Publishers	10 /Chapter
		Chapters in knowledge based volumes by Indian/National level publishers with ISBN/ISSN numbers and with numbers of national and international directories	Chapters in knowledge based volumes in Indian/National level publishers with ISBN /ISSN numbers and with numbers of national and international directories	5 / Chapter

TABLE V. CATEGORY III - RESEARCH PROJECTS AND GUIDANCE [1]

III (C)	RESEARCH PROJECTS			
III (C) (i)	Sponsored Projects carried out/ ongoing	(a) Major Projects amount mobilized with grants above 30.0 lakhs	Major Projects amount mobilized with grants above 5.0 lakhs	20 /each Project
		(b) Major Projects amount mobilized with grants above 5.0 lakhs up to 30.00 lakhs	Major Projects Amount mobilized with minimum of Rs. 3.00 lakhs up to Rs. 5.00 lakhs	15 /each Project
		(c) Minor Projects (Amount mobilized with grants above Rs. 50,000 up to Rs. 5 lakh)	Minor Projects (Amount mobilized with grants above Rs. 25,000 up to Rs. 3 lakh)	10/each Project
III (C) (ii)	Consultancy Projects	Amount mobilized with	Amount mobilized with	10 per every
	carried out / ongoing	minimum of Rs.10.00 lakh	minimum of Rs. 2.0 lakhs	Rs.10.0 lakhs and Rs.2.0 lakhs, respectively
III (C) (iii)	Completed projects : Quality Evaluation	Completed project Report (Acceptance from funding agency)	Completed project report (Accepted by funding agency)	20 /each major project and 10 / each minor project
III (C) (iv)	Projects Outcome / Outputs	Patent/Technology transfer/ Product/Process	Major Policy document of Govt. Bodies at Central and State level	30 / each national level output or patent /50 /each for International level,
III (D)	RESEARCH GUIDANCE			
III (D) (i)	M.Phil.	Degree awarded only	Degree awarded only	3 /each candidate
III (D) (ii)	Ph.D	Degree awarded	Degree awarded	10 /each candidate
		Thesis submitted	Thesis submitted	7 /each candidate

TABLE VI. CATEGORY III - COURSES AND CONFERENCE PAPERS [1]

III(E)	TRAINING COURSES AND CONFERENCE /SEMINAR/WORKSHOP PAPERS			
III(E) (i)	Refresher courses, Methodology workshops, Training, Teaching-Learning-Evaluation Technology Programmes, Soft Skills development Programmes, Faculty Development Programmes (Max: 30 points)	(a) Not less than two weeks duration	(a) Not less than two weeks duration	20/each
		(b) One week duration	(b) One week duration	10/each
III(E) (ii)	Papers in Conferences/ Seminars/ workshops etc.**	Participation and Presentation of research papers (oral/poster) in	Participation and Presentation of research papers (oral/poster) in	
		a) International conference	a) International conference	10 each
		b) National	b) National	7.5 / each
		c) Regional/State level	c) Regional/State level	5 /each
		d) Local –University/College level	d) Local –University/College level	3 / each
III(E) (iv)	Invited lectures or presentations for conferences/ / symposia	(a) International	(a) International	10 /each
		(b) National level	(b) National level	5

It is important to mention few rules:

- "The API for joint publications will have to be calculated in the following manner: Of the total score for the relevant category of publication by the concerned teacher, the first/Principal author and the corresponding author/supervisor/mentor of the teacher would share equally 60% of the total points and the remaining 40% would be shared equally by all other authors." [1]
- For university and college teachers, they "may score 10 points from either Category I or Category II to achieve the minimum score required under Category I + II". [1]

VI REQUIRED API SCORE POINTS FOR UNIVERSITY AND COLLEGE TEACHERS PROMOTION

Table VII presents minimum points per year or appointment period for university teachers, while Table VIII presents minimum points per year or appointment period for college teachers.

TABLE VII. API MINIMUM SCORE FOR UNIVERSITY TEACHERS [1]

APPENDIX – III TABLE – II (A)
MINIMUM APIS AS PROVIDED IN APPENDIX – III TABLE I TO BE APPLIED FOR THE PROMOTION OF TEACHERS UNDER CAREER ADVANCEMENT SCHEME (CAS) IN UNIVERSITY DEPARTMENTS, AND WEIGHTAGES FOR EXPERT ASSESSMENT

		Assistant Professor/ equivalent cadres: (Stage 1 to Stage 2)	Assistant Professor/ equivalent cadres: (Stage 2 to Stage 3)	Assistant Professor (Stage 3) to Associate Professor/ equivalent cadres (Stage 4)	Associate Professor (Stage 4) to Professor/ equivalent cadres (Stage 5)	Professor (Stage 5) to Professor (Stage 6)
I	Teaching-learning, Evaluation Related Activities (category I)	75/Year	75/year	75/year	75/year	75/year
II	Co-curricular, Extension and Profession related activities (Category II)	15/Year	15/Year	15/Year	15/Year	15/Year
III	Minimum total average annual Score under Categories I and II*	100/Year	100/Year	100/Year	100/Year	100/Year
IV	Research and Academic Contribution (Category III) –	10/Year (40/assessment period)	20/Year (100/assessment Period)	30/Year (90/assessment period)	40/Year (120/assessment period)	50/Year (500/assessment period)
	Expert Assessment System	Screening Committee	Screening Committee	Selection Committee	Selection Committee	Expert Committee
V	Percentage Distribution of Weightage Points in the Expert Assessment (Total weightage = 100. Minimum required for promotion is 50)	No separate points. Screening committee to verify API scores	No separate points. Screening committee to verify API scores	30% - Contribution to Research 50% - Assessment of domain knowledge and teaching practices. 20 % - Interview performance	50% - Contribution to Research. 30 % - Assessment of domain knowledge and teaching practices. 20 % - Interview performance	50% - research. 50 % - Performance evaluation and other credential by referral procedure

TABLE VIII. API MINIMUM SCORE FOR COLLEGE TEACHERS [1]

APPENDIX – III TABLE – II (B)
MINIMUM POINT NORMS OF THE APIS AS PROVIDED IN TABLE I AND WEIGHTAGES FOR EXPERT ASSESSMENT TO BE APPLIED FOR THE PROMOTION OF TEACHERS, IN COLLEGES (UG AND PG) UNDER CAREER ADVANCEMENT SCHEME (CAS)

		Assistant Professor/ equivalent cadres Stage 1 to Stage 2:	Assistant Professor/ equivalent cadres: Stage 2 to Stage 3	Assistant Professor (Stage 3) to Associate Professor/ equivalent cadre (Stage 4)	Associate Professor to Professor Promotion in Colleges (Stage 5) as per assigned posts
I	Teaching-learning, Evaluation Related Activities (Category – I)	75/Year	75/Year	75/year	75/year
II	Co-curricular, Extension and Profession related activities (Category – II)	15/Year	15/Year	15/Year	15/Year
III	Minimum total average annual Score under Categories I and II*	100/Year	100/Year	100/Year	100/Year
IV	Research and Academic Contribution (Category III)	5/Year (20/assessment period)	10/Year (50/assessment period)	15/Year (45/assessment period)	20/Year (60/assessment period)
	Expert Assessment System	Screening Committee	Screening Committee	Selection Committee	Selection Committee
V	Percentage Distribution of Weightage Points in the Expert Assessment (Total weightage = 100. Minimum required for promotion is 50)	No separate points. Screening committee to verify API scores	No separate points. Screening committee to verify API scores	20% - Contribution to Research 60% - Assessment of domain knowledge and teaching practices. 20 % - Interview performance	30% - Contribution to Research. 50% - Assessment of domain knowledge and teaching practices. 20 % - Interview performance

VII CONCLUSION

In this paper we presented regulations from University Grant Commision of India regarding qualifications requirements for recruitment and career advancement of higher education institution staff (teachers, principals, librarians etc.). We presented other important aspects of quality of teaching staff work, such as code of professional ethics. Important factor that influence quality of teaching staff work is teaching days organization and workload.

Quality of employees at higher education in India is measured by API (Academic Performance Index) score. We presented the model of API score points calculation. We also described minimum requirements regarding API points for each of three categories (teaching, professional work and research) for university and college teachers in India. Some rules are presented regarding minimum scores for category I and II and joint work score calculation in category III.

It has been shown that API score is calculated for each year and for each assessment period. For university and college teachers first and second category are not mandatory, i.e. score for category I and II are calculated together and minimum of 10 points is needed for this sum. This shows that teacher could be engaged in teaching, but also in professional and administrative work which also is appropriately counted. Still, majority of points is related to teaching activities. Regarding research activities, they are mandatory and minimum of 10/20/30 points is needed is for assistant teacher for each year.

Final conclusion is that great majority of API points is related to teaching engagement. Additional administrative and professional work is not mandatory, but is considered for API points. It is also possible for teaching staff member not to be engaged in teaching process, but in professional and administrative work. Still, research work is mandatory for any type of work engagements.

REFERENCES

[1] University Grants Commission in India: "Regulations on minimum qualifications for appointment of teachers and other academic staff in universities and colleges and measures for the maintenance of standards in higher education", Gazzete of India, Part III, Sector 4, 2010.

[2] Gujarat state self-appraisal form for API (academic performance index), http://gujarat-education.gov.in/ higher/ Portal/News/ 38_1_SELF%20APPRAISAL%20FORM.pdf

RELATION BETWEEN CONTEMPORARY PHILOSOPHY AND PEDAGOGY

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Abstract: In a world of rapid changes and increasing diversity, the need for an active, informed and responsible education is greater than ever. The role of philosophy, as the cradle of all sciences, in creating such an education is almost universally acknowledged. Philosophy of education is a field of both philosophy and education. It is based in the history of philosophy in the famous concepts of Socrates, Plato's, Aristotle's, Kant's, Hegel's philosophy. The aim of this work is to introduce the concept of critical pedagogy which is a teaching approach that is based in the discourse of understanding the way power operates in educational institutions and the constant cultivation of the intellect.

I PAIDEIA AS CULTURAL HERITAGE FROM PHILOSOPHY

Philosophy is the cradle of all sciences especially for pedagogy, psychology and sociology, because they are new, young social sciences and their history is the history of philosophy. In XIX century, razing of positivism and scientism pushed away philosophy and its historical and cultural role for the civilization and the human knowledge. It was metaphysical knowledge that was not useful, not pragmatic enough for technological world of industrialization. The history of philosophy is a place where researchers of education can always look for ideas, normative concepts and where questions about real purpose and the essence of education can be raised. The beginning about thinking of what education can be is in the V c.b.Ch. in anthropological period when Socrates gave the base of ethics in the famous identification of virtue and knowledge. Unlike sophists, Socrates was trying to reach the base principle of true, as "aletheia", not just the victory in the dialogue. The aim of education is to find out how to be more perfect in intellectual and ethical sense. Knowledge is Good, a virtue, and evil is ignorance, and the teacher have to show student how to get better. Education is a part of practical Greek life in which ethics, economic and politics, "bios praktikos", have form of a unity with theoretical and poetic ways of living. Education is not individual matter, but the very important task for community, it is changed with its developing and its inner destiny and material and spiritual progress. Education is not possible without this normative concept of ideal of what people should be, Greek ideal is "kalokagatia", synthesis of esthetics and ethics, senses and reason. Since democracy was important to the Greeks, paideia, combined with ethos, habits, made a man good and made him capable for entering the society. This step was not about learning mechanical tasks, but was about training for liberty of individual possibilities, freedom of thinking and nobility of the beautiful. Education for political life is an obligation of every free citizen in old Greece, politics and ethics are unique form of "fronesis" as rational intellectual skill.

Learning and teaching is the first practice of philosophy in a form of giving the knowledge not just as the facts that should be remembered, but as truth that has to be discovered. The being of philosophy, its very essence is a dialogue and it has to be told to the others. Philosophy is an attempt to reach indefinite universe through the limited medium of language and that's why teaching about it is not possible without two directions, without thinking, reflecting and conceiving the truth.

Philosophy of education is the area of "paideia" [1], παιδεία as way for performing education by finding and learning about virtue, "arete" άρετε. This task couldn't be fulfilled without ethics in two different senses; as a branch of philosophy, theoretical knowledge which describes practical behavior and gives normative concept of virtue and good and evil. It was possible only in the synthesis of ethical, economic and political life in the concept of practical science in Aristotle's classification of sciences. Also as a kind of experience that can be reached only by practical role-model example. The teacher is teaching by theoretical presumptions, initiating the critical thinking in pupil's intellect, but also showing him how to express rhetorical skills, how to communicate with the others, how to make difference between good and bad choices. Greek

paideia is the idea of perfection, of excellence. Paideia was very close to religion, and teaching about the way to achieve ethical consequences from it. This ideal was guided by the concept of Greek Gods; they were so close to humans, they fall in love with humans, fight, they envy, and they are so imperfect, and in the same time they are Gods. People can even see the mountain of their existence, and the message is clear, you can be more perfect, as you look at the ideal form of mankind, the God's form as an ideal. Religion is a powerful force for a young being to receive values of one society together with the moral norms. Religion, culture and politics are the natural forms of Greek "habitus", and if we analyze the reasons why Socrates was accused for spoiling the youth, we can see that the main allegation is disrespect of the Greek official Gods. Paideia is the cultural heritage that is continued through the generations, and Greek foundation of civilization is the base for complete European culture in a way that we feel like we are at homeland of our origin. It does not mean that we should consider European culture as the only valid culture, but rather to see all the cultures of the world as connected, influenced, and authentic. The culture is the history of borrow, the history of intercultural communication as a "map of mutual relationships between real and productive traffic of nations, states, groups and identities",[2]. As culture is a kind of highest values of one civilization, and education is a form of culture as cultivation of young souls, it is very important to see the differences in goals in various philosophical concepts. Good examples for this cultural need of systematic knowledge and teaching about it in Greek philosophy are Academy and Lyceum,[3]. They are considered as first universities because of organized exploration of different areas of natural and social life, and the foundation of the first great library of ancient world. The foundation of Plato's and Aristotle's theory of education is possible only if we consider the meaning of Socratic principles for pedagogy. Socrates had an ideal pedagogical method, "you already know and my aim is to help you to give birth to your knowledge". This procedure is "majeutic", as a form of "dialektike techne". Socratic ideal pedagogical assumption is that student always knows, the teacher needs to help in giving and releasing understanding of complex world. The aim of dialectics in Socrates philosophy of education is to make the inner change, to improve in ethical and intellectual sense. Teacher should take a part of Socratic spirit in every place where teaching takes its forms. Believing in student's knowledge, asking right questions, giving support for critical thinking, and leading pupil in the self-confidence introducing of virtue. All of these, and more, are the proper focus of the Socratic questioner. As a tactic and approach, Socratic questioning is a highly disciplined process. Virtue is knowledge, and you can find out how to be more perfect in intellectual and ethical sense. Evil is ignorance, you just don't know how to get better. The aim of teaching is to develop the inner space of good choices by listening to conscience, Socratic 'daiamonin". Teacher is a leader in discovering inner self, "gnoti se auton", highest wisdom, and maybe, the most difficult one. The teacher has the obligation to awake the need for discovering the truth not as finished and closed fact, but as a dialogical process of dialectics.

Plato is the role model of philosophical teacher-student relationship in which love for wisdom is the passion for knowledge as truth, and the teacher is the indefinite filed of inspiration. Eros, as spiritual love is a passion which gives a soul the wings to fly in the immortal, eternal world of ideas. He developed dialectical skills as a" rainbow that connects people and Gods" this false and true world, as a "Prometheus fire" that can help to reach the other world of real ideas in the sky, in objective idealism, is dialogic in which trough conversation "dialegesthai" discussion comes to the essence of every thing in every particular case trough the search for general in thinking, universal ideas. Words are just the tools, not the essence, and language is just an approach to the knowledge of unchangeable objective truth. Socrates gave the tools for fighting the sophists, irony and majeutic, giving birth to ideas, as a spiritual nurse. Plato constructed ideal Republic which should be governed by those who are the most educated because they have wisdom and intellectual and ethical characteristics. Plato saw education as the key to creating and sustaining his "Republic". The power of knowledge makes the differences between people and social classes.

Reaching the perfection is a cardinal Greek ideal; it is possible by knowledge of the virtue. The purpose of teaching is to let the student to be more perfect then the teacher, true teacher is teaching with the hope that student will be better and that will have more creativity. If student challenges teacher's stand point, it is the sign that own reflection, and freedom of ideas, and the courage to see the truth is more important then the respect of the authority. It can be seen as first form

of critical pedagogy as an attempt to question domination and the beliefs and practices that dominate. It is a root for all teaching approaches for theory and practice of helping students achieve critical consciousness.

II TRANSCENDENTAL EDUCATION

Kant was interested in the whole education as a concept of general culture, a true education should supply a human being with the discipline, culture, prudence and moral training. The main aim in treating other people is our principal moral duty to respect others as our aims, not means. We wouldn't do to somebody something that we wouldn't like to be done with us. Knowledge has its limits, human mind is restricted to experience, but as practical moral beings, with our free will, we can be our own masters. That is the meaning of human freedom, as a postulate of our doings and moral behavior. Kant holds that self-consciousness differentiates human beings from animals and is hence the source of human dignity. Human beings have a free will and are not determinate by sensuously inclinations. His pedagogy would require that one address the consciousness of the human being. Education has to answer the famous forth question:" What humans are?" and the answer is:" Humans are amphibolic beings; from one side they are in the area of sensitivity, "aistheton", natural causes, humans as biological beings, and from the other side, they are the part of intelligible world of eternity, ideas, freedom. Pedagogy should keep both sides of human nature in the process of education for metaphysical and physical a priori transcendental knowledge.

As a teacher Hegel combined an interesting mixture of what we would call traditional and progressive ideas. "For those attend our school we expect quiet behavior, the habit of continuous attention, respect and obedience to the teachers and a proper and seemly conduct both towards these and their fellow pupils."[4]. Hegel didn't demand iron discipline, but he thought that the philosopher at least has the right to ask of the reader to keep his own thoughts quiet until he has gone through the whole. Silence is necessary part of thinking as a preparation for thinking, listening is a key for dialectical movement as an effort of independent reflection. Philosophy of education is a science or philosophy that is education and it is understandable only by the development of particular parts of Hegel's system. Education is a process in which, from the view of general spirit as a substance, substance is giving itself self-conscious, to produce inside its own existence and reflection. The aim is to find out what knowledge really is as an absolute knowledge in subjective spirit. This means that he sees the same educational development outlined above in the unfolding of human history. It would seem that the rationality of the west marks the highest expression of human development that the world has seen. Late twentieth century western philosophizing has largely rejected such a view, rejecting in particular its racist and imperialist overtones that 'west is best' as Europocentic. The culture is written by those who are 'white, dead masculine', and that all other worldviews are underdeveloped, without spirit and knowledge.

III NEW TEACHING APPROACH IN CRITICAL PEDAGOGY

Critical pedagogy, as a part of philosophy of education, is a teaching approach that removes dominant myths in education, challenge domination presented in the role that teacher have. It is a theory and practice of helping students to break traditional clichés and achieve critical consciousness. Who are the architects of critical pedagogy today? Paulo Freire [5], the most celebrated critical educator [6] Ira Shor [7], with his "student centered" [8] pedagogy, Joe L. Kincheloe [9] with the concept of multicultural education, Peter Mc Laren [10] as the agent of radical hope etc. Those authors are connected with the idea that praxis of education involves engaging in a cycle of theory, social context, and the politics. Education is never a neutral process; it is an instrument for forming obedience, oppression and apology for the present system. There is a lot of Marx ideas in this critical views in a way that critic of global capitalism is getting modern again as the result of the crises. The need for transformation of the world, formulated in "11. Thesis of Feurbach" is asking philosophers not just to interpret the world, but to change it [11]. In his "White Terror and Oppositional Agency" Peter Mc Larren implies that educators need to examine critically the development of pedagogical discourses that demonize Others who are different (through transforming them into absence or deviance). Critical multiculturalism calls serious attention to the dominant meaning systems readily available to students and teachers, most of which are ideologically stitched into the fabric of Western imperialism and patriarchy. It challenges meaning systems that impose attributes on the Other under the direction of sovereign signifiers and tropes. White groups need to examine their

own ethnic histories so that they are less likely to judge their own cultural norms as neutral and universal. Critical pedagogy needs to hold a nonreductionist view of the social order that is society needs to be seen as an irreducible indeterminacy. The social field is always open and we must explore its fissures, fault-lines, gaps and sciences. Power relations may not always have a conscious design, but they have unintended consequences which define deep structural aspects of oppression even though every ideological totalization of the social designed to fail. Resistance to such domination means deconstructing the social by means of a reflexive intersubjective consciousness – what Freire terms "conscientization"[15]. It is a beginning of a revolutionary praxis. We also need to create new narratives, new border narratives, in order to reauthor the discourses of oppression in politically subversive ways as well as create sites of possibility and enablement. Critical social theory as a form of multicultural resistance must be wary of locating libratory praxis in the realm of a diachronic as something to be resolved in transforming the educators to agents of radical hope [13].

Curriculum reform requires teachers to interrogate the discursive presuppositions which points at their curriculum practices with respect to race, gender, class and sexual orientation. Curriculum reform means recognizing that groups are differentially situated in the production of the Western high-status knowledge. Educators would do well to follow hooks in dehegemonizing racist discourses, affirming the voices of oppressed. Students must be encouraged to produce their own oppositional readings of curriculum content. Lastly, curriculum reform must recognize the importance of encouraging spaces for the multiplicity voices in classrooms and creating a dialogical pedagogy in which subjects see others as subjects and not objects. Inherent superiority of the West and whiteness is something that needs to be displaced. The main aim of this strategy in critical philosophical pedagogy is to provide the possibility for students to construct border identities. They are intersubjective spaces of cultural transition – linguistically multivalanced spaces of intercultural dialogue. Joe L. Kincheloe helps us understand the central dynamics of critical pedagogy: "Advocates of critical pedagogy are aware that every minute of every hour that teacher teaches, they are faced with complex decisions concerning justice, democracy, and competing ethical claims. While they have to make individual determinations of what to do in these particular circumstances, they must concurrently deal with what John Goodlad calls the surrounding institutional morality. A central tenet of critical pedagogy maintains that the classroom, curricular, school structures teachers enter are not neutral sites waiting to be shaped by educational professionals. While such professionals do possess agency, this prerogative is not completely free and independent of decisions made previously by people operating with different values and shaped by the ideologies and cultural assumptions of their historical contexts. These contexts are shaped in the same ways language and knowledge is constructed, as historical power makes particular practices seem natural—as if they could have been constructed in no other way.", [14].

Kincheloe lists the basic concerns of critical pedagogy; all education is inherently political and all pedagogy must be aware of this condition. A social and educational vision of justice and equality should ground all education. Issues of race, class, gender, sexuality, religion, and physical ability are all important domains of oppression and critical anti-hegemonic action. The alleviation of oppression and human suffering is a key dimension of educational purpose, and that's why schools must not humiliate students and blame them for their failures. School should be the place where student can question all positions, including critical pedagogy itself. The professionalism of teachers must be respected and part of the role of any educator involves becoming a scholar and a researcher. The politics of knowledge and issues of epistemology are central to understanding the way power operates in educational institutions to perpetuate privilege and to subjugate the marginalized. Scientific knowledge can often be used as a basis of oppression as it is produced without an appreciation of how dominant power and culture shape it. Education often reflects the interests and needs of new modes of colonialism and empire. Such dynamics must be exposed, understood, and acted upon as part of critical transformative praxis.

IV CONCLUSION

In a world of rapid changes and increasing diversity, the need for an active, informed and responsible education is greater than ever. In recent years, events experienced and changes taking place across the world has challenged both,

educational theory and philosophy of education. What is required are new forms of education that prepare learners for actual involvement in society. Forms of education have to be practical and theoretical, rooted in real life issues, affecting learners and their communities, and taught through participation in community life as well as trough the formal curriculum. The need to provide such teaching presents important challenges for the teaching profession. It means learning new forms of knowledge, developing new teaching methods, finding new ways of working and creating new forms of professional relationship – both with colleagues and with learners. It emphasizes teaching based on current affairs over the understanding of historical systems, critical thinking and skills teaching as well as knowledge transmission, cooperative and collaborative working rather than isolated preparation, professional autonomy instead of dependence on central diktat. It requires a change in how we perceive learning, from an ideal of learning as teacher-centered to learning through experience, participation, research and sharing. A didactic, teacher-led, textbook-dominated, knowledge-based orientation has to be replaced by one emphasizing learner involvement, a broader range of teaching methods and a more skills-based approach. Critical pedagogy requires a list of skills, knowledge and values both for teachers and students. The list of those competences is already built in the tradition of human and social sciences, especially in the history of philosophy. Skills as critical thinking, problem solving, decision-making, intercultural sensitivity are the tools for a new critical pedagogy. It is important that student learn how to make judgments and form arguments, see the problem, articulate it and solve it, not leave it, to negotiate collective decisions, to see issues from other people's point of view with empathy. Teachers, together with students in a Socratic dialogue, should research facts not as taken for granted, but always developed in different points of views, with evaluation in self-critical reflection. Knowledge becomes the process, not the power, as Bacon referred. Information always has to be opened for questioning in order to avoid dogmatic concepts. Critical pedagogy is a philosophical movement that assumes knowledge as a development in which students see the history of ideas as a whole system of constant changes and the impacts of those to social and political life. All those values, openness, respect for cultural and social differences, trust and honesty, commitment to truth, respect for self and others, tolerance, assertiveness, teamwork and co-operation, equality, freedom, justice, are the foundation of philosophical ideas and virtues.

These normative ideas of critical pedagogy have also some challenges in the factual world of today. We have to face up to the greatest tensions and, still better, overcome them. While these tensions are not new, they will be of core importance for the problems of the future. The tensions concern the following issues; between global and local, general and individual, long and short term thinking, the traditional and the modern, the spiritual and the material etc. It's important that people become world citizens without losing their local roots. Besides economic globalization, there are some good points of cultural globalization as an opportunity to answer the question of the validity of the dominant Europocentric myth. Culture is becoming increasingly globalized, it is important to keep full potential of tradition and to affirm local, marginalized voices. We are living in a world that is overflowing with short-lived news and emotions which serve in providing a permanent illustration of the current problems. Public pressure is for fast answers and ready-made solutions. This is not good circumstance for education of young people, they begin to think superficially, they don't have time to read anymore, they have no patience to listen, reflect and think. Challenges of new technologies makes young people more different then the young's of the last century. Teachers should adapt to those changes cultivating autonomy of thinking, and at the same time, development of deep, reflected thoughts. Incredible expansion of knowledge and the capacity of people to learn, new areas of knowledge are permanent challenges for self-knowledge, for physical and mental well-being and for developing better understanding of the natural environment. Main objective of education today is to encourage everyone to take action in accordance with their traditions and convictions, to respect pluralism. People today are in a state of confusion and feel torn between globalization, the effects of which they can see and sometimes are forced to bear, and the search for their roots. Critical pedagogy must rise to this challenge more then ever before. Education is at the core of personal development and the community. Its task is to make it possible for each and everyone of us to develop our talents to the full and to reach our creative potential. These examples of educational ideas from the field of history of philosophy make

the possibility for a philosophy of education as a new branch of philosophy grounded in our own past, in the history of our civilization. This research tried to present the possibilities and challenges for philosophy of education today with the look back to history of philosophy and famous theories of education and in some aspects of critical pedagogy today. Philosophers of education have the purpose of fostering dialogue and to support exchange of ideas, information and experience which will expose the use of critical and reflective intelligence in the search for solutions to crucial problems in education and culture. Philosophy is always open for free exchange of ideas, not just as a closed system of finished knowledge with unchangeable borders with beginning and with the end, but as an attempt to reach indefinite diversity of human understanding.

REFERENCES

[1] The term *paideia* is well-known through its use in the word encyclopedia which is a combination of the Greek terms *enkyklios*, or "complete system/circle", and *paideia*as the knowledge. The main aim with this etymology is to reach complete knowledge, as it was possible in those times.

[2] Said E. ”Culture and Imperialism”, 13, Belgrade circle 2002.

[3] The similar aim is in paideia to teach about theoretical, practical and poetical human experiences as unique and total.

[4] Mackenzie, “Hegel’s Educational Theory and Practice” p. 163

[5] Paulo Reglus Neves Freire (Recife, Brazil, September 19, 1921-May 2 1970.)

[6] UNESCO 1986 Prize for Education for Peace

[7] Ira Shor (1945.) is a professor at the city University of New York, where he teaches composition and rhetoric. In collaboration with Paulo Friere, he is one of the leading exponents of critical pedagogy

[8] Kierkegaard discovered this orientation insisting that teacher should always understand the student’s way of reception. To be a teacher means to see in the way that student thinks, feels and understands.

[9] Joe lyons Kincheloe (December 14, 1959 – December 19, 2008) was a professor and Canada Reasercher Chair at the Faculty of Education, Mc Gill University in montreal, Quebec, Canada. He founded The Paulo and Nita Freire International Project for Critical Pedagogy. Under his leadership this project is creating a global community of reaserchers and cultural workers in critical pedagogy

[10] Peter Mc Laren (1948) is internationally recognized as one of the leading architects of critical pedagogy and known for his writings on critical literacy and Marxist theory. He is currently Professor of Education, Graduate School of Education and Information Studies, University of California, Los Angeles

[11] One of the consequences of multicultural education in critical pedagogy is activism which is defined as emancipator change with the synergistic cultivation of theory and intellect

[12] One of the consequences of multicultural education in critical pedagogy is activism which is defined as emancipator change with the synergistic cultivation of theory and intellect

[13] The concept of radical hope is based in E. Bloch’s “Principle of Hope” which calls an utopian to be a true guideline. Without that spirit of utopian the dream about tomorrow wouldn’t be universal. It is for the future as the thought which represents the very essence of being. It is the component of the structure of human being which transcendence the presence. To be, means to be by the determination of the future which is open

[14] Kincheloe J. L.:”Critical pedagogy”, p.23, second edtition, NY Petar Lang

ICT COMPETENCIES OF STUDENTS

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Abstract - This paper is a review of testing the experiences and attitudes of students of educational science of their ICT competencies and their achievements in the field of ICT in formal academic education. In this paper are compared students' ICT competence of the study group of pedagogy and study group of pre-school education studies at the Faculty of Natural Science and Education at University of Mostar. It is percived that students are well informed and that they frequent use computers and the Internet. The lack of ICT competencies of students in the use of certain computer programs and Internet search are evident. The research results are useful to us as curricular guidelines.

I INTRODUCTION

The European Council at Lisbon conference in 2000, has set a strategic goal for the European Union: to become the most competent and most dynamic economy in the world based on knowledge and capable of sustainable economic growth. The report "The concrete future objectives of education and training" (Stockholm, 2001.) indicates the three strategic objectives: quality, accessibility and openness of the education system. Work Programme "Education and Training 2010." (Barcelona, 2002.) included the information and communication competence in a list of basic competencies. At the EU level is expected to implement such generic competencies outlined in the national curricula.

Modern educational curricula[1], which are developmental, humanistic and open, as expected learning outcomes introduces core competencies, including informatical and communication competence, ie, digital literacy as a generic competence as a prerequisite for lifelong learning.

The concept of competence based on an integrative approach, the individual features seen as a dynamic combination of knowledge, understanding, attitudes, and affirmative action. The process of teaching and learning that the expected outcome of a competency must be accompanied by appropriate evaluation criteria.

Information literacy is a prerequisite for informatical literacy, which involves the confident and critical use of Informatical Communication Technology (ICT) in professional work, free time and everyday, and communication in general. At the most basic level involves the use of multimedia technology to locate, access, storage, production, presentation and exchange of information and communication and participation in the Internet network. It is associated with critical thinking and application skills in the use of information communication.

The concept of lifelong learning implies different forms of learning using ICT. ICT is being introduced in educational institutions in various forms, and simultaneously allows the networking of educational institutions at all levels - both vertically and horizontally - to exchange information, continuous monitoring, bought students and staff, co-teaching personnel, and employees in these institutions , is included in national and international exchange of experiences, research results, etc. Therefore, learning in the learning society, in the context of ICT requires a holistic interdisciplinary approach.

In the context of globalization, ICT competencies have a special place. Complex and controversial process of building the world as a whole by creating a global institutional structure and global cultural forms, makes the ICT competencies necessary. Globalization as a process of democratic unification requires the written communication to the citizen (responsibility) decides according to available information which he knows how to (de) code.

Digital competence implies having the affirmative attitude, professional knowledge and skills to use ICT and to understanding and (de)coding the information. ICT competencies are necessary in a daily networked world and indispensable in a lifelong professional education. To developed ICT competencies, on individulanoj and social level, it is necessary to create a "learning space" (Learning Spaces) as a supportive environment that enables interactive content and relationships of participants. Learning spaces represent a kind of interactive mosaic that respects the uniqueness of the individual in the digital

networked world, respects their needs and provides an opportunity for continuous learning by using computers.

In a society that learns (and the academic community is applied to that instance) anything can be the source and content of learning, all have the opportunity to learn and apply their knowledge and learning is not confined to formal education. E. Jensen states that "... for employees who deal with knowledge, education refer constantly to improve their knowledge, develop skills and abilities, finding a place for themselves in the global market that is changing, and commitment to lifelong learning. Their ability to learn will be their biggest advantage." [11]

Universities, as a place of formal academic education in making the curriculum as a starting point take the actual situation: past experiences and achievements of students, and as expected outcomes, require quality of students competence. This paper explores the initial state and guidelines for future action.

II RESEARCH METHODOLOGY

The objective of this study is to determine the experiences, attitudes and achievements of students of pedagogy and preschool education in the field of ICT, Faculty of Mathematics and Science Education - University of Mostar.

This study included 303 randomly selected students: 195 students of pedagogy and 108 preschool students, undergraduate study. Taking into account the likelihood that patients enter the study sample, it has the features: a convenient, deliberate and stratified. Questionnaires were completed anonymously with the assistant who is not ICT courses teacher so students in the statements had a greater sense of personal freedom.

Survey method was used to examine the attitudes and opinions of students on the application of ICT in the study of pedagogy and the importance of ICT competencies for their study commitments and later professional activities. As an instrument a questionnaire of open and closed-type answers was used, and a five-point Likert scale.

Statistical analysis was performed in R (version R-2.10.1 for Windows). All tests $(\chi_2 - testovi)$ were conducted at significance level 0.05 (5%).

In this work we look only at data that clearly depict the experiences, attitudes and achievements of students of pedagogy and Preschool Education, Faculty of Natural Sci ence and Education, University of Mostar.

III RESULTS AND DISCUSSION

A. H1: Students pre-school pedagogy and use the Internet significantly more than the average population

Asked how much they use the computer and the internet, students have responded in the class "regular" (daily), "sometimes" (per week) and "never" / Table 1. If you group the classes "regular" and "sometimes" in a class of "use", as the number of those students of pedagogy that use computer and Internet, it follows that 87.69% students of pedagogy use the computer and the Internet, while 12.31% of students of pedagogy does not use a computer and the Internet. In the group of students of preschool 100% of them claim they use computers and the Internet. At the level of all questioned students, 279 of them, of a total of 303, use computer and Internet, or 92.21%.

TABLE I.

	Regulary	Sometimes	Never
Pedagogy	115	56	24
Pre-school	97	11	0

At FMSE, Mostar, depending on study year and study group, 34% to 60% of students are from Croatia. In comparison with the available data on Internet use in the population in Bosnia and Herzegovina (54%) and Croatia (66%, N = 1000 people older than 15 years) we see that our faculty, students use computers significantly more than the average population of states in which they reside and study and this has proved the hypothesis that the student use the Internet significantly more than the average population and it can be interpreted as formal education and the inclusion of courses in ICT program of study and the thesis about "digital natives" (Prensky). Specifically, in evaluating of young people competence there is the term "digital natives" which is commonly used for the generation born in the post industrial developed technology society.They grow up with digital technology available, although their primary interest is often focused on computer games and communication. Repeated use induces logical thinking and develop digital literacy. At the same time encourages the development of divergent thinking, specific social skills and ways of

evaluation. Involvement in the process of formal education 'digital natives' are developing ICT competence is sometimes quicker than the formal system provides. Complete information about the use of ICT and youth in our areas are not avilable.

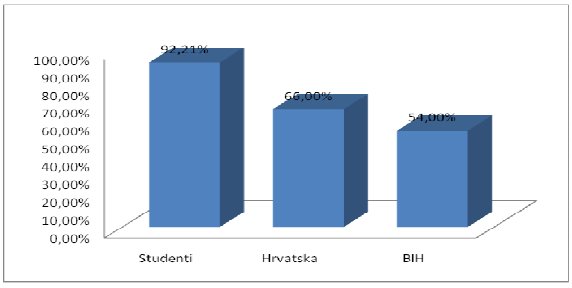


Figure 1. Showing students using the Internet both Croatian citizens and citizens of Bosnia and Herzegovina

International Studies (Pisa, 2009.) indicate that the educational result are affected by many factors, particulary environments in which students (and students) live and it is undeniable that economic status affects the availability of ICTA and therefore the results of these studies.

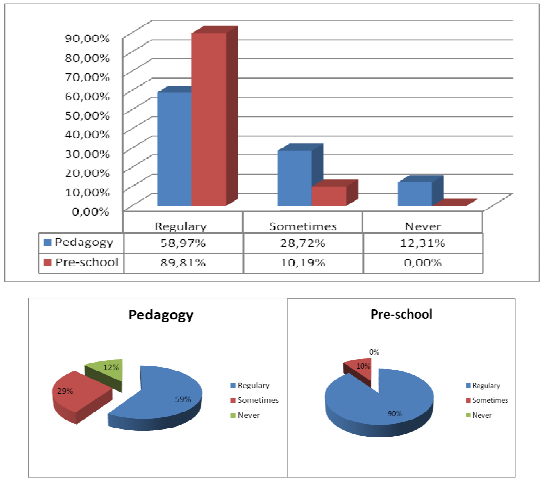


Figure 2. Using computers and the Internet

Differences in frequency of use of computers and the Internet between students of different departments can be, probably, clarified according to the place they live (for students who does not live in Mostar). It is worrying that 12% of pedagogy students claimed that they do not use any computer or internet.

B. H2: There is no statistically significant difference among the students of the pedagogy and preschool education in the evaluation of the importance of ICT competencies for (future) professional work

$\chi_2 - testom$ we tested for a statistically significant difference in the evaluation of ICT competencies for (future) professional work among students and pre-school pedagogy and found that there are significant differences, and we rejected the initial hypothesis. The reasons for such significant differences in the attitudes of students are not explored, but it could be a result of differently focused study obligations.

TABLE II. ATTITUDES OF STUDENTS - THE IMPORTANCE OF ICT COMPETENCIES FOR A PROFESSIONAL WORK

$\chi_2 - test$	**Very important**	**Important**	**Unimportant**	**Total**
Pedagogy	138	45	12	195
Pre-school	41	67	0	108
Total	179	112	12	303

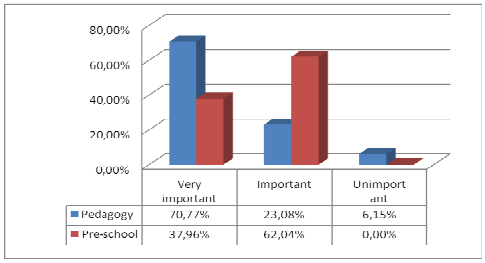


Figure 3. Differences in the attitudes of students of pedagogy and preschool education in the importance of ICT competence judgments

C. Purpose of Internet use of students of pedagogy and preschool education (ranked responses)

Students are offered the rank the order of using the Internet.

TABLE III. PURPOSE OF THE USE OF INTERNET

	PG	***PS***		
1. Information related studies (information)	163	106	83,59%	98,15%
2. Personal communication	122	106	62,56%	98,15%
3. Search the Internet to personal insterests	117	74	60,00%	68,52%
4. Internet search related study obligations	105	90	53,85%	83,33%
5. Communication with teaching staff	39	106	20,00%	98,15%
	195	108		

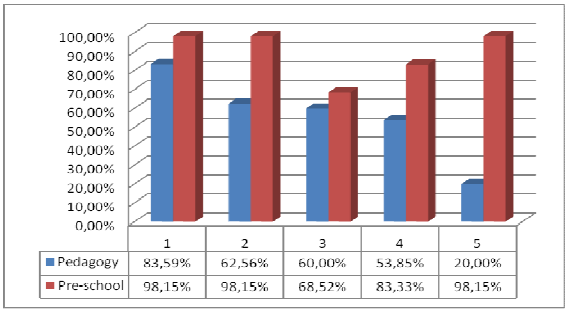


Figure 4. The purpose of the usage of ICTA

Comparing the purposes of using the Internet, it is clear that more students of preschool education, as many as 98% use the Internet to communicate with staff. We did not investigate the reasons so we can not say whether the teachers physically (not) available at the faculty or the Internet. Comparing data of a personal communication via the Internet, we can conclude that preschool education are more disposed to this form of communication. At the same time pre-school students are more inclined to search the Internet to do the academic obligations, but students of pedagogy. Unfortunately, the flies showed that the standard search engines are synonym for scientific resources for students.

D. Using the Internet Services / Browser students of pedagogy and preschool

TABLE IV. THE MOST COMMONLY USED INTERNET SERVICES / SEARCH ENGINE

	Students answers	PG	PO
1.	Standard searching engine (Google,yahoo)	171	108
2.	Specialized serching engine (Scholar)	2	0
3.	Information (librarist)	2	9

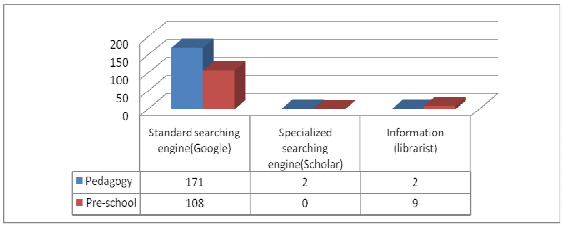


Figure 5. The most commonly used Internet services / search engine

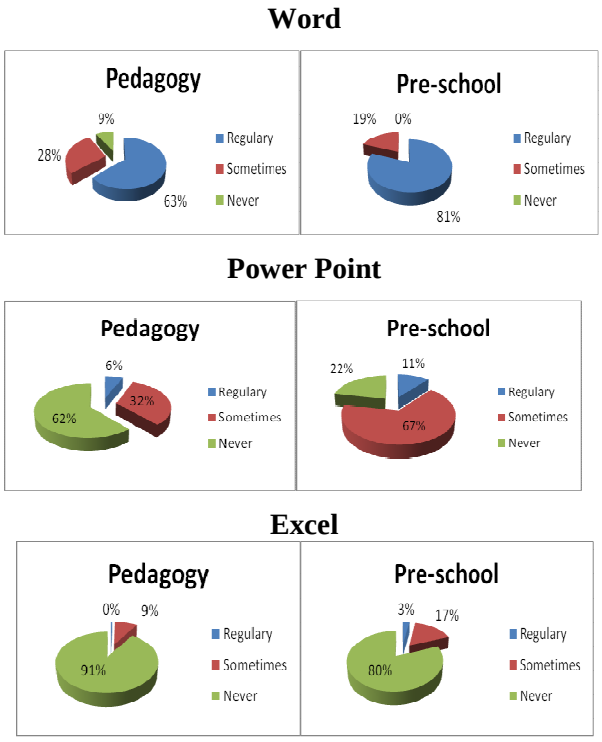
As might be expected, students are usually used to conventional search engines (98.97%) while only 1.53% of the respondents used a specialized search engines and search technical information, mainly on higher study years. The problem which was noticed on most courses is that students use Google and Yahoo as a synonym for (scientific) and search, the testimony of Professor, uncritically accept information available.

At the same time this information was used as a guideline in developing curricula. Using specialized search engines for information and access to scientific resources is becoming so interdisciplinary themes, and an example of how ICT competencies are reflected in education.

E. H3: There is no statistically significant difference between the pedagogy and preschool education students in the frequency of use of computer programs.

TABLE V. COMPUTER PROGRAMS USAGE FOR TUDING

Answers of preschool students (N=108)	**Regulary**	**Sometimes**	**Never**
Word	87	21	0
Power Point	12	72	24
Excel	3	18	87
Answers of pedagogy students (N=195)	**Regulary**	**Sometimes**	**Never**
Word	124	54	17
Power Point	12	63	120
Excel	1	17	177



Graph 6. Showing the use of computer programs for study groups

For each of these computer programs are individually $\chi_2 - testom$ tested for a statistically significant difference in frequency of use of a computer program observed among students of pedagogy and preschool education. In all three cases there was a statistically significant difference, and we must reject the initial hypothesis.

When it comes to the use of computer programs, students, participants of the study using mainly Word and Power Point, and at least Excel, and it is possible coused by requirements of studies and ICT competencies of students.

F. H4: There are significant differences in the evaluation of the ICT competencies of students in pedagogy and preschool studentsin self evaluating and evaluating teachers

H5: There is no statistically significant differences ICT competencies of pedagogy students and pre-school students

Students of pedagogy and preschool education are encouraged to self evaluation of their ICT competence and the statements compared with the evaluation of the teaching staff of the ICT competencies of students and their achievements (grades) in the exams. Experience of teaching staff indicates that students often very subjectively assess their competence and we were testing (formal exams) actual knowledge and skills and we got worse results. This information for further used for constructing of curriculum and programs development. In testing students' opinions (self evaluation) test in the fall at grade "excellent".

Neither student of any study group did not evaluate their competence as "inadequate" and even those students who do not use the internet. The survey data were processed according to results of their the exams.

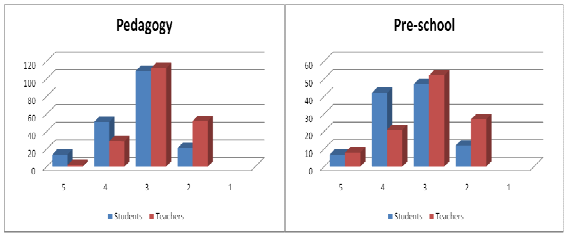
For both study groups, we conducted a test at a significance level 0.05 (5%) and established the existence of differences. In both cases there was a statistically significant difference in the opinion of students on personal ICT competencies and the actual evaluation of their competence (exams).

TABLE VI EVALUATION AND SELF-EVALUATION OF ICT COMPETENCE OF STUDENTS

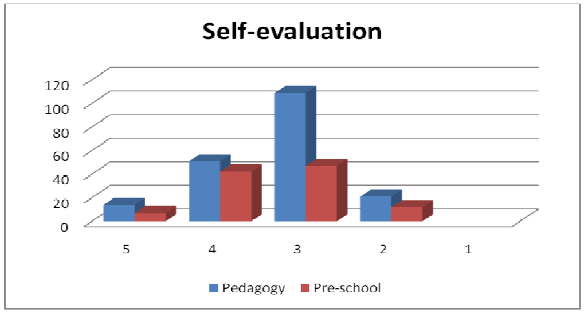
Pedagogy	**5**	**4**	**3**	**2**	**1**	**Total**
Students	14	51	109	21	0	195
Teachers	2	29	112	52	0	195
Total	16	80	221	73	0	390
PS	**5**	**4**	**3**	**2**	**1**	**Total**
Students	7	42	47	12	0	108
Teachers	8	21	52	27	0	108
Total	15	63	99	39	0	216

We also tested a statistically significant difference in the opinion of students of pedagogy and students of preschool education. We can not reject the hypothesis that there was no statistically significant difference between their opinions (they are equally valued). The results show however that the actual achievements differ. Testing is not a statistically significant difference of the results of students of pedagogy and students of preschool education, there are statistics differences and reject the initial hypothesis that there is no difference.

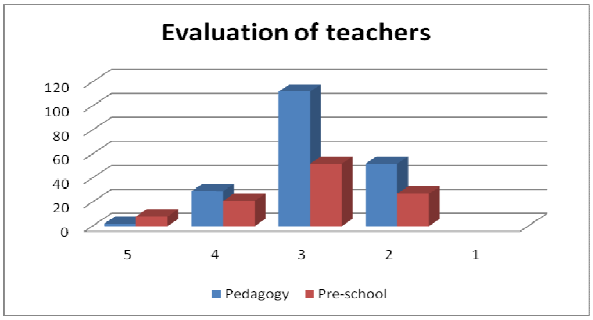
Average self-evaluation of students of pedagogy is 3:30 and the actual average score was 2.90. Average self-evaluation of pre-school students' is 3:41 and the actual average was 3.09. The important differences in grades "very good" and "sufficient". Comparing the evaluation it is obvious that students evaluate their performance more positively than teachers.



Graph 7. Showing self-evaluation and evaluation of ICT competencies of students



Graph 8. Self-evaluation of students' personal ICT competencies



Graph 9. Evaluation of teachers ICT competencies of students (test results)

IV CONCLUSION

ICT competencies are an important part of the educational process as well as the expected outcome of the formal, non-formal and informal education. Through the ongoing process of (self) evaluation and interaction of students and teachers ICT competencies are developed and students, as subjects of the processes involved in sub-constructing program. We can conclude:

- ICT competencies as core competencies must be integrated as an interdisciplinary competencies field
- ICT competencies should be expected learning outcomes
- Students are active subjects of their own knowledge, and learning becomes aligned with its capabilities
- aims, objectives and strategies for ICT in higher education should be complementary with the general guidelines and trends of the educational curriculum of each country individually taking into account the guidelines of the EU
- The process of introducing ICT in the (higher) education to evaluate and revise a year, and strategy and associated implementation programs to revise and modify the authentic level of individual institutions (respecting specificity)
- teaching staff in the process of education must necessarily develop ICT competencies (entry into the EU, all civil servants should have passed a basic office package)

The university curriculum development it is necessary to consider the specific cultural community, material environment and socio-economic student status and ICT competence of teachers. The curriculum changes are already reflected in the syllabus of the course as well as particular forms of learning and communication methods of all factors of the educational process. Research conducted at the Faculty of Natural Sciences, Mathematics and Science Education at the University of Mostar (Mostar, 2009/10. And 2010/11:) indicates the awareness of students of Educational Sciences of the possible applications of ICT. We think it is necessary to increase the representation of ICT on study programs and to provide conditions that will enable students to develop ICT skills.

REFERENCES

[1] Presidency Conclusions, European Council. Lisbon 2000.

[2] Council document 5980/01, the work program of education and training 2010th http://europa.eu.int/comm/education/policies/2010/et

[3] Report of the Working Group B on basic skills, foreign language teaching and entrepreneurship, 2003 http://www.europa.eu.int/comm/education/policies/2010/objectives

[4] Council Resolution 9286/04. on strengthening policies, systems and practices in the area calls for the promotion of learning techniques and autonomous learning, 2004.

[5] The National Curriculum Framework, RH 2010th

[6] Marušić, Pavlović, Visković : ICT in education, International scientific conference Digital tehnologies and new form of learning, Split 2010.

[7] Prensky M.: Make it interesting or I'll die of boredom *http://www.carnet.hr/casopis/34/clanci/4*

[8] Calder, J.: *Diversity and Disaffection (Overcoming Barriers for Adult Learners)*, Falmer Press, London, 1993.

[9] Dryden, G.; Voss, J.: *Learning Revolution*, Educa, Zagreb, 2001.

[10] Gudjons, H.: *Pedagogy – basic knowledge*, Educa, Zagreb, 1994.

[11] Jensen, E.: *Great education*, Educa, Zagreb, 2003., pg. 215

[12] *Key Data On Education In Europe 2005/2006*, ECSC-EC-EAEC, Brussels, Luxembourg, 2006.

[13] *According to the learning society*, Educa, Zagreb, 1996.

[14] *The Future of ICT and Learning in the Knowledge Society*, Report on a Joint DG JRC-DG EAC Workshop in Seville 2005, European Commission, Bruxelles, 2006.

[15] Tuomi, I.: *The Future of Learning in Knowledge Society, Disruptive Changes for Europe by 2020*, European Commission, Bruxelles, 2006.

[16] Delors, J.: Learning –treasure within us, Educa, Zagreb, 1998.

HIGHER EDUCATION OF TECHNICAL ENGINEERS IN LINE WITH THE BOLOGNA PROCESS

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Abstract - The Bologna Declaration is a document that the European countries use to accord higher education programs of study in order to successfully compete and compare with other regions and to prevent lagging behind in research and development. The paper presents a review of contemporary European experience in high education area as guidelines for redesigning innovations in programs of study of future technical engineers regarding Bologna Process and High Education Law in Serbia.

I INTRODUCTION

On 25 May 1998, the Ministers in charge of higher education in France, Germany, Italy and the UK signed the Sorbonne declaration on harmonization of the architecture of the European higher education system, a document preceding the Bologna declaration.

The Bologna process was launched after 29 Education Ministers signed a Declaration in Bologna in June 1999 to reform the structures of their higher education systems. Each signatory country committed itself to reform its own higher education system in order to create overall convergence at European level.

The process originates from the recognition that in spite of their valuable differences, European higher education systems are facing common internal and external challenges related to the growth and diversification of higher education, the employability of graduates, the shortage of skills in key areas or the expansion of private and transnational education.

The Bologna process has grown from 29 countries in 1999 to over 50 countries today. Current members include all EU member states (Belgium includes Flanders & French Community), Albania, Andorra, Armenia, Azerbaijan, Bosnia & Herzegovina, Croatia, Georgia, Holy See, Iceland, Liechtenstein, Moldova, Montenegro, Norway, FYROM, Russia, Serbia, Switzerland, Turkey, Ukraine.

The process is steered by bi-annual Bologna ministerial conferences, which take stock of the progress done since 1999 and set priorities for the following years. [1,2,3]

II THE EUROPEAN HIGHER EDUCATION AREA (EHEA) – BOLOGNA DECLARATION

A. Joint declaration of the European Ministers of Education (The Bologna Declaration of 19 June 1999) [4,5]

A Europe of Knowledge is now widely recognized as an irreplaceable factor for social and human growth and as an indispensable component to consolidate and enrich the European citizenship, capable of giving its citizens the necessary competences to face the challenges of the new millennium, together with an awareness of shared values and belonging to a common social and cultural space.

The Sorbonne declaration of 25th of May 1998, which was underpinned by these considerations, stressed the Universities' central role in developing European cultural dimensions. It emphasized the creation of the European area of higher education as a key way to promote citizens' mobility and employability and the European Higher Education Area Continent's overall development.

Several European countries have accepted the invitation to commit themselves to achieving the objectives set out in the declaration, by signing it or expressing their agreement in principle. The direction taken by several higher education reforms launched in the meantime in Europe has proved many Governments' determination to act.

European higher education institutions, for their part, have accepted the challenge and taken up a main role in constructing the European area of higher education, also in the wake of the fundamental principles laid down in the Bologna

Magna Charta Universitatum of 1988. This is of the highest importance, given that Universities' independence and autonomy ensure that higher education and research systems continuously adapt to changing needs, society's demands and advances in scientific knowledge.

While affirming our support to the general principles laid down in the Sorbonne declaration, we engage in co-ordinating our policies to reach in the short term, and in any case within the first decade of the third millennium, the following objectives, which we consider to be of primary relevance in order to establish the European area of higher education and to promote the European system of higher education world-wide:

- Adoption of a system of **easily readable and comparable degrees**, also through the implementation of the Diploma Supplement, in order to promote European citizens employability and the international competitiveness of the European higher education system;
- Adoption of a system essentially based on **two main cycles**, undergraduate and graduate. Access to the second cycle shall require successful completion of first cycle studies, lasting a minimum of three years. The degree awarded after the first cycle shall also be relevant to the European labour market as an appropriate level of qualification. The second cycle should lead to the master and/or doctorate degree as in many European countries;
- Establishment of a **system of credits** - such as in the ECTS system – as a proper means of promoting the most widespread student mobility. Credits could also be acquired in non-higher education contexts, including lifelong learning, provided they are recognized by receiving Universities concerned;
- Promotion of **mobility** by overcoming obstacles to the effective exercise of free movement with particular attention to: for students, access to study and training opportunities and to related services; for teachers, researchers and administrative staff, recognition and valorization of periods spent in a European context researching, teaching and training, without prejudicing their statutory rights;
- Promotion of **European co-operation in quality assurance** with a view to developing comparable criteria and methodologies;
- Promotion of the **necessary European dimensions in higher education**, particularly with regards to curricular development, inter-institutional co-operation, mobility schemes and integrated programmes of study, training and research.

We hereby undertake to attain these objectives - within the framework of our institutional competences and taking full respect of the diversity of cultures, languages, national education systems and of University autonomy – to consolidate the European area of higher education. To that end, we will pursue the ways of intergovernmental co-operation, together with those of non-governmental European organizations with competence on higher education. We expect Universities again to respond promptly and positively and to contribute actively to the success of our endeavor.

III HIGHER EDUCATION SYSTEM IN SERBIA

From the year 2000 higher education institutions in Serbia became involved in the European trends of reforms and harmonization in the field of higher education known as Bologna process. Considerable reformatory activities have been launched since Serbia signed Bologna declaration in September 2003. The Law on Higher Education (LHE, 2005) provides a legal basis for full implementation of the Bologna Declaration and the Lisbon Convention. [6]

B. The three-cycle structure

The implementation of the Bologna Process was actually put formally in place from the academic year 2006/2007 on. The three-cycle structure prescribed by LHE is established in all university higher education institutions. The percentage of the total number of all students below doctoral level enrolled in two cycle degree system in academic year 2008/2009 is 89%. The second cycle of academic qualifications gives a direct access to the third cycle. The third-cycle programmes (PhD) started in 2006/2007 in many university institutions. In order to gain entry to the doctoral level programmes, students must have accumulated at least 300 ECTS (European Credit Transfer System) credits for most study programmes and at least 360 credits for medical sciences. Within the doctoral programmes, students must earn a minimum of 180 credits to obtain the degree. Doctoral programmes include

obligatory course work and individual research. The doctoral dissertation is the final part of the study program at the doctoral studies, except doctors of arts, which is an artistic program. Accomplished scientific contributions are graded according to the number of the scientific publications, patents or technical innovations.

C. The ECTS system

The Law on Higher Education introduces ECTS as the mandatory credit system to be used by all higher education institutions in all degree programmes, for both credit transfer and accumulation. The ECTS system is fully implemented in all HEIs. The study program contains the elements specified in the LHE. Every study program covers precise description of the courses and the number of ECTS. ECTS credits are based on the workload students need in order to achieve expected learning outcomes. 60 ECTS credits are attached to the workload of a full-time year of formal learning (academic year) and the associated learning outcomes. A proper implementation of ECTS based on student workload and learning outcomes still remains a priority. Developing, describing and implementing learning outcomes is one of the main task. Within the TEMPUS framework there have been several projects involving many HE institutions, where the application of ECTS was widely discussed. The Commission for Accreditation and Quality Assessment (CAQA) also provides continuously actions to assist HE staff in applying ECTS system.

D. National implementation of the standards and guidelines for quality assurance

Serbia operates an integrated national quality assurance system complying with the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). At national level a fully functioning quality assurance system is in operation. The QA system which includes internal, external quality assurance and accreditation is required by the LHE. The Commission for Accreditation and Quality Assessment (CAQA) is legally responsible for organizing and monitoring the quality assurance scheme for all HEIs in Serbia. CAQA is formed (June 2006) as an independent expert body of the National Council for Higher Education (NCHE). CAQA designs standards, protocols and guidelines for the NCHE's approval and publication as bylaws and helps institutions in creating their respective quality management systems. CAQA carries out quality assurance processes in forms of accreditation and external quality assurance of all higher educational institutions and study programmes according to LHE. During the development of the QA system, the ESG document was utilized as the main source of information. Therefore, the existing accreditation standards, which do include QA topics, fully comply with the ESG.

The HEIs have the legal obligation to develop internal quality assurance systems. The implementation of the standards for internal quality assurance is in the first place the responsibility of the institutions. Internal quality assurance is one of the themes in the accreditation frameworks. Important elements on which programmes will be assessed for accreditation are whether there is a coherent system of internal quality assurance with clear goals and regular monitoring which leads to continuous improvement. The self-assessment report is an obligatory document in the accreditation file of any HEI. Students are involved in the preparation of self-assessment reports and in the follow-up procedures.

The external quality assurance system operates at the national level; only accredited higher education institutions and study programmes are entitled to award bachelor, master and doctoral - PhD degrees.

E. Recognition of degrees and study periods

The Diploma Supplement

The Law on Higher Education also introduces the Diploma Supplement as a mandatory document to be issued by all higher education institutions, for all programmes. The DS is issued automatically and free of charge in Serbian and English and the language in which the study programme was carried out (if different from Serbian and English). NCHE approved the form of the Diploma Supplement proposed by a special commission nominated within MoE, which is in agreement with the EU/CoE/UNESCO format. Traditionally, the communication tool towards the labor market has been the title of the qualification itself.

Joint degrees

The Law on Higher Education allows for joint study programmes organized by more than one licensed higher education institutions. A joint degree can be issued upon approval from all higher education institutions involved. Some

higher education institutions in Serbia currently carry out joint degree programmes with local and foreign partners. The percentage of the HEIs which are involved in joint degree programmes is less than 20%. Future challenges should include increasing number of joint degree programmes, especially PhD programmes.

Mobility

In order to increase student and staff mobility, several actions have been undertaken at both the national and the institutional levels, so that all major universities participate in mobility programmes. A great number of mobilities has been realized through research projects supported by the Ministry of Science and Technological Development. There are also some bilateral agreements on student and staff mobility. Part of the mobilities is also carried out through various international students' associations (of medicine, economy, pharmacy students, students of technical sciences). Since Serbia participates in Erasmus Mundus External Cooperation Window, Erasmus Mundus and Tempus programmes, students and staff have better opportunities for mobilities. Financial support to mobilities is provided by these programmes. Also, there are some system mechanisms for colleagues from other countries to come to HE institutions in Serbia. Still there are some obstacles related to financial support and visa issues.

National structures which oversee the implementation of Bologna Process in Serbia are in line of major Bologna trends. All the institutions: The National Council for Higher Education (NCHE), The Conference of Serbian Research Universities, The Conference of Serbian Universities of Professional Studies, The National Team of Higher Education Reform Experts – HERE continuously supervise the implementation of the Bologna Process, and the Ministry of Education is going to re-establish the national BFUG in the near future.

The progress has been made towards the development of national quality assurance system, the implementation of three-cycle structure and of ECTS, but much more effort is required for the development of qualifications frameworks and the recognition of qualifications.

Serbia plans measures to improve the active participation in BFUG and cooperation with consultative BFUG members: European University Association (EUA) European Association of Institutions in Higher Education (EURASHE), European Students' Union (ESU), Council of Europe, UNESCO European Centre for Higher Education (UNESCO-CEPES), European Association for Quality Assurance in Higher Education (ENQA).

IV CHANGES IN THE EDUCATION OF TECHNICAL ENGINEERS

The need for a fruitful collaboration between university and industry is a necessity. Universities are currently facing a deep restructuring process, as a result of the European integration, with the goal of creating the European Higher Education Area. On the other hand, enterprises need knowledge for immediate use in practice, for the purpose of meeting the market needs, increasing the competitiveness and generating the profit. Higher education is expected to serve the knowledge economy of the 21st century and should consider corresponding technical environment, tools and functionalities.

Universities need to cooperate with the industry and build relationships to develop joint actions. Universities need to demonstrate their willingness to play the key role, together with industrialists and local authorities. In numerous contacts with representatives from industry and small local enterprises we have concluded that increased interest to involve information technologies in the production systems and to introduce the economic based approach in the engineering decisions do exist.

The cooperation between the Universities and the enterprises should bring mutual benefits and better outcomes for all partners, in terms of improving the quality of graduated students, in terms of their preparation for today's and tomorrow's market. The cooperation should enable development of high quality training materials in advanced technologies areas, adapting to the changing needs of the society/economy and ensuring a more effective link between the fundamental and applied research and its transfer into enterprises. [7]

CA technologies are one of the greatest engineering achievements in the 20th century. Development of information technologies, especially computers and corresponding software systems that made an important support to a engineer-designer during designing process, conditioned a new way of thinking in designing process. Today engineers-designers have a powerful tool that assures selection of the best

solution in all steps of designing process at a particular time and in the particular conditions. [8]

Computer methods and technologies of the CAD/CAE type have contributed to an essentially new approach to the process of designing and engineering designing in recent years. The use of computers shortens this process in many ways enabling a considerably shorter development of products along with an immediate saving of time. Computers can be used for all kinds of calculations in constructing, for graphic representation of the results of work and indirectly, for managing mechanical systems, e.g. CNC(computer numerically control), DNC (direct numerically control), including robotics and FTM (flexible manufacturing system). [9]

The complexity of many of current mechanical systems has been growing exponentially. Unfortunately, it can be said that, generally, the Serbian higher education system has not kept pace with these needs. Existing undergraduate and graduate science and engineering programs need to incorporate more material on engineering educational software.

The issue of quality assurance and control of education is one of the key issues of modern educational process. In Western Europe there is a long tradition of evaluation of educational institutions, caused primarily market forces operating.

Standards of accreditation can be used for development and evaluation of programs in all fields of engineering and the different profiles. They are reported as program results (outcomes of the program) that describe the skills that should have graduates of accredited programs first and second cycles, as required by the European Qualifications Framework. [10]

The concept of engineering education at the Department of Industrial Engineering at the Technical Faculty “Mihajlo Pupin”, Zrenjanin, University of Novi Sad, the basic idea is treated exactly usable knowledge.

Knowledge and competencies acquired in this study program are: basic techniques and technologies in the areas of production, process engineering, energy engineering, maintenance of technical systems, environmental engineering, basic economic discipline required to manage business enterprises; mastering information and communication technologies required for modern business and Management. In the period from 2006 to 2009 he continued to carry out the system of 3 +2 (3 years undergraduate and 2 years of master). Since 2010, teaching is done by utilizing 4 (240 ECST) +1 (60 ECST) - 4 years of undergraduate and master 1 year.

Innovated curricula in the field of engineering at the Technical Faculty "Mihajlo Pupin, a step forward towards the idea of education of industrial engineers who will work in an environment changed under the influence of structural and technological changes, which speaks in favor of a large number of new cases that follow the new trends of the concept.

The objects that make up this study can be divided into the following groups:

- group objects from basic engineering disciplines (mathematics, electrical engineering, fundamentals of mechanical engineering, basics of mechanical materials, technical drawing with computer graphics, computer aided design, automatic control),
- group objects from mechanical engineering (engineering and innovation, thermal techniques with energy, mechanics, hydraulics and pneumatics, principles of machine design, production technologies, engineering materials, assembly technology, reliability of machinery, technology maintenance, design and technological systems),
- group of objects that give access to the system (systems theory, operations research),
- group management of cases (maintenance management, electronic business, management methods and decision, management of technology development, project management),
- group objects to which education in industrial engineering embodies (tribology and lubrication, chemical engineering principles to protect the environment, instrumentation, cadastre and monitoring, machinery and appliances, gas stoves and process systems, solid and hazardous waste, process plant, technical diagnostics, air conditioning heating cooling, environmental projects, protection and decontamination of the land).

All items one semester and carry the appropriate number of credits. A large number of these cases has the status of the election, which is

another example of harmonization with the Bologna Declaration. This allows the students according to their interests during the process of education specialize in certain aspects, which represents a major shift since the current curriculum did not contain subjects and students have their own narrow interests could express it only after five years of study and passed all examination, the selection of topics for graduate work. This approach will certainly more clearly define the degree of industrial engineering at the Technical Faculty "Mihajlo Pupin", which is formally protected through the issuance of the Diploma Supplement after graduation.

Considering the above, the main advantage of the innovated teaching process for the education of industrial engineer at the Technical Faculty «Mihajlo Pupin» are:

- clearly define the outputs of the program of study,
- harmonization with European levels of education (elementary studies - BSc, 4 years, graduate studies - MSc, 1 year) and the introduction of ECTS,
- education in accordance with the interests of - a number of electives subjects,
- mobility of students and teachers, international cooperation - the Diploma Supplement.

V CONCLUSION

The Bologna Declaration insists on development of education and advances in scientific knowledge, acceptance of European standards while at the same time we need to reform and adjust our education system. The reformed education is expected to increase professional and creational efficiency of studies, to decrease the duration of studying, increase mobility of students towards higher levels and forms of education and advancement, to assure that the students keep up with development of science and master the skills and thus provide accordance of qualifications with work demands imposed by a particular profession.

Improvement of quality of teaching is an important task of any teacher in an educational institution. The aim of the Bologna Process is to assure the qualitative studies everywhere in Europe.

The actual programs of study in universities in Serbia can prepare engineers for challenges they will face in an economy in transition, while companies have confidence in engineers who are educated in our higher education institutions.

Implementation of the Bologna concept study confirms the readiness of our University of continually working to improve the quality of higher education, assess the results achieved and that basis create the following activities. The more understanding the relationship between educational needs and opportunities should be a continuos process of monitoring, interpreting and understanding various aspects of the theory and practice of education and teaching.

REFERENCES

[1] www.euractiv.com/education/bologna-process/article-117448. Accessed on: 2011.

[2] Cosic I, Kovacevic I, Katic V et al., »Bologna 2010: State, dilemmas and perspectives«, XVI Conference of the Development Trends, Kopaonik, 2010., Serbia, pp.13-16.

[3] The Bologna Process 2020 – The European Higher Education Area in the new decade, Conference of Europien Ministers Responsible for Higher Education, Leuven, April 2009.

[4] www.bologna-bergen2005.no/Docs/00-Main_doc/990719BOLOGNA_DECLARATION.PDF. Accessed on: 2011.

[5] The Bologna declaration, Ministry of education and science, Republic of Serbia, www.mpn.gov.rs, Accessed on: 2011.

[6] www.tempus.ac.rs. Accessed on: 2011.

[7] Gecevska, V., Lombardi, F. and Čuš, F, "E-learning opportunity in high education for engineers", Annals of the Faculty of Engineering Hunedoara – Journal of Engineering, VII – 2, 2009., pp. 193-198, ISSN 1584 – 2665.

[8] Desnica, E., Letić, D., Gligorić, R., and Navalušić, S., "The importance of improving education for successful performance of engineering tasks", The 7th International Symposium KOD 2012 - Machine and industrial design in mechanical engineering, Hungary, May 2012.

[9] Letić, D. And Desnica, E., Inženjrska grafika I i II – scenario u AutoCAD-u, Tehnički fakultet »Mihajlo Pupin«, Zrenjanin, 2011.

[10] Tarle, P., S. and Davidović, M., "Obrazovanje u funkciji strukturnih i tehnoloških promena u poštanskom i telekomunikacionom saobraćaju", XXIV Simpozijum PosTel 2006, Beograd, str. 29-38.

INFORMATION OVERLOAD IN POWERPOINT PRESENTATIONS

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Abstract - There are many articles today which stress the benefits of using PowerPoint and slide presentations in the classroom. Many authors believe that PowerPoint slide show presentation programs provide an effective approach to both student work and classroom instruction. However, there is little consistent evidence to show that teaching with PowerPoint leads to significantly better learning and significantly better grades than teaching by more conventional methods. The explanation may lie in the fact that authors of presentations build too much information into the slides. In such cases students face the challenge of information overload: meaningful learning requires that the learner engage in substantial cognitive processing during learning, but the learner's capacity for cognitive processing is severely limited. Instructional designers have come to recognize the need for multimedia instruction that is sensitive to information load. In designing a PowerPoint presentation teachers should apply principles for information off-loading, listed in this paper.

I INTRODUCTION

Even though the research on learning with pictures has been conducted from different theoretical perspectives [1,2], recent cognitive theories like Mayer's ''Cognitive Theory of Multimedia Learning'' [3,4] or Schnotz's ''Integrative Model of Text and Picture Comprehension'' [5] can be used to describe and explain the results of a large number of studies. Mayer's theory, for example, regards the learner as a constructor of his or her own knowledge, actively selecting, organizing, and integrating relevant visual and verbal information. It is based on three basic assumptions:

1) Active processing: According to Wittrock's generative theory of meaningful learning [6,7], learning occurs when learners actively process information through the following series of activities: select - organize - integrate).

2) Dual channel processing and dual coding: From Paivio's dual coding theory [8] and Baddeley's working-memory model [9], the notion of two different cognitive systems for information processing is taken: a verbal system transmitting and processing sequential information like written or spoken text and a visual system responsible for spatial information and images.

3) Limited capacity: The overall information processing capacity is very strictly constrained by the limitations of short-term memory load within each system [9, 10].

There is strong empirical evidence that learning outcomes are improved by presenting the learner with verbal and pictorial information in a coordinated way (the so-called ''multimedia principle''[3,4].

Schnotz and Bannert (2003) [11] proposed a cognitive model of multimedia learning, which integrates a considerable amount of empirical findings from the text and picture comprehension literature.

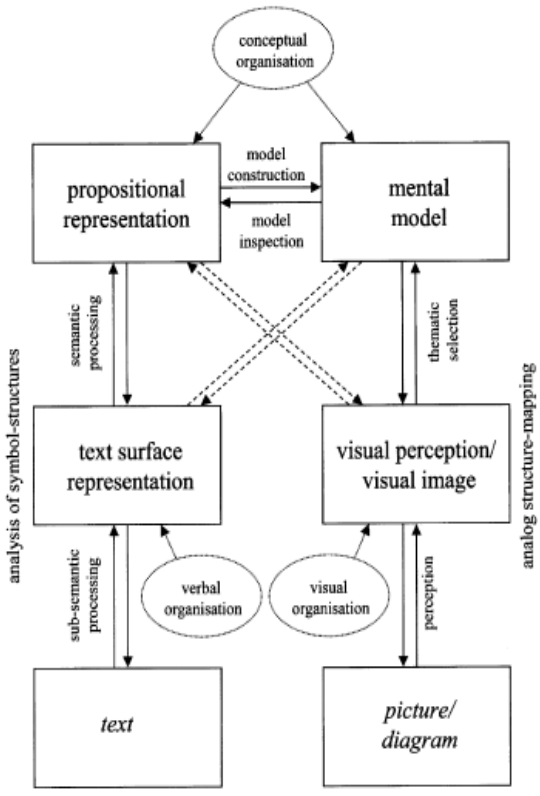

Figure 1. A cognitive model of multimedia learning [11]

Designing multimedia learning environments, however, is aimed not only at enhancing learning results but also at optimizing learning efficiency [12, 13]. Optimizing efficiency requires data about learning results and the cognitive resources that have to be invested to achieve these results. Especially the amount of working memory resources required for achieving a learning task is critical because working memory resources are assumed to be strictly limited [12, 14, 15]. Schnotz and Bannert's model is especially suitable to derive hypotheses on working memory demands required for learning based on verbal and pictorial materials.

Schnotz and Bannert [11] assume that comprehension is a continuous process in which mental structures are constructed step by step in the learning process and are updated by currently processed information (verbal or pictorial). This integration process requires old and new information to be simultaneously available, which taxes working memory resources.

Availability of the integrated mental model requires not only retrieval of a particular proposition or pictorial element, but also retrieving its (inferred) relation(s) to other elements. Although this argument clearly corresponds to Schnotz and Bannert's model it also fits several other mental model theories of comprehension [16, 17, 18, 19, 20, 21].

Mayer and Moreno assume that processing in both channels results in two mental models, a ''verbal mental model'' and a ''visual mental model''.

In both channels, information is processed independently until the two mental models are established. Referential connections between the models are constructed only at this level of processing.

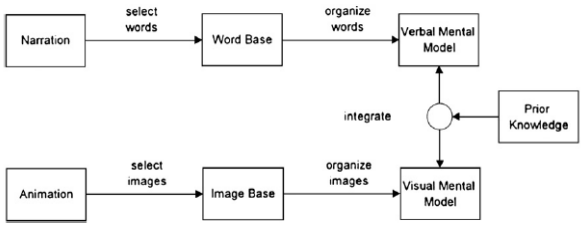

Figure 2. A cognitive theory of multimedia learning [12]

II ROLE OF POWERPOINT PRESENTATIONS IN CONTEMPORARY EDUCATION

PowerPoint should be recognized as a new communication medium that is fundamentally changing the nature and dynamic of how we teach. In 2002, it was estimated that more than 400 million copies of PowerPoint were in circulation and that "somewhere between 20 and 30 million PowerPoint-based presentations are given around the globe each day" [22]. Those numbers seem likely to have grown exponentially since then. Indeed, Parker [23] alleged that to "appear at a meeting without PowerPoint would be unwelcome and vaguely pretentious, like wearing no shoes". In the past three decades there has been a decisive shift in the media that have been used to communicate messages in educational settings. We have gone from the era of "chalk-and-talk" and occasional flip-charts to overhead transparencies and to PowerPoint slides.

III ADVANTAGES AND DISADVANTAGES OF POWERPOINT PRESENTATIONS

Using PowerPoint and slide shows to teach offers benefits to both students and teachers. Technology surrounds students. To reach them, teachers must use the language they understand: technology. Using PowerPoint and slide shows, you can integrate multiple sources in your classroom presentations. PowerPoint and slide presentations hold student attention through the use of video, graphics and music. Because students today are so technologically advanced, tools that involve technology such as slide shows increase student involvement and interaction.

The usual advantages of PowerPoint presentations are listed as follows [24]:

1. PowerPoint is fun to watch and fun to make.
2. Used correctly, PowerPoint can accommodate all learners' needs.
3. It motivates students when used in moderation.
4. PowerPoint allows you to reflect on your lesson and correct any needed changes.
5. You are able to print out what you did in class for students that were absent. Better yet, turn the accountability on to students and post your presentations on-line.
6. PowerPoint is not hard to learn. It is rated "B+" for ease of use. It should take about one hour to learn the basics

7. You can easily input images, media and recordings.

8. Templates are built in for different appearances.

9. You can add notes pages.

10. They are more exciting than a simple word document or hand written presentation.

11. Master slides make presentations consistent.

However, Powerpoint presentations also have a number of disadvantages [24]:

1. File size can become quite large on medium to large presentations

2. Some of the features can be quite complicated to use and even the simple features require some getting used to

3. When at work, you can't rely on someone else's computer or laptop to run your presentation, there are too many software conflicts and disk space barriers.

4. It takes quite a bit of time to create a complete presentation

5. Some features such as animations and backgrounds can distract the audience from the actual information in the presentation

IV EFFECTIVENESS OF POWERPOINT PRESENTATIONS

Most users of PowerPoint appear to conceive their goals as educators to involve merely a one-way transmission of knowledge, rather than to promote the construction of knowledge and the analysis and synthesis of knowledge [25].

Given the widespread adoption of PowerPoint, the small number of studies of its effectiveness is surprising [26, 27]. Journal articles indicate that students like to be taught using PowerPoint and think that PowerPoint presentations are entertaining, that they enhance clarity, and aid recall of subject matter [28, 29, 30, 31]. Several studies point to the idea that graphics improve student recall [27, 32, 33, 34]. There is little consistent evidence, however, to show that teaching with PowerPoint leads to significantly better learning and significantly better grades than teaching by more conventional methods. A majority of studies shows that use of PowerPoint is not associated with a significant improvement in student grades [27, 30, 31, 35]. In fact, one study demonstrated a decrease in student performance when the instructor switched from transparencies to PowerPoint [36].

PPT have a greta potential to help teachers in delivering educational content; however, if used inappropriately, they present a barrier between teachers and students. Many times, students leave lectures taking only a small percentage of information that teachers have presented in a class. This is because some presentations contain too much information presented in a short time – too many pictures, large blocks of text, multicoloured backgrounds, animation effects... In fact, many characteristics of PPT presentations are in collision with the way the human brain works. Design of a PowerPoint presentation should be harmonized with the learning habits of human brain.

V HOW HUMAN BRAIN WORKS

The human brain is a complicated, creative information-processing system. Information processing starts with input from the sensory organs, which transform physical stimuli such as touch, heat, sound waves, or photons of light into electrochemical signals. Once information is processed, an attention filter decides how important the signal is and which cognitive processes it should be made available to. For example, although your brain processes every blade of grass when you look down at your shoes, a healthy attention filter prevents you from noticing them individually. In contrast, you might pick out your name, even when spoken in a noisy room. There are many stages of processing, and the results of processing are modulated by attention repeatedly.

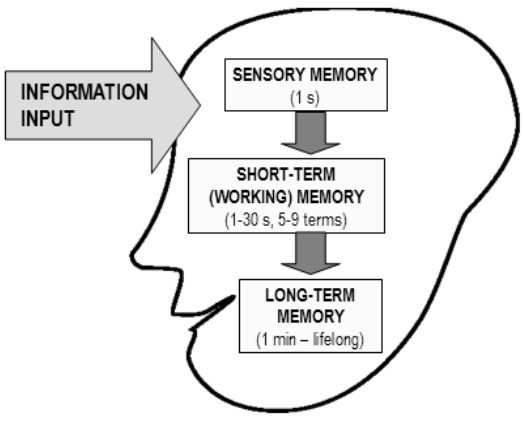

Figure 3. How human brain stores information

In order for the brain to process information, it must first be stored. There are multiple types of

memory, including sensory, working, and long-term (Figure 3).

First, information is encoded. There are types of encoding specific to each type of sensory stimuli. For example, verbal input can be encoded structurally, referring to what the printed word looks like, phonemically, referring to what the word sounds like, or semantically, referring to what the word means. Once information is stored, it must be maintained. Some animal studies suggest that working memory, which stores information for roughly 20 seconds, is maintained by an electrical signal looping through a particular series of neurons for a short period of time. Information in long-term memory is hypothesized to be maintained in the structure of certain types of proteins.

Learning is defined as a permanent change of a human long-term memory. Our capability to process information is a multi-step process which comprises: perception, attention, selection, organization and integration of information. Students are able to understand and memorize the presented material only when they organize information into a coherent mental structure and integrate them with previous knowledge.

VI WORKING MEMORY CAPACITY

Sensory and long-term memory have infinite capacity. However, capacity of working memory is very limited. Human brain is capable of processing only a few terms simultaneously - a few words or a few images or sounds. In his article, Miller [37] discussed a coincidence between the limits of one-dimensional absolute judgment and the limits of short-term memory.

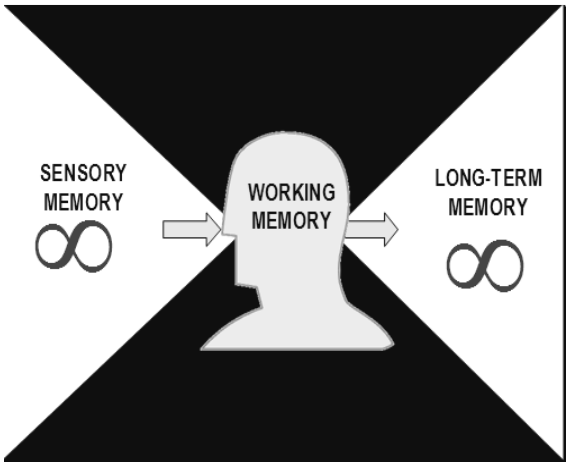

Figure 4. Working memory has a very limited capacity

Performance is nearly perfect up to 5 or 6 different stimuli but declines as the number of different stimuli is increased. In order to store sensory information into long-term memory of our listeners, it is necessary to „squeeze“ it through a narrow channel - working memory (Figure 4).

In design of a PowerPoint presentation it is necessary to take into account the limited capacity of a brain’s working memory, thus minimizing the possibility of overload of a cognitive system [38].

Cognitive theory offers theory-based assumptions about how people learn from words and pictures. *Dual channels* is the concept that the human cognitive system consists of two distinct channels for representing and manipulating knowledge: a visual-pictorial channel and an auditory-verbal channel. The visual channel handles information presented to the eyes (such as illustrations, animation, video, or on-screen text). The verbal channel handles information presented to the ears (such as narration or nonverbal sounds).

VII INFORMATION OVERLOAD

Typically you choose to use PowerPoint in your presentation for several reasons:

1. To help your audience to **understand**.
2. To help your audience to **learn**.
3. To help you to get your **message** across.

But have you ever thought about what happens when you build too much information into your slides?

When members of your audience become confused they switch off. Their working memories have become overloaded and they have become frustrated. As a presenter, it's not the reaction you want.

A growing body of research explains the science behind PowerPoint overload, and lays out recommendations to reduce the load. In light of the science, it is up to us to make a fundamental shift in our thinking. We have to change our PowerPoint habits to align with the way people learn

In designing a PowerPoint presentation, one should have in mind the following rules:

1. PPT slide shows should contain both visual and verbal forms of presentation,

2. too many objects on a slide cause the overload of a human cognitive system,

3. presentation should be made in a such way to provide students with an opportunity to select, organize and integrate the presented information.

Mayer et al [39] have been conducting dozens of research studies on multimedia learning – the potential of using words and pictures together to promote human understanding. The studies have resulted in a substantial body of research with clear recommendations for multimedia design principles.

Five specific PowerPoint techniques lay out a pathway for reducing PowerPoint overload, each of which applies a research-based principle [39]:

1. The Signaling Principle,
2. The Segmenting Principle,
3. The Modality Principle,
4. The Multimedia Principle,
5. The Coherence Principle.

The signaling principle

The usual way of creating a PPT slide is to start with a title in the upper part of a slide. However, the title itself does not explain the main idea of a slide. Instead of writing a title, write a *headline* that explains the main idea of every slide (Figure 5). Write your headlines in active voice, with a subject and verb. This process of writing a headline will help you distill and clarify your own thinking about your topic.

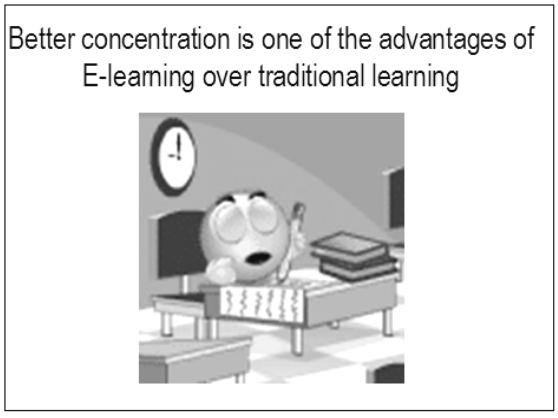

Figure 5. Illustration of the signaling principle

The segmenting principle

The "Normal" view of the PPT slide is the place where you design individual slides. But when you focus on a single slide, it's easy to pile on the information which only serves to shut down understanding. You should break up information through your presentation by referring frequently to the Slide Sorter view (Figure 6). From this perspective, you can read the headlines you've written and see how your story flows.

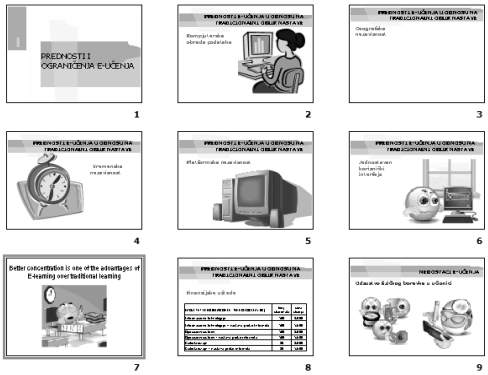

Figure 6. Illustration of the segmenting principle

The modality principle

Visual overload can be removed by moving text off-screen, and shifting the processing to the auditory channel by narrating the content instead. Mayer et al have established that listening only to words and simultaneously watching the graphics on slides leads to 28% higher retention of information than reading the text along with watching graphic. The elegant way to accomplish this in PowerPoint is to use the Notes Page view (Figure 7).

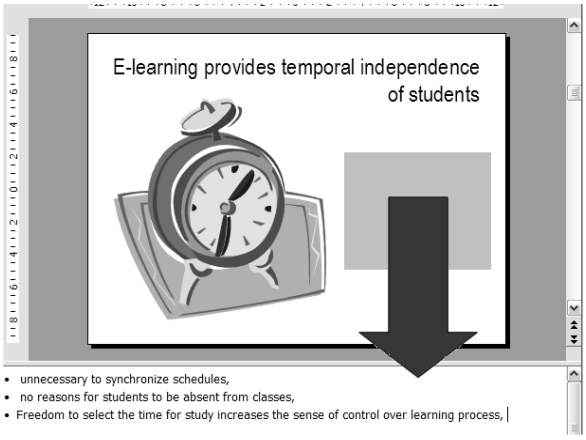

Figure 7. Illustration of the modality principle

The multimedia principle

People learn better from words and pictures than from words alone [40]. In a presentation, it is common to see a series of PowerPoint slides filled with bullet points and no visuals besides a logo and a colored background. There are a number of reasons we put bullets alone on a slide: they are easier to produce than graphics and they remind us

of what we want to say when we speak. But for whatever reasons we use bullets, text alone on a screen is simply not effective [39]. Instead of text, use graphics, which have a far larger capacity of describing phenomena than bulleted text.

The coherence principle

When we put everything we know on a topic to a slide in a PPT presentation with an aim to impress our listeners, we are actually doing the opposite. Too much redundant information stops their cognitive ability to process information. One of the hardest things to do is to keep things simple. When making a slide, cut out everything that does not support your main idea – text that you will narrate, logos, fancy animations and complex, multicoloured backgrounds that have no connection with the slide context (Figure 8).

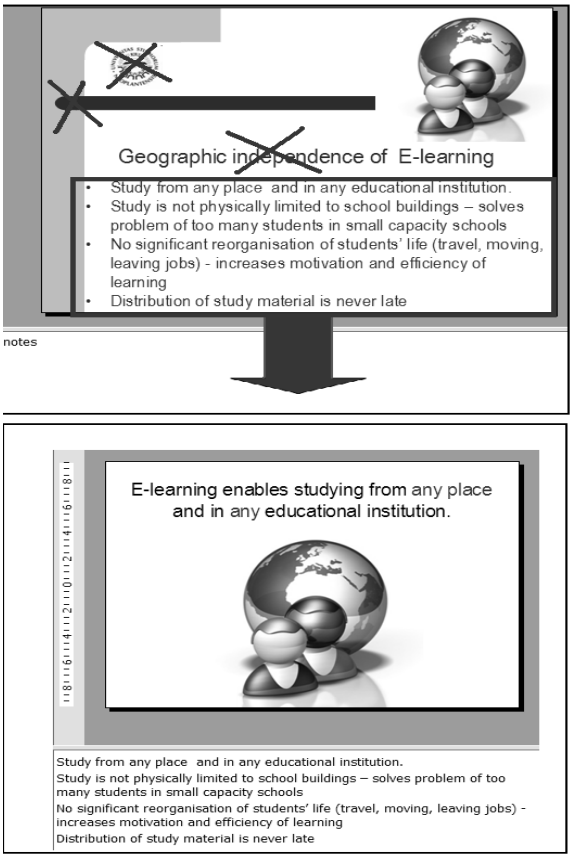

Figure 8. Illustration of the coherence principle

VIII CONCLUSION

Nowadays, PowerPoint presentations (which should enrich the educational message) are becoming THE message, resulting in reduction of an audience's attention applied to a teacher's discussion of relevant content. Audience has a problem when it tries to assimilate the same information from two different sources at the same time. Thus, minimizing of information overload in a PowerPoint presentation should be a central consideration in the design of multimedia instruction.

ACKNOWLEDGEMENTS

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REFERENCES

[1] Levie, W. H., & Lentz, R. (1982). Effects of text illustrations: a review of research. Educational Communication and Technology Journal, 30, 195-232.

[2] Lewalter, D. (1997). Learning with pictures and animations: a study on the effects of student attributes on the effectiveness of illustrations. In L. J. Issing, & P. Klimsa (Eds.), Information und Lernen mit Multimedia und Internet (pp. 83e96). Weinheim: Beltz-PVU.

[3] Mayer, R. E. (2001). Multimedia learning. Cambridge: Cambridge University Press.

[4] Mayer, R. E. (2005). Cognitive theory of multimedia learning. In R. E. Mayer (Ed.), The Cambridge handbook of multimedia learning (pp. 31-48). Cambridge: Cambridge University Press.

[5] Schnotz, W. (2005). An integrated model of text and picture comprehension. In R. E. Mayer (Ed.), The Cambridge handbook of multimedia learning (pp. 49-69). Cambridge: Cambridge University Press.

[6] Wittrock, M. C. (1974). Learning as a generative process. Educational Psychologist, 11, 87-95.

[7] Wittrock, M. C. (1989). Generative processes of comprehension. Educational Psychologist, 24, 345-376.

[8] Clark, J. M., & Paivio, A. (1991). Dual coding theory and education. Educational Psychology Review, 3, 149-210.

[9] Baddeley, A. (1992). Working memory. Science, 255, 556-559.

[10] Chandler, P., & Sweller, J. (1991). Cognitive load theory and the format of instruction. Cognition and Instruction, 8, 293-332.

[11] Schnotz, W., & Bannert, M. (2003). Construction and interference in learning from multiple representation. Learning and Instruction, 13, 141-156.

[12] Mayer, R. E., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. Educational Psychologist, 38, 43-52.

[13] Paas, F., Renkl, A., & Sweller, J. (2003). Cognitive load theory and instructional design: recent developments. Educational Psychologist, 38, 1-4.

[14] Baddeley, A. D. (1986). Working memory. Oxford, UK: Clarendon Press.

[15] Engle, R. W., Cantor, J., & Carullo, J. (1992). Individual differences in working memory and comprehension: a test of four hypotheses. Journal of Experimental Psychology: Learning, Memory and Cognition, 18, 972-992.

[16] van Dijk, T. A., & Kintsch, W. (1983). Strategies of discourse comprehension. New York: Academic Press.

[17] Gernsbacher, M. A. (1990). Language comprehension as structure building. Hillsdale, NJ: Erlbaum.

[18] Graesser, A. C., Singer, M., & Trabasso, T. (1994). Constructing inferences during narrative text comprehension. Psychological Review, 101, 371-395.

[19] Johnson-Laird, P. N. (1983). Mental models. Cambridge, Great Britain: Cambridge University Press.

[20] Kintsch, W. (1998). Comprehension. New York: Cambridge University Press.

[21] Zwaan, R. A., Langston, M. C., & Graesser, A. C. (1995). The construction of situation models in narrative comprehension: an event-indexing model. Psychological Science, 6, 292-297.

[22] Simons, T. (2005). Does PowerPoint make you stupid? Presentations, 18 (3). Retrieved on November 21, 2012 from http://global.factiva.com/.

[23] Parker, I. (2001, May 28). Absolute PowerPoint. The New Yorker, 77 (13), 76–87. Retrieved on January 10, 2012 from http://polyglot.lss.wisc.edu/lss/intime/AbsolutePPT.pdf, 1–6.

[24] What are the benefits of using powerpoint and slide presentations in the classroom? Retrieved on April 21, 2012, from http://www.ehow.com/info_7826177_advantages-classroom-powerpoint-education.html

[25] Ramsden, P. (1992). Learning to teach in higher education. London, England: Routledge.

[26] Bartsch, R. A., & Cobern, K. M. (2003). Effectiveness of PowerPoint presentations in lectures. Computers and Education, 41, 77–86.

[27] Szabo, A., & Hastings, N. (2000). Using IT in the undergraduate classroom. Should we replace the blackboard with PowerPoint? Computers and Education, 35, 175–187.

[28] Cassady, J. C. (1998). Student and instructor perceptions of the efficacy of computer-aided lectures in undergraduate university courses. Journal of Educational Computing Research, 19, 175–189.

[29] Perry, T., & Perry, L. A. (1998). University students' attitudes towards multimedia presentations. British Journal of Educational Technology, 29, 375–377.

[30] Susskind, J., & Gurien, R. A. (1999). Do computer-generated presentations influence psychology students' learning and motivation to succeed? Poster session, annual convention of the American Psychological Society, Denver.

[31] West, R. L. (1997). Multimedia presentations in large classes: A field experiment. Annual Convention of the American Psychological Society, Washington, DC.

[32] ChanLin, L.-J. (1998). Animation to teach students of different knowledge levels. Journal of Instructional Psychology, 25, 166–175.

[33] ChanLin, L.-J. (2000). Attributes of animation for learning scientific knowledge. Journal of Instructional Psychology, 27, 228–238.

[34] Lowry, R. B. (1999). Electronic presentation of lectures—Effect upon student performance. University Chemistry Education, 3, 18–21.

[35] Stoloff, M. (1995). Teaching physiological psychology in a multimedia classroom. Teaching of Psychology, 22, 138–141.

[36] Bartlett, R. M., Cheng, S., & Strough, J. (2000). Multimedia versus traditional course instruction in undergraduate introductory psychology. Annual Conference of the American Psychological Association, Washington, DC.

[37] Miller, G. A. (1956). "The magical number seven, plus or minus two: Some limits on our capacity for processing information". *Psychological Review* **63** (2): 81–97

[38] Oberauer, K., Süß, H.-M., Schulze, R., Wilhelm, O., & Wittmann, W. W. (2000). Working memory capacity - facets of a cognitive ability construct. *Personality and Individual Differences, 29*, 1017-1045.

[39] Atkinson, C. & Mayer, R. Five ways to reduce PowerPoint overload, Retrieved on April 21, 2012 from http://www.sociablemedia.com/PDF/atkinson_mayer_powerpoint_4_23_04.pdf

[40] Levie, W. H. & Lentz, R. (1982). Effects of text illustrations: A review of research. *Educational Communication and Technology Journal, 30, 1*95-232

INFORMATION LITERACY AND INFORMAL CONTEXT LEARNING

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Abstract - Informal learning does not have the appropriate status of the generally accepted measures referring to education. The informal learning values and methods are less present than the principles values and methods presented by schools, faculties and universities. The expansion of the information technologies development and application in all spheres of society demands a new, wide and versatile knowledge, which is to say that the formal learning can hardly satisfy all individual and social needs. On the other hand, informal learning has not been exploited enough.

Due to everything that has been stated, it is necessary to explore in detail the degree of students' information literacy and the factors that affect the level of students' information literacy. Are these factors educational institutions, family, peers, the Internet, mass-media,...? Do the informal learning and particular educational activities that help you 'learn without noticing you are learning' have an impact on students' level of information literacy and to what extent?

I INTRODUCTION

Contemporary revolutions in science and technology have given rise to outstanding changes in all spheres of society. As a civilizing process, informatization has an impact on all segments of life and work, including the systems of education. Many scientists believe that the contemporary education is not sufficiently oriented towards the achievements and attainments of the information and communication technologies (ICT). Therefore, numerous political and pedagogical strategies have been implemented in order to acknowledge and validate informal education and learning, in within the European Union and European Council, as well as within the cooperation of these two European institutions.

Commerce development tendencies have shown that education and creation of human resources are among top priorities of national strategies and policies of social, economic and technological advancement. Constant changes in society and economics, a rapid development in science and technology and especially the expansion of modern and postmodern technology forms represent a highly educated population that is capable of successfully participating in social processes and using the available technology. In this way, developed societies necessarily become learning societies.

Education is obliged to follow the most innovative information technology achievements and to use new technologies. The basic task of educational systems is to ensure that every individual develops his potential, becomes capable of using his knowledge and of improving it, selects what is important within a certain context and understands what he has learned. Solving this task is not simple but one thing is certain-changing and adjusting educational contents, approaches, structures and strategies, including the inclusive approach to students are starting points which lead towards solving the task.

The basic objective of introducing the contemporary technology into an educational environment is to facilitate obtaining knowledge and to make that knowledge lasting as much as possible. It depends both on financial opportunities and subjective factors – lecturers and students, on his volition and capability of dealing with the contemporary technology.

It is in human nature to be intimidated by introducing innovations and to resist them. It is a natural fear of changes, convictions referring to a negative effect of those innovations and to overcoming the 'obstacles' which go along with innovations. This is exactly when it is necessary to enrich learning by applying contemporary technologies but also to open the door of informal learning, so that the gaps in the area of possessing skills are fulfilled, which makes knowledge and skills visible. This is how the students' motivation is affected in a positive manner because by explicitly recognizing what people can do, one can experience his own values. To a great extent ICT will contribute towards making the obtained knowledge up-to-date, developing, exploratory and technological. Simply, today both students and lecturers have to know how to use contemporary methods and technologies in the sphere of education.

Within an information-oriented society teaching methods have to improve the teacher's and student's ability to use the power of information. Teachers should always point out the importance of a high quality of information. Students should be taught to make a distinction between a fact and an opinion. The key lies in the ability of evaluating information, establishing its value in comparison to other information and in establishing authenticity and modernity. Is there any space for informal education and informal learning for teachers and students? Currently, the informal learning does not have the status of generally accepted measures referring to education. The informal learning principles, values and methods are less present than the principles, values and methods presented by schools, faculties and universities. The expansion of the information technologies development and application in all spheres of society demands a new, wide and versatile knowledge, which is to say that the formal learning can hardly satisfy all individual and social needs. On the other hand, informal learning has not been exploited enough in our country.

It is equally important that students possess both information and informational literacy, the knowledge about these sorts of literacy and how important they are for education today.

II LEARNING IN DIFFERENT LIFE CONTEXTS – LIFE-WIDE LEARNING

In Europe contemporary flows in the sphere of education strongly promote 'learning during whole life' – lifelong learning but also learning in 'different life contexts' – life-wide learning. The ambitious strategic aim of the European Union, proposed in Lisbon in 2000, suggests that Europe should become 'the most dynamic and competitive economics based on knowledge' until 2010. To put it more simply, it should get closer to the ideal 'Europe of knowledge'. Both younger and elder people should be encouraged to use opportunities for their own improvement in and out of a school context.

Every kind of learning which leads towards a higher rate of employment, personal development, more active attitude in society and understanding contemporary European values should be valued and acknowledged. In this context, thanks to its flexibility and ability to respond to rapid and intensive changes of 'Growing Europe', informal learning has a significant role. In recent years, numerous political and pedagogical strategies have been implemented in order to acknowledge and validate informal education and learning, in within the European Union and European Council, as well as within the cooperation of these two European institutions. The fact that using Tablet PCs in the world (the USA, Japan, China, India, South Korea) has become a reality the best testifies how much attention in the world is paid to new educational technologies, i.e. their application in teaching. For instance, the Ministry of Education of South Korea has published a plan to digitalize all school books until 2015. The Ministry will provide free Tablets for children coming from poor families.

The term 'learning in different life contexts', which appears in various documents of the European Union, points to three basic forms of education in the contemporary society – formal education, informal education and informal learning.

A. Formal education

Formal education is conducted in specialized school institutions and after this process an individual obtains a certificate about the qualifications gained. Formal education is regulated by particular legal acts and knowledge and skills are obtained according to a plan and program that has been determined in advance in accordance to established education standards. Knowledge is gained gradually, depending on the age and this is why it is divided into grades and degrees (primary school, secondary school, higher school and faculty). Prime characteristics of formal education are: high level of institutionalization, equality on the level of primary education, varied secondary and tertiary education which enables specialization in various kinds and levels of qualification. The basic disadvantage of formal education is its inertia because it adapts more slowly to society changes, i.e. it does not follow rapidly all the changes in society and development of new educational technologies.

B. Informal education

The Europe's new educational area represents an affirmation of lifelong learning and linking formal and informal forms of education via developing programs of good quality.

A consequence of the formal education inertia or its own nature results in its not being able to keep track of the development of new discoveries. Therefore, informal education's purpose is to make formal education complete and to give us the

opportunity to access all those contents which are inaccessible through formal education or which are completely intact; such as various courses in specific skills and practical business skills, self-improvement etc. However, there are numerous similarities between formal and informal education – both are based on a bipolar process of teaching and learning with lecturers or teachers, and on teaching contents. Due to the lack of a sufficiently effective model of flexible formal education, in some cases, informal education is the one that narrows the gap between the existing and necessary education, scientific disciplines and wishes of young people. Informal education is conducted through activities such as courses, seminars, lectures, conferences, workshops, different types of training and volunteering. Even though informal education is not legally regulated and there are not any particular rules about what it should be like, there has to be a frame within which it can be conducted, as well as the aims and tasks which have been prepared in advance and which are to be followed and adapted to a target group. Exactly due to the differentiation of education contents, it has to be flexible in order to suit all students. What is typical of informal education is that students have to take part in those courses, seminars etc. voluntarily, and usually it does not depend on the age, experience or previous education. A lecturer has to be a trained and competent person and his/her role is not just teaching but also there has to be an exchange of experience and skills between them, and students have to learn through practical work, so that those who are learning become active factors of the learning process.

C. Informal learning

According the EU Commission (2000):

"Informal learning is a natural part of everyday life. As opposed to formal and informal education, informal learning is not necessarily intentional, and therefore it can be recognized by individuals themselves as a contribution to their knowledge and skills." [5]

"Informal learning is a lifelong process through which every individual gains attitudes, values, skills and knowledge from everyday experience and educational influences coming from the environment." [6]

Informal learning, also known as 'life school' is the oldest way of acquiring knowledge and skills; it is something natural in everyday life. It is lifelong, voluntary, unplanned and spontaneous; it appears through interaction with friends, parents and media, without any special plan or structure. Informal learning represents a combination of life and learning and it relies on systemic and cumulative aspects of everyday experiential learning.

As opposed to formal and informal education, informal learning does not have to be conducted consciously, and it often comprises educational activities that help you 'learn without noticing you are learning'. The substantial difference between formal education and informal learning is that formal education invariably implies teaching, whereas this is not the case with informal learning. In contemporary high-tech societies informal learning can take place in various environments such as libraries, museums, scientific centres, botanical gardens and mass-media, and one of the most exploited resources of informal learning is the Internet.

The strategy and concept of learning has become a major baseline for social, state and educational policies in the world. Its realization depends on individuals' qualifications for operating in an informatics environment, possessing skills of finding, selecting, evaluating and using information timely; in other words, it depends on information literacy.

III INFORMATION LITERACY

The fact that the International Alliance for Information Literacy (IAIL) was formed in 2003 at the suggestion of the Prague Conference of Experts on Information Literacy the best shows how much attention is paid to information literacy in the world.

One of its objectives is to allow the exchange of research work and knowledge about information literacy between nations. The International Alliance also believes that *lifelong learning* is a basic human right and that her final goal is the usage of information literacy in order to offer the opportunity to take part in the *information society* to all people, so that they can exercise their right. Founders of the International Alliance are the Institute for Information Literacy of Australia and New Zealand (ANZIL), with its bases in Australia and New Zealand (http://www.anziil.org/), European Network for Information Literacy (EnIL), with its base in the European Union (http://www.ceris.cnr.it/Basili/EnIL/index.html), National Forum for Information Literacy (NFIL), with its base in the USA (http://www.infolit.org), NORDINFOlit with its base in Scandinavia,

SCONUL (Society of College, National and University Libraries) and Advisory Board on Information Literacy with its base in the United Kingdom (http://www.sconul.ac.uk/groups/information_literacy).

The concept of information literacy developed along with the advancement in information and communication technology in the early 1970s, and the term was first used in 1974 by Paul Zurowski, who was the first man of the information industry at the time. On behalf of the National Commission on Libraries and Information Sciences in his report he defined information literacy as 'an efficient exploitation of information in a problem solving context'. [1]

The American Library Association (ALA) says: "In order to possess information literacy, a person has to be capable of recognizing which particular information is needed and afterwards, that person has to be capable of finding, evaluating and using the information efficiently."

Finally, in 1989 the U.S. Presidential Committee on Information Literacy published a report which even more pointed out the significance of information literacy by defining it as 'the ability to recognize important information, and also to find, evaluate and use it efficiently'; once again pointing out that information literacy is 'a skill necessary for lifelong learning and for creating an informed and prosperous citizenry'. [2]

In 1998 the American Association of School Librarians (ASSL) and the Association for Educational Communication and Technology published *Standards of Information Literacy for Students*, which presented nine indicators which can be used by secondary school librarians and teachers when defining an informationally literate student and determining the influence of information literacy on independent learning and social responsibility:

1. An informationally literate student approaches information efficiently and effectively.
2. An informationally literate student assesses information critically and competently.
3. An informationally literate student uses information precisely and creatively.
4. A student learning independently is informationally literate and seeks information in accordance with his own interests.
5. A student learning independently is informationally literate and understands the importance of literature and other creative forms of information.
6. A student learning independently is informationally literate and strives to being successful when seeking information and obtaining knowledge.
7. A student contributing positively to the intellectual development of a community and society is informationally literate and understands the importance of information within a democratic society.
8. A student contributing positively to the intellectual development of a community and society is informationally literate and behaves ethically towards information and information technology.
9. A student contributing positively to the intellectual development of a community and society is informationally literate and participates effectively in seeking and creating information. [3]

In 2000 the Association of College and Research Librarians (ACRL), a branch of the American Librarian Association, published *Information Literacy Competency Standards for Higher Education*; thereby providing five standards and a significant number of indicators regarded as best way for the implementation and evaluation of information literacy programs after finishing secondary school. The five standards are:

- An informationally literate student determines the type and scope of information on his/her own
- An informationally literate student approaches the information needed effectively and efficiently
- An informationally literate student critically assesses information and its sources and incorporates the chosen information as a part of his/her own knowledge base and system of values
- An informationally literate student, either as an individual or as a part of group, effectively uses information in order to reach a particular goal
- An informationally literate student understands numerous economic, legal and social problems which surrounds the information, thereby approaching them

and using them in an ethical and legal manner.

In 2007 the American Librarian Association broadened and altered the standards that should be followed by librarians. The addition published is *Standards for the 21st Century Learner* and it tackles several types of literacy: information, technological, visual, textual and digital literacy. These literacy aspects are organized within four principal objectives which would enable students to "use skills, resources and means", to "explore, think in a critical way and obtain knowledge", to "make conclusions, reach decisions based on facts, apply their knowledge in new situations and create a new knowledge base", to "exchange knowledge and to contribute to the development of a democratic society in an ethical and productive manner" and to "strive to personal and aesthetic development". [4]

IV RESEARCH

The research was done using descriptive methods relating to the collection, processing and interpretation of data. The aim of the research study was to examine the attitudes of students to determine the extent to which informal learning, as an educational resource, affects the level of information literacy of students, i.e. , whether the use of informal learning resources, can increase the level of IT knowledge and skills of students in secondary education. The research tasks were derived from the set of goals in order to determine the exact indications and findings in the extent to which informal learning affects the level of information literacy for secondary school students, respectively, to examine and determine the extent to which the use of informal sources of knowledge affects the computer, digital and multimedia literacy of high school students. Independent variables in the study were gender affiliation, type of school (high school, vocational school) and place of residence (village, city-suburb). The dependent variable was defined as students' attitudes toward using the resources of knowledge adopted and informal learning in the area of computer usage and IT technologies. The dependent variable is operationally defined by respondents / CA on a scale of attitudes as a continuous variable interval level of measurement. The study is the assumption that informal learning significantly affects the level of information literacy of students in secondary schools, or that by using informal sources of knowledge, it contributes to increasing levels of IT, multimedia and digital literacy of students.

A. In this work, the research and interviewing scaling technique is applied, and instruments are accounted for attitude scales and questionnaires. The attitude scale used five-point Likert scale for measuring the intensity of agreement or disagreement with a given claim (70 claims).

B. The sample consisted of fourth grade pupils in grammar schools and secondary vocational schools in AP of Vojvodina, where classes are held in Serbian and Hungarian. The study involved 377 students, and statistical data processing was performed by using the statistical software package for data processing - SPSS 17.0

On the basis of the frequency response of the claims it can be determined as follows:

1. in addition to textbooks, to information and knowledge about ICT, participants come to the least extent by using the professional literature and journals, and is very similar to the information and knowledge gained through educational programs on TV, but as a resource through which students acquire information and knowledge is their communication with friends, a resource that is mostly used for acquiring information and knowledge according to the Internet (77.2%).
2. the claim that knowledge, on how to use the Internet, electronic books and electronic sources of knowledge, was gained outside of school (independent, communicating with friends, using professional journals or using the Internet), 14.1% of respondents said that it is generally true, and 72.7 % of respondents to be very accurate, which taken together is 86.8% of respondents
3. the claim that knowledge about the use of electronic mail has been gained outside of school (independent, communicating with friends, using professional journals or using the Internet), 20.4% of respondents said that this is largely true, and 59.2% of respondents to be very accurate, which taken together is 79.6% of respondents
4. the claim that knowledge about the use of forums on the Internet has been gained outside of school (independent, communicating with friends, using professional journals or using the

Internet), 15.1% of respondents said that this is largely true, and 73.5% of respondents to this very accurate, which taken together is 88.6% of respondents

5. the claim that knowledge to use the download on the Internet has been gained outside of school (independent, communicating with friends, using professional journals or using the Internet) 9.0% of respondents said that this is largely true, and 78.0% of respondents to this very accurate, which taken together is 87.0% of respondents
6. the claim that knowledge to create a blog on the Internet has been gained outside of school (independent, communicating with friends, using professional journals or using the Internet), 13.8% of respondents said that it is generally true, and 56.5% of respondents to this very accurate, which taken together is 70.3% of respondents
7. the claim that knowledge about the use of WiFi networks have gained outside of school (independent, communicating with friends, using professional journals or using the Internet), 14.1% of respondents said that this is largely true, and 71.6% of respondents to be very accurate, which taken together is 85.7%
8. the claim that knowledge to set the video on Youtube gained outside of school (independent, communicating with friends, using professional journals or using the Internet), 12.2% of respondents said that this is largely true, and 74% of respondents to be very accurate, which taken together is 86.2% of respondents
9. the claim that knowledge about how to install and use antivirus software acquired outside of school (independent, communicating with friends, using professional journals or using the Internet), 18.00% of respondents said that it is generally true, and that 58.1% of respondents this is very true, that taken together amounted to 76.1% of respondents
10. for the claim that there is no need to otherwise obtain information and knowledge on ICT for education in the school fully complies with the current events in the field of ICT and is favored by only 13.5% of respondents. [12]

V CONCLUSION

"During their lives all people learn consciously and subconsciously and they have a legitimate necessity to have their learning acknowledged and supported everywhere and in every form." [7]

A constant and accelerated development in science and technology, especially the expansion of modern and postmodern forms of technologies, represents a highly educated population who is capable of participating in social processes efficiently and of using the ICT available, i.e. a population which is informationally literate. The educational trend of today is characterized by striving for flexibility, individualization; it creates a necessity to learn anywhere and at any time through formal and informal education and informal learning.

Educational institutions have to focus on information literacy on all levels. This demands commitment to learning during whole life and the ability to discover and identify innovations necessary for keeping up with changes.

Informal learning is a very important educational process and we are witnesses that a great number of learners are learning in informal contexts. Furthermore, one of the most exploited resources of informal learning is the Internet and it is assumed that a great number of learners have gained knowledge about ICT outside of formal education. Particularly, it should be highlighted that, due to the inertia of formal education, there is an enormous necessity to get information and knowledge about ICT in other ways, because school contents do not completely follow innovations in the sphere of ICT.

The problem of information illiteracy, as a global political and educational unit, has caught many educational systems unprepared by posing the question:"Now what?" How can an enviable level of information literacy be reached? One thing is certain, informal sources and informal learning are unavoidable because it has become evident that formal education is no more capable of keeping up with the development of ICT and fulfill demands for quantity and quality permanent education.

As soon as possible it is essential to provide the answer to the question:"Can the incorporation of informal learning elements into formal education or the implementation of particular educational activities which make you 'learn without noticing that you are learning' into school contents result in

reaching an enviable level of students' information literacy?"

Moreover, it is also necessary to determine whether and to which extent *informal learning affects the level of students' information literacy, i.e. to determine whether using informal sources of knowledge contributes to increasing the level of students' information literacy.*

Hence, we have to continue tackling informal learning, we have to continue exploring it and it is serious scientific work that can explore the possibilities of realizing the aforementioned educational units and that can provide the answer to the question:"Now what?"

REFERENCES

[1] Paul Zurowski (1974): The Information Service Environment: Relationships and Priorities. Washington DC: National Commission on Libraries and Information Science

[2] http://www.ala.org/ala/mgrps/divs/acrl/publications/whitepapers/presidential.cfm

[3] American Association of School Librarians and the Association for Educational Communications and Technology, Information Literacy Standards for Student Learning", 1998

[4] American Association of School Librarians, Standards for the 21st Century Learner, 2007.

[5] European Commission (2000). A Memorandum on Lifelong Learning. SEC (2000) 1832. http://www.bologna-berlin2003.de/pdf/MemorandumEng.pdf

[6] Smith, M. K. (1988): Developing Youth Work. lnfornial Erlucation, Mutual Aid and Popular Practice. Milton Keynes: Open University Press.

[7] Dohmen, G (2001): Informelles Lernen – Die internationale Erschliebung einer bisher vernachlassigten Grudform menschlichen fur das lebenslange Lernen aller. BMB Bonn

[8] Smith,M.K. (2000): Curriculum theory and practice, The encyclopedia of informal education

[9] Gui, M. & Argentin, G. (2011). Digital skills of internet natives: Different forms of digital literacy in a random sample of northern Italian high school students, New Media & Society

[10] Lifelong Learning and the New Educational Order by John Field (Trentham Books, 2006), Validation of nonformal and informal learning

[11] http://www.cedefop.europa.eu/EN/Files/4073_en.pdf

[12] D. Grahovac, D. Karuović, B. Egić**,** INFORMAL LEARNING AS AN EDUCATIONAL RESOURCE**,** The New Educational Review, Wydawnictwo Adam Marszałek,Toruń Poland, ISSN 1732-6729, Vol. 29, No.3, 2012., pp 174-182 http://www.educationalrev.us.edu.pl/volume29.htm

THE IMPORTANCE AND ROLE OF EDUCATION IN SOCIETY

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Abstract - Education is one of the important, special and complex segments. A number of concepts, approaches and definitions of education still can be divided into two groups. For ones, modern education contributes to the achievement of social life, it is a basic social process of maintenance man and the progress of mankind, and the continuity of culture. For others, modern education is the key factor of economic development and the knowledge of which depend on all other social processes.

I INTRODUCTION

Education is a continuous process which aims to transfer knowledge and skills, and develop skills necessary for participation in social processes, and functioning within the human community. At different stages of development of human society, different types of skills and knowledge are favored. However, it is certain that individuals and groups, who have favored disposal of knowledge and skills, held an important, privileged position within the narrower and wider communities. The traditional definition of education based upon the belief of education as the systematic acquisition of scientific knowledge about nature, society and human thinking and mastery of skills and work habits by which the specific personality traits and adopt view of the world are developed and shaped. More modern understanding of education assumes that the institutional education system of acquiring knowledge and train people to acquire knowledge, skills and habits they need. Education as a development resource should provide, the educational system and educational content that is in it to realize, realize the main objectives related to personality development, the preservation of man's natural environment and create awareness about the global problems of the contemporary modern world, education of humanity. In the modern world, education monitors changes caused by their developments. Thus, education in the 21st century will be directed towards the acquisition of knowledge that becomes an important factor of social development and will have a decisive value for the individual and for civilization.

II THE HISTORY OF EDUCATION AND SCHOOLING

Knowledge and skills are always passed on from generation to generation, and it is important to note the tendency of preservation and promotion of a knowledge management as well as challenging them and creating new, and that it always has been a part of the educational process. Knowledge and skills acquired initially were based solely on experience, and were passed orally, so the process of education was of informal character.

In the distant past, people's knowledge was passed from generation to generation and jealously guarded. The first forms of schools and education have appeared in ancient Greece, in Sparta and Athens. The Spartans were tightly organized and in constant war of preparedness and the Spartan training aimed at preparing troops always ready to fight the enemy.

Unlike Sparta, Athens recognized the need of nurturing the soul and body in general and also in setting ethical rules for coping with life. They actually crystallize the spirit of the time that has emerged through natural development of human society. Through all the activities of the ancient society, a strong need to collect acquired but also scattering of knowledge into a common framework can be seen. It should be based on traditional education, not just the European system of values, but values around the world known at that time. This would be both systematically passed, which would contribute to faster and better development of knowledge themselves and society as a whole. Numerous schools of before Socrates period discussed the physiological phenomena through the dialog method combined with art and physical culture, or through an ascetic monastic character of the school organization.

Education in the Middle Ages is primarily oriented to the practical needs. Although there were people who loved knowledge for its own sake, they were rare and often felt the need to seek excuses for their intellectual curiosity. The main goal was that every person has the knowledge necessary to perform his job. Other skills are worthless, and they could be dangerous. Medieval education can be described only in academic institutions such as schools and universities, as represented by the nobles and the homes where the young nobles acquired knightly education. Producing young knight in the formal education and marked the end of the proof that it can take its place in society. Throughout the Middle Ages book knowledge in Western Europe, with the exception of Italy, was mainly restricted to those who belonged to the priestly ranks. To 12 century literate laity was extremely small. After the 1100th year, their number is constantly increasing. Many rulers and nobles know how to read, while with the merchants reading and writing must have been widespread. However, one should not exaggerate the extent of literacy. All the nobles and most retailers have catered to the officials who led their conversation and reading their letters that they received. There was hardly any a truly educated laity. [1]

The creators of Slavic books were two educated Greeks from Salonika, Constantine (in monasticism Cyril) and Methodius. The activity of Cyril and Methodius and their students, regardless of the place and country where it developed, had a general Slavic character. The general Slavic and most important achievements of their work: Slavic alphabet, Glagolitic, and somewhat later, Cyrillic, the first literary Slavic language, called Old Church Slavonic in science, and literature created on it. [2]

III EDUCATION AS AN ENGINE OF SOCIETY

Each national economy and its long-term growth depend almost entirely on the quality of its human resources. In this case, the use of these resources and invest in their quality is the primary factor in development. Modern national education policy in developed countries are based on a concept developed in recent decades in international organizations dealing with educational policy (UNESCO, OECD, ILO, Council of Europe, European Commission) and that they recommend to their members in implementing the national education reform. These are the concepts of lifelong learning and the concept of a learning society.

The concept of lifelong learning and human resource development of a harmonized system includes various forms of learning at all stages of life. These are: organized learning (education and training) that can be formal (school) and informal and unorganized or informal learning. One can learn for a lifetime, but you cannot go to school for whole life, so this learning in adulthood, is primarily organized in noschool organizations, or where an adult works and lives.

So the company, more developed especially, becomes a learning society. The modern education system consists of a network of school-related and non-school organizations and their partnership. The school is no longer the only educational institution and the development of human resources of a country can not reduce to reform of a school system. In developed countries, the system of human resource development include education of youth and adults and non-formal adult education, and more and more consideration is given to the Information and self learning. Education is now considered a condition of survival and development of modern societies. Those who survive are the first and easiest to adapt and to adopt the innovations.

IV KNOWLEDGE AND EDUCATION

Knowledge is the most important human resource and capital, and there is the necessity of holding the information (knowledge) in order to survive in a constantly changing environment of today's society called knowledge society. An educated man is in the spotlight of that society. It is necessary to define some terms that are used as synonyms for knowledge:

- Learning is the process of acquiring skills and knowledge, resulting in a relatively permanent change in behavior.
- Training-means acquiring new knowledge and practical skills necessary for the operation, management, and management of the organization, according to adopted rules, regulations and standards. Training leads to changes in skills.
- Training-an exercise in acquired practical knowledge and skills.
- Developing knowledge-is related to the acquisition of new knowledge, skills and abilities that enable an individual to

undertake complex tasks, preparing it for the future and the demands to come. The development leads to changes in attitudes and values.

- Education-acquisition means constant innovation and broader knowledge in the applied scientific disciplines and business practices. [3]

V KNOWLEDGE AS INTELLECTUAL CAPITAL OF 21ST CENTURY

According to research by Stanford University (USA), total human knowledge was created up to 1900. It was doubled up to 1950. Since then, the whole of human knowledge doubles every 5-8 years. This fascinating information is interesting by itself, but there are unforeseen implications on our daily lives, -personal and business. At the private plan's "explosion" of knowledge with the result that countries and individuals who are newly-acquired knowledge at their disposal have great potential for continuing strong growth in living standards, quality of life and wealth in general. In business life of individuals, organizations, states and the observed world as a whole, this vast, rapid, and daily changes affect the way that in every respect, and significantly alter the previous way of life. At the beginning of the 21st century, we are faced with the enormous changes:

- Life, society and economy become more complex,
- time-we live in is unpredictable,
- nature of jobs is radically changing,
- more business-disappearing due to technological change,
- the past-may be less support and guidance for the future.

It is already difficult to predict what knowledge and skills will be needed and requested for the next 10 years. In most professions knowledge is doubling every few years, which means that knowledge of each one of us needs to be doubled every 2 -3 years just to "keep up" with the changes, and those who did not will inevitably fall behind! Society in which knowledge is valued as a resource, investing in education and science, which was developed information infrastructure in which highly values individuality, creativity and ability of individuals and organizations is named in an innovative society. [4]

VI EDUCATION FOR ECONOMIC DEVELOPMENT

In developed countries the main development resource is human capital, and its quality is important to determine the education and training. Education and training should contribute to sustainable national development and the continuous development of individuals. Therefore, all developed countries hold education and human resource development as national priority and implement those strategies of development of education and training that contribute most to the economic, social and cultural development of society and the personal development of its stated members. .Because of these reasons modern strategy of education and human resources they caught not only education of children and young people but also formal and informal education. It is estimated that those countries whose development policy is not based on the concept of lifelong learning are doomed to economic and political marginalization.

The contribution of education and training development is widely acknowledged fact. It is estimated that investment in education and training of individuals make a profit that is comparable to investments in physical capital. An increasing share of services in the economy, the speed at which technology changes, the growing share of knowledge and information in relation to the value of production and the level of economic are restructuring in favor of this type of investment. It is estimated that an additional year of average schooling in the developed countries of Europe immediately led to increased economic growth by about 5% and to increase long-term growth by 2.5%. During the nineties, greater investment in human capital brought annual growth to 0.5% or more in several EU member states compared to the previous decade.

The main objectives of the future education are relating to:

- to prepare young people in their personal life to gain a realistic picture of themselves, which will be implemented in personal, social and common conditions,
- preparing young people for life in a democratic society, which includes information on rights, fundamental freedoms, duties and responsibilities of citizens,
- prepare young people for work, which should provide a broad view of work and

theoretical insight into the nature and forms of work

- preparing young people for cultural life, to find resources for personal enrichment and involved in the spiritual, cultural and historical heritage and so are prepared for life in a multicultural world.

Accordingly, it is necessary to change the strategic direction of development of the education system in terms of exercising the right to quality education, to achieve the development of personal skills of every citizen. All this should allow the possession of certain skills and traits: a complete knowledge of the native language with basic knowledge of grammar, sentence structure, understanding the basis of mathematics and natural sciences, which must be coupled with new technologies, the ability to think the solution to the problem or knowledge to make the difference between facts and prejudices, mastery learning techniques to acquire new skills and adapt to new situations, and mastery of communication skills, including proficiency in one foreign language. Diploma is not a guarantee of a job, if you do not have the appropriate personal qualities, such as the ability for teamwork, a sense of responsibility and personal discipline, decision making ability, sense of cooperation and willingness to take risks, initiative, curiosity and creativity, professionalism, striving for perfection and achieving a sense of the possibilities and limits of civil liability.

Based on these attitudes, life-long learning and the need to realize the essence of learning involves teaching people to think, not only to accumulate facts. Some countries reform their educational systems to use the experiences of those countries that have already implemented such a reform, of course, leading account their specific features and characteristics. In this way they give the corresponding contribution to the education reform of world system. Education is undoubtedly of great importance for the development of society in all ages of its existence. In the modern world, education follows the changes caused by their development.

Thus, education in the 21st century will be directed towards the acquisition of knowledge and will become an important factor of social development and will have a decisive value for the individual and for civilization. Education will be important for perception and understanding of global changes in modern society, particularly regarding the problems associated with harmonizing economic development with environmental laws in terms of science and technology, in terms of preserving cultural identity and sovereignty of their nation states in terms of globalization of economic life economic and political domination of most developed countries, as well as in terms of democratization of social relations.

VII THE PROJECTED FUTURE OF EDUCATION

The process of knowledge acquisition and transfer of knowledge is inevitably accompanied by the development of society. Specifically, the pre-industrial period of development of society, traditional values, knowledge and practical skills were passed down from generation to generation. During the period of industrial development, and all of the knowledge could not be more learned in the family. Because of that, the process of transferring knowledge turned into mass education. Automation machines more and more, and man better and better successfully solve many routine tasks at the intellectual and creative activities. In addition, the machines perform physical flow of materials and people dealing with the flow of information and knowledge. However, in automated manufacturing systems of tomorrow, no machines or people will no longer be tied to the factory or office, or people will live in big industrial cities of today. In fact, it will be deployed around the world, close to one another to be linked very sensitive communications, and your job will be done in the immediate social groups in their homes.

Technology of tomorrow do not need semi-skilled labor force that performed monotonous tasks on the current line, it needs people critical spirit, which can seamlessly manage the new circumstances, people who are willing to work during the coming new knowledge .To new time , called the digital era, risk society and civilization, knowledge, and certainly requires a new form of education. In such and such, new circumstances, education is a fundamental task and should improve the adaptability of man in time that comes and play a significant role to increase those skills that are needed. However, in order to set the future of education that could be achieved, it is necessary to predict who will perform the tasks that will be of interest.

We also need to know and what would the title be needed, what will dominate family relationships, such relationships will prevail. There is a need to look and what would be a moral or

ethical problems that could arise and what technology will be developed and what will be the organizational structure to fit. All this, as well as determine other intellectual and psychological skills and knowledge to the people of tomorrow will be needed to successfully track the rapid social development. Thus, man's future depend on its education. Consideration of possible projection of the development, changes in education in the future will refer to the change of organizational structure of the education system, the improvement of curriculum and the promotion of orientation directed towards the future. The current classical teaching will not be able to meet the needs that anticipate changes in the future. This lecture will disappear and they will replace many of the other newer methods of education based on experience, for recreation, for fun and work.

As a new approach to education inevitably follows the changes in the society of tomorrow are expected, futurists legitimately raise the question of whether the educational process will be held in appropriate institutions. This is because, a much higher intellectual level of the world population and a much higher level of general education and culture is provided. Thus, in these circumstances, the parents assume the role of teachers, which are otherwise in many developed countries already thought. Also, it talks about education opportunities through observation and participation in many important social events, and talk about life-long education and distance learning, but it is slowly becoming a reality. In accordance with such visions, as possible new forms of education in the future are mentioned: home education, mobile education, lifelong learning and virtual education and distance education.

The changes brought by the new time changes that are associated with transience, diversity and newspapers certainly suggest the need for new knowledge. Knowledge in the future I going to get older faster, so it will be necessary to take into account the efficiency of learning. In this regard, it will be very important to learn how to learn, how to forget and learned how to learn again. This education will receive a new dimension.

VIII THE PROMOTION OF EDUCATION IN SERBIA

Serbia needs the education system that is compact, and flexible. Compact means that it is fully in line with the development strategy, a flexible, easily adaptable to the market. The reform process must be continuous, consistent, clear, precise and oriented towards the needs and interests of citizens of Serbia. In understanding this concept of education, as part of the development of human resources of a country is an individual, his future, employment, personal and professional life. If one would be a good educational system it must be compatible with the selected development strategy that is able to quickly respond to labor market trends.

This means that when a development strategy is chosen incorrectly or if the labor market permanently emits false signals, the system of education can be effective. To avoid this conceptual error it is necessary to harmonize the development of education strategy with the planned general social and economic trends and developments. Restructuring the economy towards the service industry and the development of other segments of industry and agriculture in particular has to respect policy and education and to build in that direction further development of the education system. In the education sector in Serbia, which includes preschool, elementary, middle and high education is just over 1.3 million students and about 110,000 employees. This means that the field of education covers almost a third of the active population in the Republic, or just over 20% of the total population.

This means that nearly 3 million people aged over 15 has a minimum life and job skills. One of the big problems with education that will meet in the coming years is demographic decline and reduction of number of children, which means fewer students in schools. Last years, decreasing the number of students enrolled in first grade of elementary schools and much middle is already facing the problem of fewer students. In the context of technological development of society and the changed relationship and structure of the economy and especially in the context of the different roles of the citizen as an individual, the role of education must become significantly different. Since teachers have much more autonomy to be innovative and creative, they have a range of abilities to transfer knowledge and skills of students in coping with new or unforeseen circumstances. Therefore, education and training of teachers and educators are becoming a key requirement of the overall development and education.

Another major area of priority is education reform education in order to meet the needs of the

labor market. In understanding the concept of education as a source of human resource there is a need for qualified and skilled labor that are becoming very important factors .One of the biggest challenges of the Serbian economy and society is to reduce the total number of unemployed. Be sure that the education system can not resolve this issue, but it certainly can and must be directly related to employment policy in Serbia. Modernization of the State and its orientation towards modernism technologies must influence the innovation goals of education and the convergence of the developed countries. Therefore, the aims of modern vocational education in our country have to be oriented towards the strengthening of expertise and greater flexibility in overcoming the changing demands in the world of work and in society as well as the acquisition of key skills so that young people were ready for new professional challenges and can be included in the overall modernization of society. Realizing that our society is moving towards the learning society, it is necessary to develop it in young and make them ready for training and further education.

In order to achieve the necessary social and economic change, Serbia has to restructure its human capital, supply it with new knowledge, skills and values, attitudes and behavior. This means that education is the basis of socio-economic transformation of Serbia. All the more, to the question of further development of the education system and its strategic basis is in relation to the development of society and economy.

IX CONCLUSION

Man finds, creates, enlarges, improves, apply and transfer knowledge to others. Therefore, knowledge is the mediator between the individual and society. Educated man is a part of society and should be the center of successful development of a knowledge society. It is very important to enable the individual to control personal development. Taking responsibility for our own development, he is responsible for the development of society. Understanding and respecting the individual characteristics of man plays an important role in the learning process, but the learning opportunities offered in the community should have the benefit of the whole community. Starting from all previous determinations, and taking into account all previous approaches to education, modern education is, from a sociological point of view, defined as a social process in which knowledge is acquired, from the standpoint of its importance to civilization and global changes is viewed as the need for a developed personality, which is the main determinant of knowledge as a development resource. In this context, education will be important for perception and understanding of global changes in modern society, particularly regarding the problems associated with harmonizing economic development with environmental laws in terms of science and technology, in terms of preserving cultural identity and sovereignty of nation states in their globalization of economic life, economic and political domination of most developed countries, as well as in terms of democratization of social relations.

REFERENCES

[1] Baruning O. (1990), Introduction to the history of educational theory, Beograd: IM Kolarac prapočeci

[2] Deretić J. (1987), A short history of Serbian literature, Belgrade publishing and graphics institute

[3] Petković V. (2005), Human Resource Management, Cacak: College Business School

[4] Chamber of Commerce of Montenegro (2008), Education Reform and Human Resources Development, Podgorica

[5] Stefanović V. (2005), Human Resource Management, Zaječar: Faculty of Management

[6] Tanasijević Z. (2006), New ways of human resources management, Kragujevac: National Conference on Quality

[7] Tasić I., Sajfert D. (2011), Organization of Schools, Zrenjanin: Faculty "Mihajlo Pupin"

UML MODEL OF AUXILIARY APPLICATION IN MACHINE LEARNING

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Abstract - This paper describes the process of UML modeling applied to the SampleCreator application. It is an application implemented in C# programming language and .NET 4.0 framework, which is used to create a training set required by AdaBoost algorithm. Training set is created based on images that are obtained by converting video clips from basketball games in the series of images that are stored on the user's computer. In this way we obtain a set of images that include basketball players (positive examples) and the sets which contain no basketball players (negative examples). The application provides more functionality- save frames from video content provided on the location on user's computer, marking the objects of interest on stored images, to be trained by them, and parse the parameters from the XML file that results from the application of AdaBoost algorithm on training objects.

I INTRODUCTION

Modeling is used in many aspects of life. It was first encountered in ancient civilizations such as Egypt, Greece and Rome, where the modeling was used in creating models for art and architecture. Today modeling is widely used in science and engineering in order to provide an abstraction of the system at a certain level of accuracy and with a certain degree of detail. Then the model is analyzed to provide a better understanding of the system being developed. According to the OMG (Object Modeling Group), "modeling is the development of software applications before coding."

In software design and development based on a model, modeling is used as a basic part of the software development process. Models are created and analyzed before implementation of the system, and serve to direct the implementation that will follow.

Better understanding of the system can be achieved if development is viewed from multiple perspectives (different views) [1] [2] as the requirements modeling, static and dynamic modeling of software systems. Graphical modeling languages like UML, assist in the development, understanding and communication between different views.

II OBJECT-ORIENTED METHODS AND UML

Principles of object-oriented programming, play a crucial role in the software analysis and design because they focus on key questions about the possibility of changing the software, its adaptation and evolution. Object-oriented methods are based on the concepts of information hiding, classes and inheritance. Information hiding may lead to the creation of systems that are more independent and it is therefore easier to modify and maintain.

With an increasing number of notations and methods for object-oriented analysis and design of software applications, created a need for a common language for modeling. As a result, there is a UML (Unified Modeling Language) to offer a standardized language and graphical notation for describing object-oriented model. However, since UML is independent of the methodology, it must be used together with one of the methods for object-oriented analysis and design.

Modern methods for object-oriented analysis and design are based on the model and use a combination of use case modeling, static modeling, modeling of state machines and interactions between objects. Almost all modern object-oriented methods use UML notation to describe software requirements, analysis and design models [3] [4].

In the modeling of use cases, functional requirements of the system are defined in terms of usage and participants who use or interact with a given system. Static modeling provides a structural view of the system. The classes are defined according to their attributes and relations with other classes. Dynamic modeling provides a view of the system in relation to behavior. Use cases are created to show the interaction between objects

which participate in it. Interaction diagrams are created to show how objects interact with each other in order to realize the use cases.

III DESIGN OF SOFTWARE ARCHITECTURE

Software architecture divides the overall system structure, in terms of components and their interconnection, to the internal implementation details of individual components [5]. Emphasis on the components and their interrelations are sometimes called programming-in-large, while detailed design of individual components is called programming-in-miniature.

Software architecture can be described at different levels speaking in terms of detail. At higher levels it can describe the decomposition of system into subsystems. At the lower level, it can describe the decomposition of subsystems into modules or components. In both cases, the emphasis is on an external view of the subsystem / component - that is, the interfaces provided and required, and their interconnection with other subsystems / components.

Attributes of software quality in the system must be taken into account when developing the architecture. These attributes relate to how the architecture provides the answer to the important non-functional requirements such as performance, security and the possibility of quick and easy maintenance.

Software architecture is sometimes viewed as a high-level design. It can be described using different views. It is important to ensure that the architecture meets the software requirements, both functional (what the software should do) and nonfunctional (how well it should do). It is also the starting point for detailed design and implementation, particularly in cases where development team becomes quite large.

IV UML DIAGRAMS

UML notation has evolved since it was first adopted as a standard in 1997. The highest revision of the standard was made in 2003, and current version is 2. UML notation has consistently grown over the years and today supports a number of diagrams. The application development is usually based on following diagrams:

- Use case diagram
- Class diagram
- Object diagram
- Comunication diagram
- Sequence diagram
- State machine diagram
- Activity diagram
- Deployment diagram

A. Use-case diagrams

Use Case Modeling is an approach to describe the functional requirements of the system. Inputs and outputs of the system are given by first describing by the use case model, and then using static modeling.

In approach of modeled using use cases, functional requirements are described by the participants, who are users of the system, and use cases. Use case defines a sequence of interactions between one or more participants and systems. At the stage of processing requirements, use case model looks like a black box system and describe the interaction between participants (one or more) and system in the descriptive form that consists of inputs that are entered by users and answers provided by the system.

Use case typically consists of a series of interactions between actors and systems. Every interaction consists of entrance which provides the actor, followed by the response received from the system. Thus, the actor provides input to the system, and system gives an answer to the actor. While simple use cases consist of only one interaction between actors and systems, in most systems consist on several interactions. More complex cases may involve using more than one participant.

SampleCreator is a tool to create examples with which a training of AdaBoost algorithm will be executed. In addition, this tool has other features that are shown in Figure 1 It shows the main features of this tool:

- Parsing of XML – AdaBoost algorithm given as a result of a training process an XML file with certain values of parameters. This file is necessary to parse into a form suitable for use in an application that uses the results of training in order to detect objects of interest.
- Video display – The video is shown using DirectShow technology. During the displaying at every 0.5 seconds one frame is saved in the location provided to the user's

computer. These frames are used for training set creation.

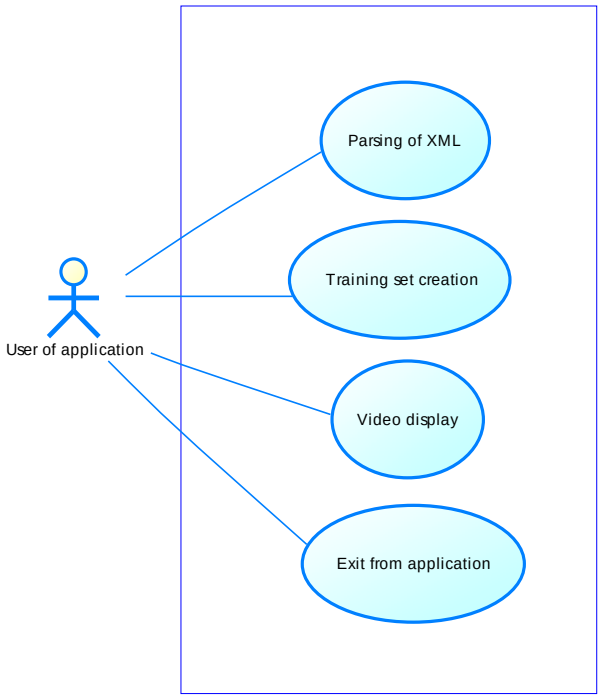

Figure 1. Sample Creator basic use cases

- Training set creation – From frames that are obtained from the video material is necessary to create a training set. This set contains positive and negative examples. Positive examples is cut from the observed images and then combined with the negative examples which represent images that certainly do not contain objects of interest.
- Exit from application – This is a functionality that stops application execution.

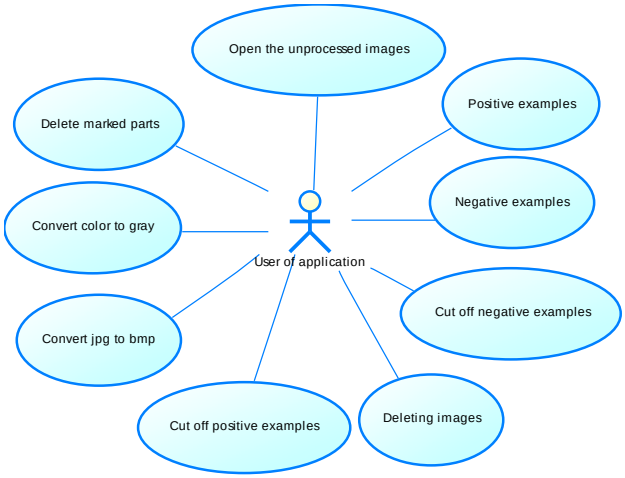

Figure 2. Training set creation

Creating a training set provides additional functionality as shown in Figure 2 These functionalities include:

- Open the unprocessed images – Opening a set of images from which are marked objects of interest, if any, or parts of images that contain no objects of interest.
- Positive examples – Select an object of interest in the picture for which training is performed. Each object is marked by four coordinates, x and y coordinates of upper left corner, and the width and height of the object. Data objects are written into the file that could be used during training.
- Negative examples - If the image does not contain any object of interest it is considered as a negative example, and is used in the training process. During training, positive examples are placed on top of images that represent negative examples.
- Cut off negative examples – If part of the image does not contain objects of interest, it can be cut and labeled as a negative example.
- Deleting images – If the image is a not appropriate either negative or positive example, it can be deleted in order not to adversely affect the process of training.
- Cut off positive examples – This functionality enables to cut all the positive examples from the images in order to make further adjustments (increase contrast, sharpen, background subtraction, ...).
- Convert jpg to bmp – AdaBoost algorithm supports JPG and BMP format images, but jpg format can cause problems in training, so it is advisable that all images are in BMP format.
- Convert color to gray – AdaBoost algorithm works on gray images. Because of this all imagese could be converted to gray to occupy less space and make algorithm faster.
- Delete marked parts – If the labeling of positive examples marks part of the image that is not an object of interest, you can uncheck observed image and again mark objects of interest.

B. Activity diagrams

UML activity diagrams represent diagrams that show the flow and control sequences that occur

during software activities. Activity diagram shows the sequence of activities, decision nodes, jumps, and even competitive activities. These diagrams are used in the modeling of application flows, for example. in service-oriented applications.

Use case model can be described using activity diagrams. However, to show the use case, it is required only a subset of what activity diagrams can offer. More precisely, it is not necessary to model the competitive activities of the use cases [7].

Activity diagram can be used to represent the sequence of steps in use case, including the main sequence and all the alternative sequences. In other words, the activity diagram can be used in more precise description of the use case because it shows the exact location and conditions in the sequences that are required for alternative execution. Activity node can be used to display one or more steps in the use case. High level activity node can be used to display whole use case, where it can later be decomposed into a separate activity diagram.

In order to show the use cases, activity diagrams, use activity nodes, decision nodes, arcs that connect nodes of activity and jumps. Activity node is used to represent one or more steps are needed to describe the use case. Decision node is used to display situation in which, on the basisi of decision, execution may take alternative path. Depending on use case, an alternative sequence can then be connected to the main sequence.

Activity nodes could be agregated nodes that could be hierarchically decomposed to give lower-level activity diagram. This concept can be used to indicate the use cases with the inclusion and expansion. Therefore, node activity in the base use case can be used to represent a connection with the case of use which represents inclusion (or extension), which is then displayed on a separate lower-level activity diagram.

Use case "Training set creation" can be shown by activity diagram, which is shown on figure 3. It shows that first step is to check whether there are images that can be used for training. These images are created during viewing video content. If images do not exist, execution of the application breaks because there is a no set of pictures that contain training examples. If images exist, they are loaded one by one and displaed the application window. Images obtained from video content may or may not contain objects of interest. If observe basketball games, there are scenes that do not include basketball players (advertisements, announcements, crowd shots, celebrities, ...) so that they can not be used in training process. They can be used as negative examples or as examples in training set that will serve to verify that the algorithm does not mark all objects as required, or to verify the performance of the training. There are images that can not be characterized as neither positive nor as negative examples. These are usually images of basketball players that are quite unclear, so there is possibility that it will take training in the wrong direction. Such images is best to be completely left out of the training process (delete them). Sometimes parts of the image do not contain any object of interest and can be cut into a separate image to be marked as a negative example. For images that contain the required objects, they should be labeled, that is x and y coordinates of the upper left corner of the rectangle that surrounds the required objects should be specified, as well as its height and width. The process is repeated for all objects in the image, which can contribute to training. Objects that are not correctly displayed should be omitted (eg most of the object is obscured by other objects). These data are entered into the file to be used in the training process to cut only the required objects from positive images, while the rest of the image is ignored.

C. Class diagrams

The static model is related to the static structural view of the problem, which is invariable with respect to time. The static model describes the static structure of the system being modeled, which is thought to have a lower likelihood of change in relation to functions of the system. More precisely, the static model defines the system classes, class attributes, relations between classes and operations held by each class.

Object is a physical or conceptual entity in the real world that allows an understanding of the real world and, therefore, creates the basis for a software solution. Object in the real world can have physical properties (can be seen or felt); example may be the door, the motor or lamp. The conceptual object is more abstract concept, and an example of such object may be a bank account or transaction.

Object-oriented applications consist of objects. From the standpoint of design, object groups data and procedures that are performed on the data. Procedures are usually called methods or operations. Some approaches, including the UML notation, observe the operation as a specification of

functions that perform a particular object, and methods as implementations of functions [8].

Object (also called an instance of the object) is a single "thing", eg. Marko's car or Petar's bank account. Class (also called a class of objects) is a collection of objects with the same characteristics, for example bank account, car, customer.

An attribute is a value that contained by object class. Each object has its own attribute values. The name attribute is unique within the class, but different classes may have attributes with the same name, eg. class Client and the Employer may have the attribute with the name address.

The operation is a specification of the functions performed by the object. The object has one or more operations. Operations manipulate the values of attributes contained in the object. Operations can have input and output parameters. All objects that belong to the same class have the same operation. For example, Account class has a read, opening and closing operation.

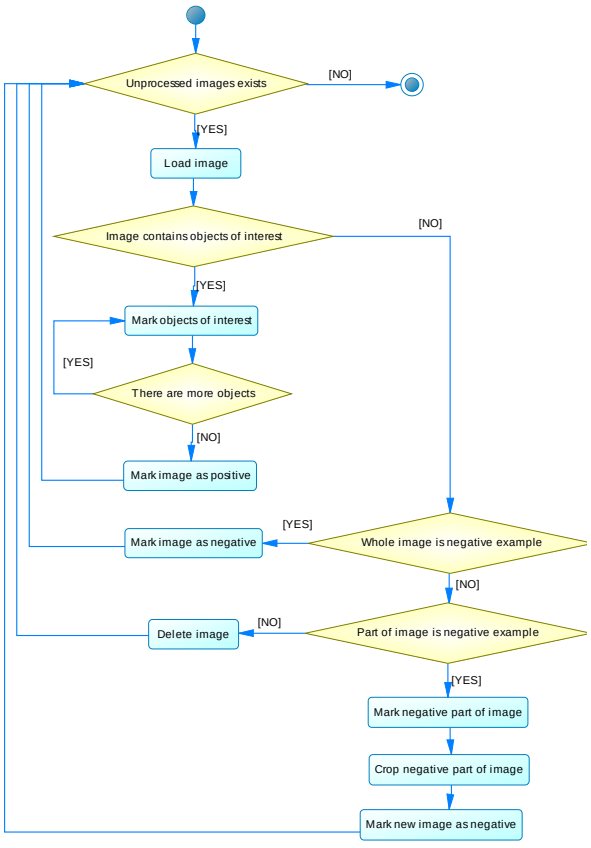

Figure 3. Training set creation

Object represents an instance of the class. Some objects are instantiated as needed during the execution of the application itself. Each object has its own identity under which differs from all other objects. In some cases, this identity can be an attribute (eg account number), but it is not necessary to be an attribute.

In static modeling are used three types of relationships: association, relation whole / part (aggregation and composition) and the relationship of generalization / specialization (inheritance).

Using SampleCreator tool, video material can be turned into frames. From them it is possible to perform the training of AdaBoost algorithm so that the frames mark areas of interest (positive examples), as well as images that do not contain objects of interest (negative examples). The implementation of an application that allows labeling of positive and negative examples, convert images from jpg to bmp format and converting color images to grayscale is shown in Figure 4.

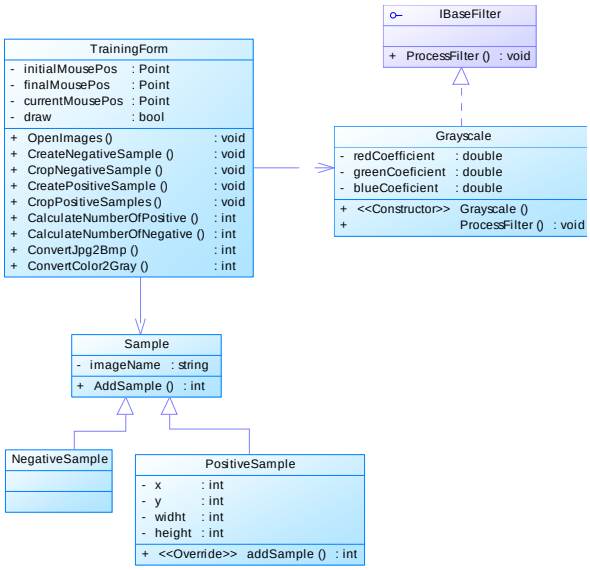

Figure 4. Magnetization as a function of applied field. Note how the caption is centered in the column

The form created to display frames, and any other necessary operation is TrainingForm. It contains the following attributes: initialMousePos, finalMousePos, currentMousePos (containing the positions of the mouse to enable the marking of objects of interest) and draw (logical value that tells whether the mark has already done). In addition, the class includes a number of methods:

- OpenImages – allows frames to be loaded from a location on computer
- CreateNegativeSample – mark picture as negative example
- CropNegativeSample – crop part of image that will be marked as negative example
- CreatePositiveSample – mark image as positive example nad enters objects locations in corresponding text file

- CropPositiveSamples – crop part of image that will be marked as positive example and saves those examples in corresponding folder
- CalculateNumberOfPositive – shows number of examples that are marked as positive
- CalculateNumberOfNegative – shows number of examples that are marked as negative
- ConvertJpg2Bmp – converts frames form jpg to bmp format, because AdaBoost algorithm does not support all jpg standards
- ConvertColor2Gray – convert images from color imates to grayscale, because AdaBoost performs on grayscale images

V CONCLUSION

This paper presents a model of SampleCrator software that serves as an auxiliary application in the process of training AdaBoost algorithm. The software is modeled using different types of diagrams that represent the required modeling and analysis. Thus was obtained a better view of the process of creating software and the functionality it provides, and the execution and implementation of these functionalities. An additional advantage is the possibility of modeling the distribution and organization of the process of creating the software between multiple teams working on its implementation. Although SampleCreator a small-scale application that serves as an auxiliary tool in the AdaBoost training, it consists of several components that are independently created, and after successful testing built into the application. Thanks to UML modeling and technology, this process is carried out in precisely defined steps that have enabled rapid and efficient integration process.

REFERENCES

[1] H. Gomaa, "A Software Modeling Odyssey: Designing Evolutionary Architecture-centric Real-Time Systems and Product Lines," in Proceedings of the ACM/IEEE 9th International Conference on Model-Driven Engineering Languages and Systems, Genoa, Italy, 2006, pp. 1-15.

[2] H. Gomaa and M.E. Shin, "Multiple-View Meta-Modeling of Software Product Lines," in Eight International Conference on Engineering of Complex Computer Systems, Greenbelt, Maryland, 2002, pp. 238-246.

[3] G. Booch, J. Rumbaugh, and I. Jacobson, The Unified Modeling Language User Guide. Boston: Addison-Wesley, 2005.

[4] M. Fowler, UML Distilled Applying the Standard Object Modeling Language. Boston: Addison-Wesley, 2004.

[5] L. Bass, P. Clements, and R. Kazman, Software Architecture in Practice. Boston: Addison-Wesley, 2003.

[6] C. Kobryn, "UML 2001: A Standardization Odyssey," Communications of the ACM, vol. 42, no. 10, pp. 29-37, 1999.

[7] H. Gomaa, Software Modeling and Design.: Cambridge University Press, 2011.

[8] P. Kruchten, The Rational Unified Process: An Introduction. Boston: Addison-Wesley, 2003.

COMPLEX COMPUTATION ALTERNATIVES IN FORM OF ARTIFICIAL INTELLIGENCE

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Abstract - With the current level of technological advancement there are often processing limitations emerging during real systems implementation. Following paper contains discussion about possible conventional complex computation alternatives in form of artificial intelligence. As an example of such implementation Fast Fourier transform algorithm is modeled using feedforward neural network. Obtained research results, presented below, implicate that neural networks can be used as fast and reliable conventional methods substitution.

I INTRODUCTION

Fast Fourier transformation algorithms can be very demanding in term of processing power needed for their execution. The problem is magnified when such algorithms must be performed in real-time systems. Having that in mind, FFT implementation becomes almost impossible to achieve using embedded devices of low processing characteristics.

One such problem occurred during Cooley-Tukey algorithm implementation on lower middle class microcontroller, Fez Panda II. In fig. 1 we can see basic specifications of Fez Panda II microcontroller.

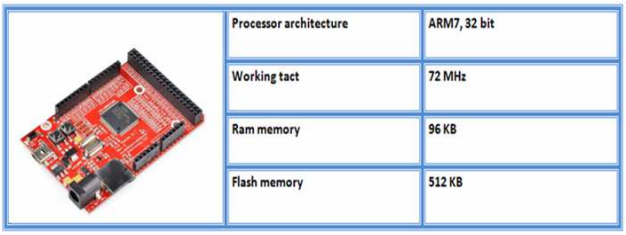

Figure 1. Fez Panda II specs

After extensive testing following results pointed out that current FFT implementation just is not fast enough. Execution time for 128 point FFT at 40000 samples per second is, at average, 1.2 seconds. The lower limit for one FFT iteration execution, defined by the nature of the problem, is 700 milliseconds. The only conclusion is that less computationally demanding substitution for Cooley-Tukey FFT algorithm must be found.

II ALTERNATIVE IN FORM OF ARTIFICIAL INTELLIGENCE

After extensive research and quest for adequate substitution it has been concluded that domain of artificial intelligence could provide fast and reliable alternative [2, 3]. Feedforward neural network with one hidden layer was chosen as FFT substitution.

According to a rule of thumb, neural network implementation is reserved for solving problems which are not solvable using conventional methods [4, 5]. In our case problem can be solved using classical approach, but as mentioned before execution time represents the main obstacle. Bearing in mind that emphasis is on overall speed, not the precision, neural network can be more than suitable solution.

III ARTIFICIAL NEURAL NETWORKS

An artificial network (Neural Network, NN for short) consists of a set of simple processing units which communicate by sending signals to each other over a large number of weighted connections [6]. This is the form of a parallel or distributed task execution. Every NN consists of:

- A set of processing units, called neurons.
- Connections between neurons. Generally each connection is defined by a weight w_{ij} which determines the effect that signal from neuron i (or group of neurons called layer) has on neuron j.
- The transfer function f(n) which summarizes weighted inputs to a neuron. Usually an argument n of the transfer function f is calculated as standard weighted summation.

Figure 2 shows the connection between a layer of neurons i and neuron j.

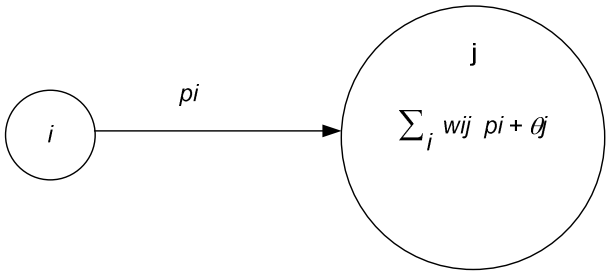

Figure 2. Standard weighted summation

Every input p_i to the neuron is weighted, all weighted inputs are summarized and finally a bias θ_j is added. The output of a neuron is calculated by a transfer function which is usually sigmoid.

The main feature of a NN is possibility of training. Supervised training is achieved when for every input value an target value is presented. The goal of a training process is to learn targets for given inputs. The learning process is conducted via weight transformation through learning algorithm.

Most common learning algorithm for feedforward NN is the Backpropagation algorithm or some of its variations. Feedforward NN means that inputs are propagated from input layer to the next layer until output layer is reached, while the error of output layer is propagated backwards (backpropagation of the error). Between input and output layers are so called hidden layers.

IV SOLUTION ARCHITECTURE

Devised feedforward neural network has 64 inputs, 42 neurons in hidden layer and one output neuron (Figure 3).

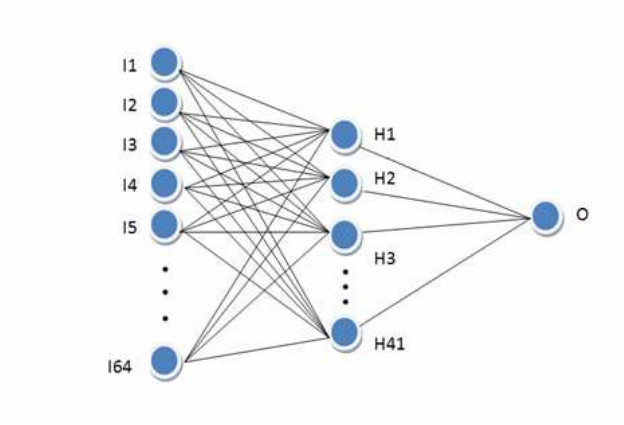

Figure 3. Neural Network architecture

This particular number of inputs is chosen because of the compatibility with Cooley-Tukey algorithm which demands samples number to be to the power of two [7]. Input data represent voltage readings sampled at 40000 times per second. Expected output is incoming signal's dominant frequency. NN

$$P(t) = \frac{1}{1+e^{-t}}$$

uses sigmoid activation function (Fig. 4):

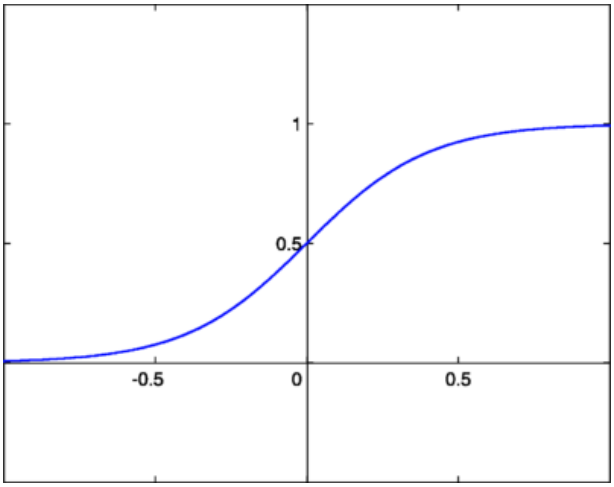

Figure 4. Sigmoid activation function

Activation function has been modified by adding slope parameter β in order to prevent phenomena known as catastrophic memory loss.

V TRAINING

Neural network is trained using backpropagation algorithm. Starting weight values are generated randomly. During the process of training neural network is presented with training sets. The first 64 elements of training set are generated signal values and the 65th element is the targeted frequency (figure 5).

With every processed training set neural network is updating its weight values. Computations are determining how much the error is changed by a small change in each weight. Then the weights are shifted by a small amount in the direction that reduces the error. This approach is called gradient descent on the error [9]. There are many algorithm variations. Standard on-line back-propagation with momentum algorithm is used in this implementation [1].

There are three adjustable training parameters. Alpha represents learning momentum. It effectively keeps a moving average of the gradient descent weight change contributions, and thus smoothes out the overall weight changes. Eta represents learning rate. Learning rate determines scale of weight changes during training. If learning rate is set too low, the training will be unnecessarily slow. Having it too large will cause the weight changes to oscillate wildly, and can slow down or even prevent learning altogether. Precision is main

training stopping condition. Based on precision value training algorithm will stop when certain error threshold is achieved. Higher precision value will require longer training process.

Voltage reading	Voltage reading	Voltage reading
50	50	22
62	97	0
26	22	22
83	18	69
8	96	99
97	54	85
0	0	40
99	73	3
3	85	8
.	.	.
.	.	.
.	.	.
40	30	59
47	11	14
64	91	0
3	64	30
91	0	77
16	64	99
73	91	77
38	11	30
Frequency	Frequency	Frequency
18626	11980	6437

Figure 5. Training data example

Choosing right parameter values is often determined by the nature of the problem and it's a matter of trial and error because there are only few training rules that are universally applicable [9].

VI ANALYSIS RESULT

Test results have shown that the average execution time falls around 625 milliseconds. That is almost thirty percent faster than Cooley-Tukey FFT algorithm. Further improvements can be performed in order to optimize neural network and lessen execution time.

Xerxes program represents a proof of concept (Figure 6). Using techniques shown above Xerxes is able to mimic Cooley-Tukey algorithm with high precision.

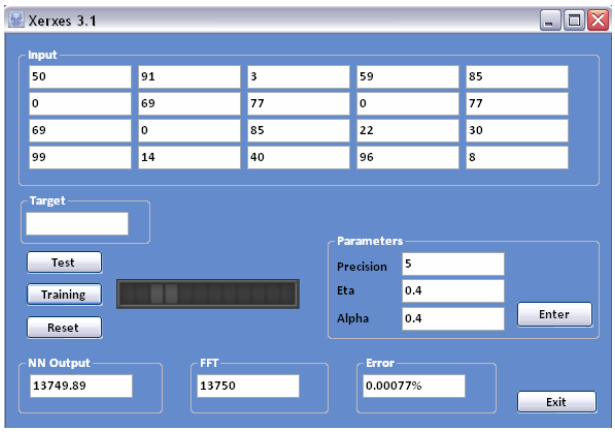

Figure 6. Xerxes testing program

VII CONCLUSION

After analyzing obtained results we can conclude that artificial neural networks can find their place alongside conventional methods used for solving computationally demanding tasks. There are some downfalls considering precision but with enough training average deviation can be reduced to an acceptable level. The fact that the execution time is only architecturally dependent makes neural networks a very powerful tool. Complex algorithm behavior can be replicated using sufficient amount of their processing data. Single neural network architecture can be used for replicating many different behavior models with only slight changes in neuron number.

REFERENCES

[1] John A. Bullinaria, (2001). Step by Step Guide to Implementing a Neural Network in C. School of Computer Science of The University of Birmingham, UK.

[2] Raul Rojas, (1996). Neural Networks, A systematic introduction. Springer-Verlag, Berlin, New York,USA.

[3] D.A. Pomerleau, G.L. Gusciora, D.S. Touretzky, and H.T. Kung, (1988). Neural Network Simulation at Warp Speed: How We Got 17 Million Connections Per Second, Proc. IEEE International Conf. on Neural Networks, Vol. II, San Diego,USA.

[4] P.J.B. Hancock, (1988). Data Representation in Neural Nets: An Empirical Study. Proceedings of the 1988 Connectionist Models Summer School, Morgan Kaufmann Publishers Inc,USA.

[5] Ripley, B.D., (1996). Pattern recognition and neural networks, Cambridge University Press, Cambridge, UK.

[6] B. Kröse, Patrick van der Smagdt, (1996). An Introduction to Neural Networks, University of Amsterdam

[7] R.P.Lippman,(1987). An introduction to computing with neural nets, IEEE ASSP Magazine, pp 4-22.

[8] E. Mizutani, S.E. Dreyfus, and K. Nishio,(2000). On derivation of MLP backpropagation from the Kelley-Bryson optimal-control gradient formula and its application. In Proc. of the IEEE International Conference on Neural Networks (vol.2), pages 167–172, Como, Italy.

[9] Robert Turetsky, (2000). Training Neural Networks, IEEE North Jersey Chapter, Columbia University, USA.

VISUALIZING GRAPH SEARCH ALGORITHMS - POSITION IN TEACHING ARTIFICIAL INTELLIGENCE

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Abstract – This paper presents the visualization of graph search algorithms. A review of Dijkstra's algorithm is given, as a characteristic representative of this category. It is shown on the example of this algorithm how the algorithm visualization can be done on the basis of graph representation. The statistical data on learning the search algorithm, using the software for visualization within the subject Artificial Intelligence are provided. A review of visualization of Dijkstra's algorithm: PathFinder and ANIM3D is given. Basic characteristics of these visualizations are summarized, as a basis for their use in teaching Artificial Intelligence.

I INTRODUCTION

Algorithm visualization software graphically illustrates the mechanisam behind a certan algorithm, so it can help in great measure at understanding how an algorithm works. A good practice at learning about graph search algorithms is to follow a flow of a certain algorithm visually, step by step. In the field of artificial intelligence, where it is necessary for students to process a great number of search algorithms, the visual interface for displaying the mechanism of an algorithm must be well designed.

According to [1], the effectiveness of algorithm visualization technology is seen in its enabling the students to participate the course in a greater scope, which is very similar to participation of the instructor himself. The instructor usually creates visualization for classroom use and uses it as a visual aid in lectures.

This paper shows the visualization of one of graph search algorithms – Dijkstra's algorithm and its use in teaching Artificial intelligence. Section two shows Dijkstra's algorithm from the graph viewpoint, as a basis for visualization. Section three is an overview of Dijkstra's algorithm's visualization used for teaching Artificial intelligence. Section four describes the basic idea of visualization of this algorithm as a model for teaching purposes. Section five concludes this paper.

II DIJKSTRA'S ALGORITHM

Dijkstra's algorithm, conceived by Dutch computer scientist Edsger Dijkstra is a graph search algorithm that solves the single-source shortest path problem for a graph with nonnegative edge path costs, producing a shortest path tree [2].

A. Defining problems using a graph

In practice, graph

$$G = (V, E)$$

V – vertices, E – edges, has been added the function of distance

$$f: E \rightarrow R$$

which assigns length to each edge. This length, or distance between vertices is usually a positive integer, although it can be any real number.

An important problem in graph theory is determining the shortest path between selected vertices. According to [3], there are four variants of this problem:

- distance between one to all other vertices (single-source problem)
- distance between all vertices to one separated vertex (single-destination problem)
- distance between two distinguished vertices (single-source, single destination problem)
- distance between all vertices (all-pairs problem)

First three problems are considered separately (and not as a subset of the fourth) because there are more efficient algorithms for solving them. E.W. Dijsktra published a paper in 1959, in which he describes a graph search algorithm which efficiently solves the first problem, for graph with non-negative edge distances, outputting a shortest path tree between selected vertices as a result [2].

B. Dijkstra's algorithm overview

At the start of algorithm description Dijkstra considers n vertices, of which some or all are branch connected pairs; also length of each branch is given – non-negative. He limits the algorithm for a case where there is at least one path between any two vertices, and then proposes two problems [2]:

- The first problem is construction of minimum total length tree between n vertices, such a tree is a graph with one and only one path between any two vertices.
- The second problem is searching the minimum total length path between two given vertices P and Q.

In short, algorithm starts with the initial vertex, assigns initial values as lengths and tries to improve them with each iteration.

1. A temporary distance value is assigned to every vertex: zero for the initial one and infinity to all others.
2. All vertices are marked as unvisited. Starting vertex is marked as current. An array of unvisited vertices is made, which is filled with all vertices except for the starting one.
3. For current vertex, all unvisited neighbours are tested and their temporary distances are calculated. For example, if current node A is marked with temporary distance of 6, and branch that connects it with it's neighbour B has a length of 2 then distance to B (through A) is 6+2=8. If this value is lesser than previously recorded temporary distance to B, it's overwritten. Regardless of the fact that neighbours of a certain vertex are tested, they are not marked as visited in this step so they stay in the unvisited array.
4. When all neighbours of current vertex are tested, vertex is marked as visited and is removed from the unvisited array. The visited array will never be checked again; it's currently memorised length is final and minimal.
5. If destination vertex is marked as visited (when planning the path between two selected vertices) or if minimal temporary distance between two vertices in the unvisited array is infinite (when complete traversal is planned), then stop. Algorithm is finished.
6. Mark an unvisited vertex marked with minimal temporary distance as the next 'current vertex' and go back to step 3.

III DIJKSTRA'S ALGORITHM VISUALIZATION OVERVIEW

This section shows, out of many possible, the Dijkstra's algorithm visualization used for teaching artificial intelligence.

C. Visualization as a teaching tool

Visualization of a certain algorithm is always a challenge for students. This paper is another confirmation of this claim.

C. D. Hundhausen in [1] describes his observation of classroom activities, including 83 student groups (1-4 students each), who constructed animations of 22 algorithm themes. Figure 1 shows the number of student groups having animated each algorithm theme.

The particularly popular ones were:

- QuickSelect algorithm,
- Dijkstra's algorithm,
- Kruskal and Prim's minimum spanning tree algorithm,

as well as breadth-first and depth-first search. These themes were representative of the major problem-solving techniques studied in the course: divide-and-conquer, greedy, dynamic programming, and graph algorithms.

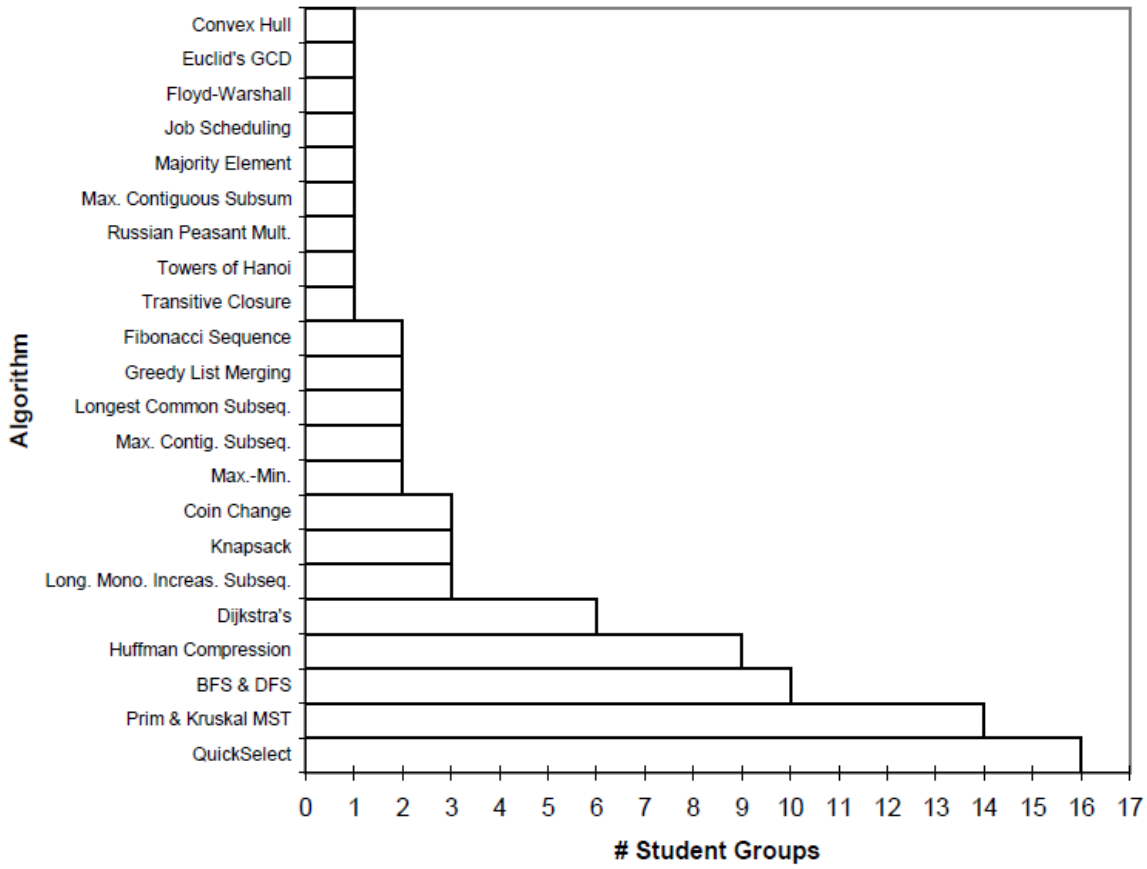

Figure 1. Number of student groups that animated each algorithm theme

It has been noticed during Artificial Intelligence classes at Technical faculty "Mihajlo Pupin", Zrenjanin, that there is a significant difference in acquiring knowledge of graph search algorithms when visual presentation is or is not present. During the school 2011/2012 year, students have described a segment of certain graph search algorithm in their seminar papers and practical work. Vast majority of them (around 80%) have shown the operation of the algorithm by graph. Also, a significant portion of the group used certain applications to do it. Therefore, they were compelled to understand operation of the algorithm in a better way, in order to be able to describe its next step. On the other hand, the learning material was better adopted, since the same problem was faced several times. This way of analyzing the operation of these algorithms by visualization software has induced certain students to explore the use of Dijkstra's algorithm.

D. PathFinder

M. G. Sánchez-Torrubia and C. Torres-Blanc emphasizes the value of parallel algorithm operation monitoring by graph and certain algorithm code line. It was done successfully in PathFinder [4].

Figure 2 and Figure 3 shows PathFinder, a new electronic Math Teacher for active learning Dijkstra's algorithm. Sánchez-Torrubia and Torres-Blanc in [4] defined the concept of this electronic teacher and described the minimum and some additional requirements.

The tool in question represents an enhanced paradigm of this new concept on Computer Aided Instruction (CAI) resources, i.e. an application designed for active eLearning, following the eMathTeacher philosophy. One of the most striking features here is the animated algorithm visualization panel. It shows, on the code, which step the student is currently executing, as well as where he had made a mistake within the algorithm running. Another two features are the active framework area for the algorithm data and the capability of saving/retrieving the created graph.

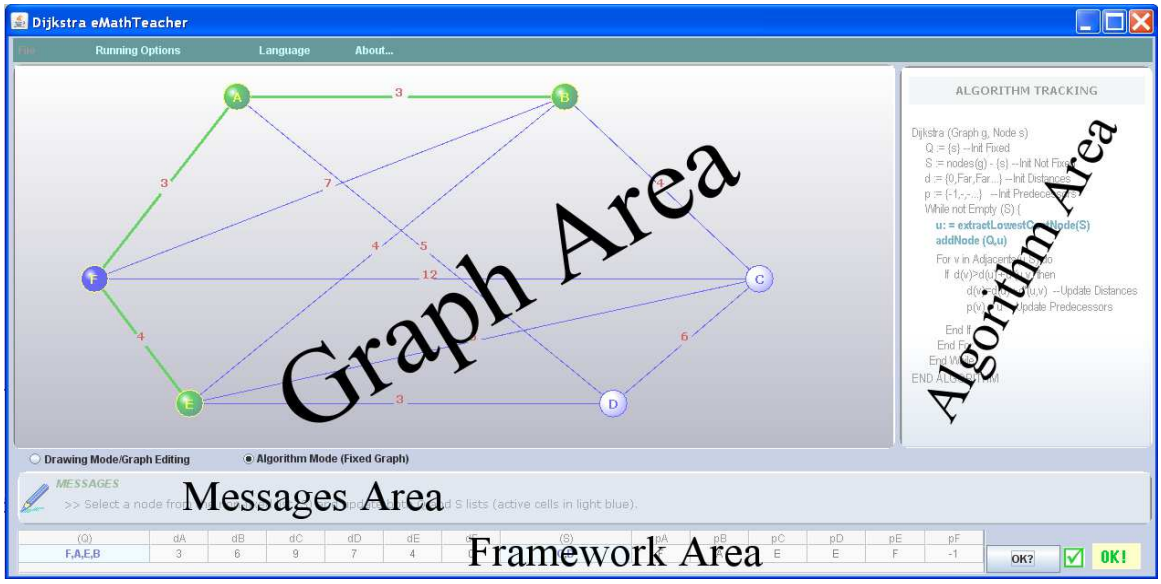

Figure 2. PathFinder: an eMathTeacher for Dijkstra's algorithm - Areas

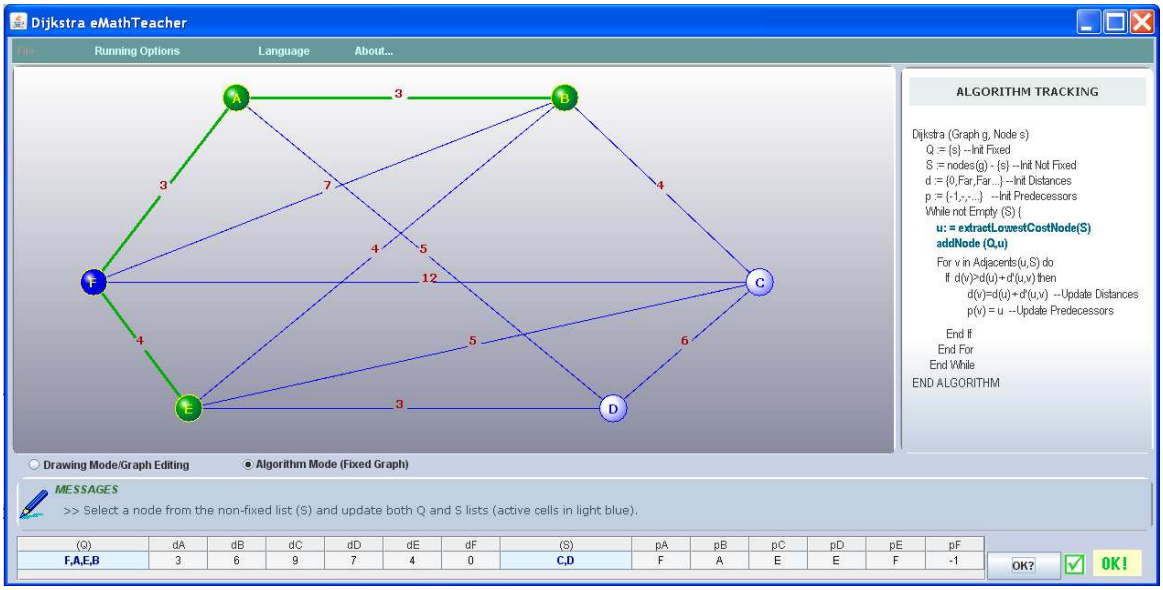

Figure 3. PathFinder: an eMathTeacher for Dijkstra's algorithm - Example

In [5] describe the minimal conditions for a tool to be considered an eMathTeacher:

- Step by step inquiring: for every process step, the student should provide the solution while the application waits in a stand by mode, expecting the user's input.
- Step by step evaluation: just after the user's entry, the eMathTeacher evaluates it, providing a tip for finding the proper answer if it is wrong or executing it if ok.
- Visualization of every step change that happens.
- Easy to use.
- Flexible and reliable: allowing the user to introduce and modify the example and to repeat the process if desired.
- Clear presentation within a nice and friendly graphic environment, helping insight.
- Platform independency and continuous availability (anytime, anywhere).

This way of presenting the graph search algorithm enables direct associations for each algorithm line, giving the students higher self-confidence to use this algorithm.

E. ANIM3D

M. A. Najork and M. H. Brown describe a 3D animation library for visualization of combinatorial structures in one of their papers [6]. For the purposes of this paper, algorithm animation is taken. Although constructing a new view of an algorithm usually takes dozens of design iterations, consuming a lot of time, this library eases this situation. It provides high-level constructs for performing animations, eliminating the need for recompilations through offering an interpretive environment.

Also, ANIM3D develops a 3D animation of Dijkstra's shorthest-path algorithm in just 70 code lines, avoidin combining SI and CGS units. Since equations do not balance dimensionally, confusion often occurs. If mixed units have to be used, they have to be clearly stated for each quantity used in an equation.

An 3D animation of this algorithm is shown in Fig. 3 – Fig. 6 [6]. The vertices of the graph are displayed as white disks in the xy plane.

Above each vertex v is a green column representing D(v), the best distance from s to v known so far. Initially, the columns above each vertex other than s will be infinitely (or at least quite) high. An edge from u to v with weight W(u;v) is shown by a white arrow which starts at the column over at height 0 and ends at the column over v at height.

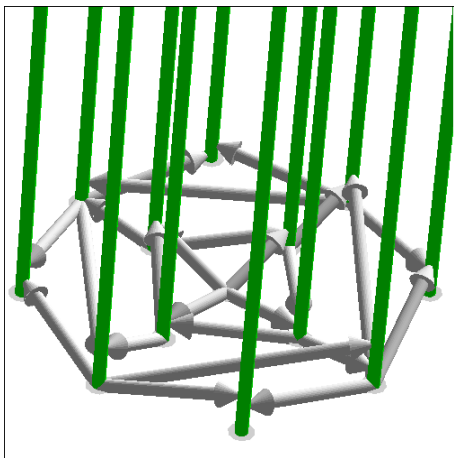

Figure 4. The snapshot shows the data just before entering the main loop

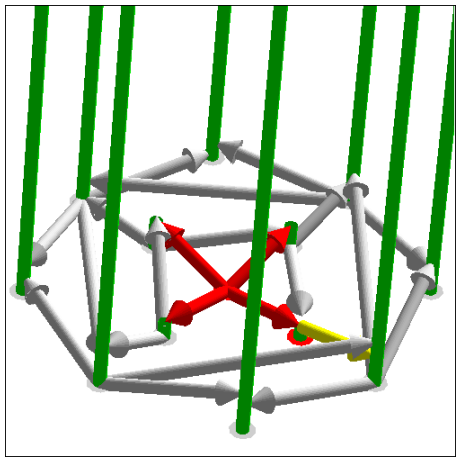

Figure 5. The snapshot shows the algorithm about one-third complete

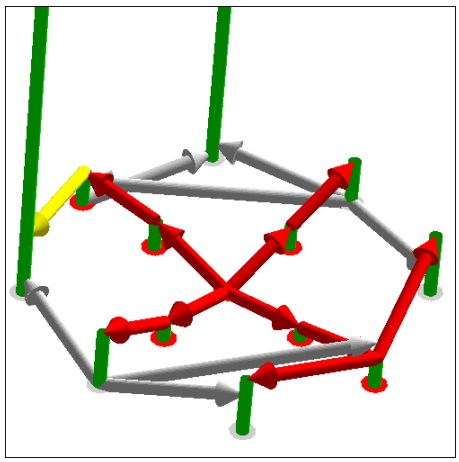

Figure 6. The algorithm is about 2/3 complete

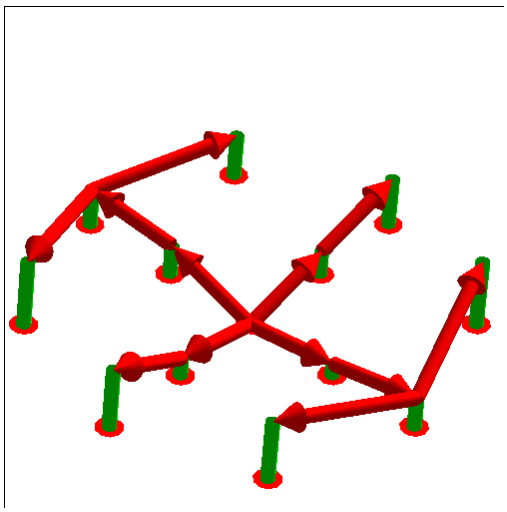

Figure 7. The algorithm upon completion

Upon completion, the 3D view shows a set of red arrows which form the shortest-path tree, and a set of green columns which represent the best distance D(v) from s to v.

IV GRAPH SEARCH ALGORITHM VISUALIZATION

Based on the previously analysed aspects, several basic concepts of graph search algorithm visualization can be drawn, like:

- Each change on graph occurs only in steps related to only one graph node;
- An algorithm review is necessary for each image (graph) change – that review can be shown through the code itself (like in PathFinder) or another, even picture mode, like in ANIM3D;
- It is desirable for the visualization to follow both steps forward and steps backward in algorithm operation;
- Optimal time frame for complete display of an example is desirable, which should mean the possibility for a certain part of algorithm operation display can be faster.

Each analysed concept would be desirable to evaluate, so the plan for teaching the subject of Artificial Intelligence in the following semesters is to perform a more detailed assessment of each individual concept.

V CONCLUSION

This paper showed the visualization of graph search algorithms as a way of learning about these algorithms within the Artificial intelligence teaching process. The software making successful visualizations was shown, and the important elements were summarized. This showed how graph search algorithms can be used with a higher success rate.

REFERENCES

[1] C. D. Hundhausen, "*Integrating Algorithm Visualization Technology into an Undergraduate Algorithms Course: Ethnographic Studies of a Social Constructivist Approach*", Computers & Education, Volume 39 Issue 3, November 2002, doi>10.1016/S0360-1315(02)00044-1

[2] E. W. Dijkstra, "A note on two problems in connexion with graphs". *Numerische Mathematik* 1: 269–271., 1959, doi:10.1007/BF01386390.

[3] D. Urošević, *Algoritmi u programskom jeziku C* (Mikro Knjiga, 2007), str. 145.

[4] M. G. Sánchez-Torrubia, C. Torres-Blanc, M. A. López-Martínez, "*PathFinder: A Visualization eMathTeacher for Actively Learning Dijkstra's Algorithm*", Electronic Notes in Theoretical Computer Science (ENTCS), Volume 224, January, 2009, doi>10.1016/j.entcs.2008.12.059

[5] M. Gloria S_anchez-Torrubia, Carmen Torres-Blanc, and Juan B. Castellanos. *Defining eMath-Teacher tools and comparing them with e&bLearning web based tools*. In Proceedings of the International Conference on Engineering and Mathematics (ENMA), 2007.

[6] M. A. Najork, M. H. Brown, "A Library for Visualizing Combinatorial Structures", VIS '94, Proceedings of the conference on Visualization '94, IEEE Computer Society Press Los Alamitos, CA, USA 1994, ISBN:0-7803-2521-4

CONTENT KNOWLEDGE AND MATURITY IN MATHEMATICAL AND COMPUTER SCIENCE EDUCATION

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Abstract – This paper specifies content knowledge and maturity as basic elements of the education in two closely related disciplines, mathematics and computer science. An illustrative sample from the university practice is also presented.

I INTRODUCTION

An evolutionary chain of languages, made by Robert Logan [1], contain six components: speech, writing, mathematics, science, computing and the Internet. Globally, writing and mathematics emerged at the same time, approximately 3100 years BC. Science appeared after 1000 years. Computing and Internet have appeared in the last century. Logan develops the hypothesis that the last two languages are of the same importance as any of the previous languages in the chain.

Writing is closely related with reading and is defined by a script and writing/reading rules. Some aims of the educational circles are fluency, comprehension and use of reading in learning different teaching facilities.

Mathematics is one of the most important components of school's curriculum. However, the content, teaching methods and resorts are under permanent criticism and changes. There is a general agreement that the results of mathematical teaching are not successful enough.

The world we live in is mathematically very complex. Many mathematical words and expressions are widely used in everyday communications. The use of money, time measuring, distance concept, and many others, are strongly based on mathematics.

Relation between mathematics and computer science is significant, and their interaction multiply affects on mathematical education.

II MATHEMATICAL EDUCATION

There are many approaches in improving mathematical education. All these approaches are with the same goal. A commitment of the teacher is decisive, especially his willingness in formal and informal education to become an expert in mathematical content, mathematical maturity, pedagogy, and computer science applications.

Mathematical content knowledge is roughly speaking problem-solving skill. The focus is on learning a lot of arithmetic, algebraic and geometric procedures and their usage in solving a wide range of mathematical problems.

Mathematical maturity involves understanding, solving encountered mathematical problems, posing problems, proving theorems, precise mathematical communication, reasoning and logic. Maturity is evident also in being able to use general mathematic knowledge and to make connections over a wide range of disciplines. Maturity is not specific to any particular content area and it is independent of amount known facts.

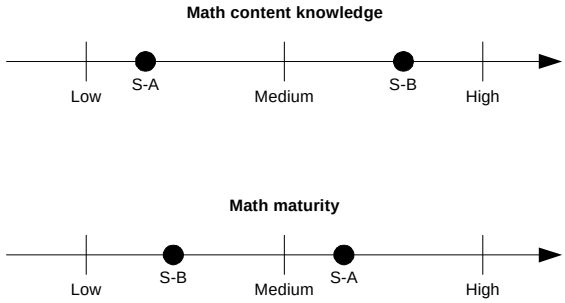

Figure 1. Separate expertise scale for math content and math maturity [Morsund]

Progressions in content knowledge and maturity are mutually independent, however of the same importance. A person may have a high level of math content knowledge and a low level of math maturity, or vice versa. Figure 1 provides an

example of two hypothetical students: Student A (S-A) and Student B (S-B) [2].

Mathematical teacher should be an expert in both, content knowledge and maturity, and more, in mathematical pedagogical knowledge. However, some researches [3][4] show rather low level of pedagogical knowledge and mathematical maturity.

Reading and writing mathematical contents are very useful, especially for understanding. First, the aim is to learn reading mathematical content that is rather different of reading in oral language. For the sake of mathematical maturity, there should be another mode – reading to learn mathematics. Burns stated [5]: *Writing in math class supports learning because it requires students to organize, clarify and reflect on their ideas – all useful processes for making sense of mathematics. In addition, when students write, their papers provide a window into their understanding, their misconceptions, and their feelings about the content there're learning.*

Cognitive development is very important part of education. Although it is a continuous process, there are four stages in Jean Piaget's cognitive development model [6]: sensorimotor, preoperational, concrete operations and formal operations (abstract thinking). Piaget's approach is based on construction/constitution and analysis of mental models. Moving through these stages depends on nature and nurture as hereditary and environmental factors. Progress through the first two stages considers understanding of the environment and initial usage of symbols. It is more dependent on nature. Influence of the nurture is essential in stages of concrete and formal operations. The third stage implies logical thinking, systematic manipulation of symbols and reversible mental actions, i.e. operational thinking. In mathematics, it is a content knowledge level. Abstract and systematical thinking, problem solving and testing hypotheses are some of the characteristics in formal operations stage, which is open-ended, and in mathematics is related with maturity. Biological mature is only the basis for the last stage, but favorably environment and support are necessary. Moreover, cognitive development of one person may progress differently in separate disciplines. This leads to formation of different cognitive expectations in disciplines such is mathematics, especially in geometry and probability.

Generally, patterns can be stored in human's mind, so they can be thought as some models of information, knowledge, procedures and data representation. Moursund stated: *Learning is a process of revising models (perhaps even to the extent of discontinuing use of a model), and building new models* [2].

Through the number line concept, an example of assimilation and accommodation of mental model will be presented. A very young child does not know a notion of number, but it has a good sense of quantity. He knows very well witch pile contains more candies. At kindergarten, he learns a notion of number by comparing sets with same number of different elements. At this moment, a mental model consists only of small counting numbers (up to 10) represented by some "abstract" sets. (And this is a preoperational stage.) Next step is setting up the numbers on the line, with a remark on open right end. Significant accommodation of the model is introduction of zero and negative numbers. This model allows adding and subtracting, so here is the beginning of concrete operational stage. Further, there are accommodations for fractions and rational numbers, and the last one, the introduction of irrational numbers. The last stage, abstract thinking involves cognition of continuity on the number line, and facts that unit measure and direction are sufficient for its defining. Assimilation and accommodation toward math content is presented at figure 2.

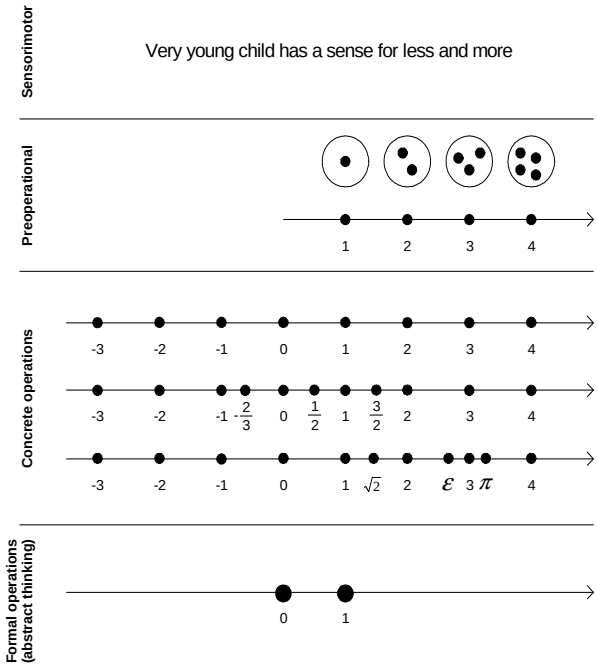

Figure 2. Assimilation and accommodation of mental model through the number line concept

Solving problem is a major issue in mathematical education. Unfortunately, it is often a major goal of both, the teacher and its students, to reach the solution of a posted problem. In that purpose, reading to learn mathematics tends to be a looking for an example that seems to be similar enough. However, it develops only solving skills and contributes sometimes to content knowledge. It should not be taught to solve problem of this or that kind, but to develop a general attitude for the solution of problems. For the sake of mathematical maturity, and in contrast with an algorithm, some concepts of heuristic strategies should be involved in solving problems: drawing a picture, breaking a big problem into smaller, trials and errors, developing a similar but simpler problem, library research. This means a plan of action that may help, but is not guaranteed to help. The solving should have the main purpose of increasing general knowledge, and not the solution.

An influence of the computer and information science on mathematical education is evident, even in the teaching curriculums. Sometimes, it is justifiable, but sometimes it is not. For example, procedure of square root calculation is completely through. However, it is comprehensible. On the other hand, it provides significant help or even complete solutions for wide range of problems, so why not to use it? It is hard to harmonize that offer with basic principles of mathematical education such as mathematical thinking and solving problems.

Relation between mathematics and computer science is significant, and their interaction multiply affects on mathematical education.

III COGNITIVE DEVELOPMENT IN COMPUTER SCIENCE EDUCATION

Computer science discipline was born in the early 1940 with the confluence of algorithm theory, mathematical logic and the invention of electronic computer [7]. The term *computer science* is later interchangeably used with terms such as computer science and engineering, computing, and informatics. The main effort in computer science discipline has been directed toward human-made processes, especially to information processing systems and machines. The main difference between computer science and computer engineering is that computer science is focused on analysis and abstraction, while computer engineering on abstraction and design [8]. The term computing is used to embrace all of computer science and engineering. The short definition of computing, taken from [8] is:

The discipline of computing is the systematic study of algorithmic processes that describe and transform information: their theory, analysis, design, efficiency, implementation, and application. The fundamental question underlying all of computing is, "What can be (efficiently) automated?"

The question stated in the previous quotation is one of the most inspiring questions in human history, and it suggests that *Computer Science* should have existed long before the advent of digital computers [9]. The roots of computing are influenced by mathematics and engineering (see Figure 3.). Analysis in computing is influenced by mathematics, while engineering influences design. Moreover, there are formed computer departments in academia that have mathematical or engineering emphasis. Computer science departments with a mathematics emphasis and with a numerical orientation are usually named as computational departments.

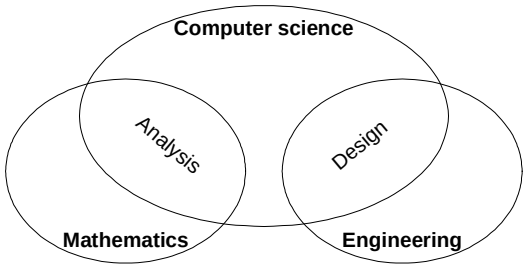

Figure 3. Influences on computer science education

However, it is considered that computer science has much closer relationship with mathematics than many scientific disciplines. This is consequence of the influence that mathematical issues such mathematical logic, Boolean algebra for circuit design, category theory, algebra, algorithms for solving equations and other classes of problems in mathematics have on early development of computer science field. Some academicians try to include computer science discipline in mathematics, while others propose that mathematics is a part of computer science, but neither of these inclusions is valid [9]. It is betted to describe the relationships between mathematics and computer science as mutual impact, and to consider different roles these disciplines have on person's education. Although both disciplines are necessary for the development of human society, the visibility and the case of use of computer

science advancements tend to get the credit in society [2].

Computer science is fundamentally based on computational thinking that is skill for everyone, not just for computer scientists [10]. From the early childhood, humans gain analytical skills and computational thinking through reading, writing and basic arithmetic. Wing stated fundamental characteristics of computational thinking [10]:

- *Computational thinking is related to conceptualizing, not programming*. Therefore, it requires thinking at multiple level of abstraction.
- *Computational thinking is fundamental, not rote skill*. Interesting challenge is to make computers think like humans, but without devolving humans to rote behavior because of computer assistance in daily activities.
- *Computational thinking is a way that human think, not computer*. It is related to how humans solve problems. We should never forget that humans design and instruct computers to solve problems.
- *Computational thinking complements and combines mathematical and engineering thinking*. Mathematics provide formal basis for computing, while engineering aspect is related to building systems that solve problems and interact with the real world.
- *It is based on ideas, not artifacts*. The basis for computing is human ideas that are further realized through artifacts such as software and hardware.

Both computer science and math education begin in the early childhood. Through playing children gradually learn some concepts from math and computing. However, there is a significant difference between math and computer science education. Math education is driven by detailed scope and sequence, state and national standards, books and other materials tied to standards, and state and national assessment [2]. In contrast, education in computer science comes from combination of formal and self-instructions. The samples for informal, or self-instructed education in computer science are activities such as playing computer games, or searching for content on Internet. Through these activities, children gain some sense and knowledge about using mouse and keyboard for particular purpose. Informal and self-instructing education also includes using digital devices such as cell phones, cameras, music storage and playback devices, and so on.

Based on the previous discussion, computer science education depends of many people that influence children growth. Formal education comes from regular classroom teachers or computer technology specialists, while informal education comes from parents, older siblings, colleagues in school and friends.

Computer science education can be viewed through cognitive development of students. Jean Piaget, biologist, philosopher, and behavioural scientist, developed one of the most significant theories in cognitive development [6]. This theory is based on the process of coming to know and the stages through which is knowing ability gradually acquired. Piaget proposed four sequential stages of development: sensorimotor stage, preoperational stage, concrete operational stage, and formal operational stage. Lutz and Huitt [11] discussed adoption and extensions of Piaget's theory of cognitive development in many scientific disciplines. Following the reasoning that led to math cognitive development scale Moursund [2] developed a computer science cognitive development scale with the following stages:

- *Stage 1: Piagetian Sensorimotor***.** Informal education usually provided by parents and other caregivers that contribute to general progress in sensory motor development and becoming acquainted with ICT environment.
- *Stage 2: ICT Preoperational*. It includes both informal and formal ICT education in preschool. This stage is characterized with considerable development of speed and accuracy in using mouse, touch pad and similar multimedia devices.
- *Stage 3: ICT Concrete Operations*. It included both informal and formal education, but with increasing importance of formal education. During this stage, children start to think logically, which is demonstrated through systematic and logical manipulation with symbols related to concrete objects. In addition, at this stage children start to use variety of software tools, as well as to work in graphical manipulation environments like studios for working with digital photography.
- *Stage 4: CS Formal Operations*. Open-ended developmental stage with begins of systematic and abstract thought. Requires ICT knowledge, skills and speed in representing and solving problems at the

level of high school graduate students. This stage continues into adulthood and requires a solid college-level CS course.

- *Stage 5: Abstract CS Operations*. Characterized with content proficiency and maturity at the level of contemporary CS texts at senior undergraduate level. At this stage are situated capabilities to solve high level CS problems posed by others.
- *Stage 6: Computer Scientist*. This is very high level of CS proficiency and maturity. At this stage is situated research work that advances the field, and work related to posing and solving problems at the level of contemporary frontiers.

IV SAMPLE FROM THE PRACTICE

As a sample that illustrates the difference between content knowledge and maturity in computer science programming task in assembly language for Intel 80x86 microprocessors will be presented [12][13]. The task is to write a program that solves a simple problem that uses matrices. As it is presented in figure 3, the knowledge in computer science has its root in mathematics and engineering. For the stated task, the following is assumed:

- Students should have knowledge about the specific topic from mathematics. This also assumes that students have appropriate maturity level in mathematics related to abstract thinking and understanding of multidimensional arrays.
- Students should have strong technical knowledge related to digital electronics and computer architecture. This means that students are familiar with the inner structure of selected microprocessor and organization of RAM memory.
- Students should know syntax of target assembly language, and should be familiar with software development tools.

The common situations in the practice are:

- Student knows enough about the computer organization and programming, but do not have knowledge about the domain of the problem. This illustrates the weak knowledge in mathematics. In that case there is no sense to discuss about maturity level in mathematics.
- Student knows the solution of the problem (he has domain content knowledge), but do not know computer organization, or do not know how to use programming tools. This situation illustrates the lack of content knowledge in the domain of computer science.
- Student solves a problem in the domain, and writes a program that implements the solution. When a student has higher level of content knowledge and maturity in mathematics, he is able to provide a set of possible solutions, and to select the optimal one. Usually, in that case a student has enough content knowledge in computer science for writing a program that will implement the solution.
- Student solves a problem in the domain, and writes a program that implements the solution. When the student is capable to easily write a program for the stated problem by using different programming structures, and/or different available libraries, we can talk about the increased level of maturity level in computer science.

Efficient solving of different problems in a selected domain and capability to provide several solutions and to discuss their efficiency, require specific domain knowledge and maturity level, technical knowledge in computer science and engineering, and increased maturity level in computer science.

This sample illustrates the necessity to include subjects that will provide strong mathematical knowledge, engineering knowledge, and develop specific computer science knowledge and skills in the curriculums for computer science and information technology.

V CONCLUSIONS

Math and computing education are closely connected, which is evident from long history of mathematics and computing. Many people and organizations are involved in development and change of these disciplines. Changes start in mathematical and computer science education and influence all areas where these disciplines are used. The major role in changes in both disciplines plays ICT that provides powerful hardware and networking infrastructure, information retrieval systems and tools that can solve or help in solving a wide range of problems. Changes should increase proficiency and maturity of pupils and students in both mathematics and computing. This paper

discusses development of content knowledge and maturity in mathematics and computer science and presents cognitive development scales for both disciplines.

A sample from the university practice is also provided with the aim to illustrate the concepts of content knowledge and maturity in mathematics and computer science. The sample is described on the conceptual level, without unnecessary practical details. However, some important remarks and conclusions are derived, and these remarks should direct both further research and the practice at university.

REFERENCES

[1] R. K. Logan. The Sixth Language: Learning a Living in the Internet Age, 2nd Edition. The Blackburn Press. Caldwell, New Jersey, USA. 2004.

[2] D. Moursund. Computational Thinking and Math Maturity: Improving Math Education in K-8 Schools (Second Edition). University of Oregon, Eugene, Oregon, USA. 2006.

[3] L. Ma. Knowing and Teaching Elementary Mathematics. Lawrence Erlbaum Associates. Mahwah, NJ, USA. 1999.

[4] S. Emerick, Eric Hirsch and Barnett Berry. Does highly qualified mean high-quantity? ASCD InfoBrief, November 2004.

[5] M. Burns. Writing in Math Class: A Resource for Grades 2-8. Math Solutions Publications. Sausalito, CA, USA. 1995.

[6] J. Piaget. The psychology of intelligence, 2nd Edition. Routledge. London, UK. 2001. [Originally published in 1950].

[7] P. J. Denning. “Computer Science: The Discipline”. In Encyclopedia of Computer Science, 4th Edition (Anthony Ralston, Edwin D. Reilly, and David Hemmendinger, Eds). Grove's Dictionaries, New York, NY, USA. 2000.

[8] D. E. Comer, D. Gries, M. C. Mulder, A. Tucker, A. J. Turner, P. R. Young. “Computing as a discipline”. Communications of the ACM, Vol. 32, Issue 1, January 1989, pp. 9-23. DOI: 10.1145/63238.63239.

[9] D. E. Knuth. “Computer Science and Its Relation to Mathematics”. The American Mathematical Monthly, Vol. 81, 1974, pp. 323-343.

[10] J. M. Wing. “Computational thinking”. Communications of the ACM - Self managed systems, Vol. 49, Issue 3, March 2006, pp. 33-35. DOI: 10.1145/1118178.1118215.

[11] S. T. Lutz and W. G. Huitt. “Connecting cognitive development and constructivism: Implications from theory for instruction and assessment”. Constructivism in the Human Sciences, Vol. 9, Issue 1, pp. 67-90. 2004.

[12] B. B. Brey. The Intel 32-bit microprocessors: 80386, 80486, and Pentium. Prentice Hall, New Jersey, USA, 1997.

[13] R. Detmer. Introduction to 80x86 Assembly Language and Computer Architecture. Jones and Bartlett Publishers, Sudbury, MA, USA, 2001.

VIRTUALIZATION TECHNOLOGY IN HIGHER EDUCATION IT COURSES

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Abstract – Growing technology in the field of ICT emphasizes importance of expert education for their use. The main sources of such education should be universities, and numerous factors that influence on its efficiency should be reconsidered. This paper deals with university education for various IT courses that demand network infrastructure for their teaching program. Besides laboratories with real network equipment, which enable students to work in real network environment, virtualization technology and appropriate software can be used for teaching computer networks and other courses such as data and system security, system administration, etc.

This paper describes the most characteristic environments of virtual network laboratories as well as their main features. The new virtual laboratory, named VNLab, is proposed and described in this paper.

I INTRODUCTION

Rapid development of computer communications influenced on importance of expert education which will use these technologies. In the first place, expert education is provided by universities and other academic institutions. Efficiency of this education mostly depends on laboratory conditions used for its practical part. High equipment costs, its constant changing and upgrade requests complicate maintenance of computer laboratories. All these reasons reflect on growing importance of software solution in this area.

One of the modern ways for adopting practical and functional knowledge about computer networks and systems is virtualization software for network modeling and teaching. [1, 2] Virtualization software proved itself as efficient enough for virtual laboratories creation [3, 4, 5, 6], and its primary role was to create experimental environment for new technologies, as well as developing and testing network software. The other, but not less important purpose of virtual laboratories is in education of information technology experts, i.e. for engineering education. Many examples confirm this statement. Virtual laboratories can be used in the fields of: operating systems [7], system administration and networks security [8, 9, 10, 11], server and client software development, data bases [12], distributed network platforms and other [13]. The most popular use of virtual laboratories is in the field of computer network education. There are many different platforms developed for those purposes, as well as the ones primarily designed for experimenting and networking concepts studying. Recently, the new appliance of virtualization technology in the area of data and system security has emerged as well.

This paper describes the most characteristic environments of virtual network laboratories as well as their main features. The example of proposed virtual laboratory, named VNLab is showed too.

II VIRTUAL NETWORK ENVIRONMENTS

In this section, the brief presentation of various approaches to creation of virtual network laboratories is presented, as well as the summarization of their main characteristics [14].

A. VNUML (Virtual Network User Mode Linux)

Open-source tool with a general purpose, based on network scenarios is VNUML. It was developed in 2004 at Telematics Engineering Department of Technical University of Madrid, as part of Euro6IX research project for experimenting in the area of IPv6 network systems. Its primary aim was to simulate computer networks and to be a tool for creating virtual network polygon test. VNUML was based on User-mode Linux (UML) technology.

VNUML was developed from the laboratory with local access (available as Live CD too) to the environment with remote access.

B. Netkit

The second important network emulation system based on the same virtualization technology is Netkit [15]. It is fully developed at open-source software. It contains four components: kernel, system file image, software for virtual hub and the set of defined user commands. The Netkit environment was

developed for experimental purpose in computer networks domain. The project of its development started in 2005 in the Computer Networks Research Group at University of Roma Tre, and it was the part of Linux User Group LUG Roma 3 project for creating costless educational environment. The project was extended by XML based language named NetML. The purpose of NetML was to describe network topology used in network scenario of particular environment [16, 17, 18].

Netkit is used by many universities as teaching tool. The system is designed for working with local access. Besides installation package, there is a Live CD version too. The main drawback of this system is inability of UML to support other operating system than Linux.

C. V-NetLab

V-NetLab environment represents complex structure with one NFS server. This server is used as storage for virtual machines and its disk image files. The V-NetLab has nine workstations with Linux operating system and VMware virtualization software. The system has a gateway that enables users to access the virtual network and command interface. [19]

Some of the exercises for this environment include: firewall system configuration with iptables software, network analysis (with tools such as: ping, traceroute and nmap) and network intrusion detection with snort tool.

D. VELNET

Virtual Environment for Learning Networking –VELNET, uses VMWare Workstation virtualization software with different guest operating systems (Windows XP, Windows NT Workstation, OpenBSD). Unlike other solutions with Linux environment as dominant one, Windows platform prevails in this case. VELNET was developed in 2003 in the School for computing and information technology at the University of Western Sidney, Australia.

E. VlabNet

VlabNet project is based on Debian operating system, Xen virtualization software and Quagga Routing Suite routing software. This solution represents one of the first attempts of combining virtual machines and physical network equipment. [20]

F. Manage Large Networks (MLN)

MLN is an open-source package that represents tool for defining computer networks. The system uses User-Mode Linux (UML) or Xen as virtualization software and different virtual machines based on different Linux distributions. MLN language was also developed and it simplifies network scenarios creation and configuration. Students may use this system by script files written in this language.

G. Marionnet

Marionnet [21] is virtual network laboratory that enables defining, configuring and running complex networks and their devices such as: switches, hubs, routers and cables. It is a free application created for Linux platform and based on UML and VDE [22] virtualization tools.

H. vBET

vBET system [23] is UMLbased. Users describe scenario by textually oriented specification language. Parser processes specification and generates a script. Running the script virtual node and virtual topology are created. After the experiment scenario may be canceled. vBET language is similar to the NetML and MLN, because automation of running commands on virtual machines is not allowed.

I. Dynagen

Dynagen [24] differs from abovementioned systems. This system is oriented to the creation of scenarios made of emulated Cisco routers, based on Dynamips technology. The main advantage of this system is high level of scenario reality while its main drawback is inability to emulate any other platform or node type (such as server or working station) except for Cisco router.

J. VNLab (Virtual Network Laboratory)

VNLab is an online educational system that distributes learning material, as well as learning environment, using the network infrastructure. The laboratory is based on virtualization technology. VNLabwas developed during 2007 at Technical Faculty “Mihajlo Pupin”, University of Novi Sad, Serbia. Initially, it was used as teaching environment for Computer Network course for bachelor students at Information technology study program. Nowadays, its usage is being expanded with support for Data and Network Security Course. There is an ongoing research in order to expand the VNLab usability to other courses as well [25].

VNLab represents hardware-software model of virtual network laboratory [25, 26, 27, 28, 29]. VNLab is based on Microsoft Virtual Server 2005 R2 [30] virtualization software (Figure 2.).

K. GNS3 (Graphical Network Simulator)

GNS3 is graphical simulator which enables complex networks simulation [31]. Comparing to previous ones, it is a totally different environment and the only similarity is virtualization software: Dynamips, Qemu and VirtualBox VM. To provide simulation environment for complex communication systems (Figure 1.), GNS3 has been integrated together with following program packages:

- Dynamips – Cisco IOS emulator,
- Dynagen – text based interface for Dynamips,
- Qemu – generic and open source emulator and virtualization tool,
- VirtualBox – free virtualization software,
- Wireshark – open source program for packages analysis.

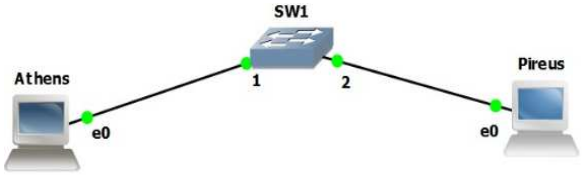

Figure 1. Simulation environment in GNS3

GNS3 is a tool designed for laboratory exercises creation for future engineers and administrators, as well as for exam preparation for next certificates: Cisco (CCNA, CCNP, CCIP and CCIE), Juniper (JNCIAm, JNCIS and JNCIE) Redhat (RHCE, RHCT), Microsoft (MSCE, MSCA) and Novell (CLP). It can be used for experimenting and working with Cisco IOS and Juniper JunOS operating systems [31].

As shown in Table I, the dominant virtualization software is UML (User Mode Linux), but variety of other software can be used with great effectiveness as well.

TABLE 1. VIRTUALIZATION TECHNOLOGIES

Environment name	Virtualization technology	Education Curses
VNUML	UML	Computer Networks
Netkit	UML	Computer Networks
V-NetLab	VMWare	Security
VELNET	VMWare	Computer Networks
VLabNet	Xen	Computer Networks
MLN	UML, Xen	Computer Networks
Marionnet	UML, VDE	Computer Networks
vBET	UML	Computer Networks
Dynagen	Dynagen	Computer Networks
VNLab	MS Virtual Server 2005	Computer Networks, Security
GNS3	Dynagen, Qemu, VirtualBox	Various

The choice for suitable virtualization platform is simplified, i.e. multiple platforms may be used with the same efficiency. Also, table shows that dominant usage of this environment for learning purposes is related to networking related course. Despite this dominance, there are some efforts for transforming existing virtual environment or creating completely new one intended for implementation of Data and Network Security course.

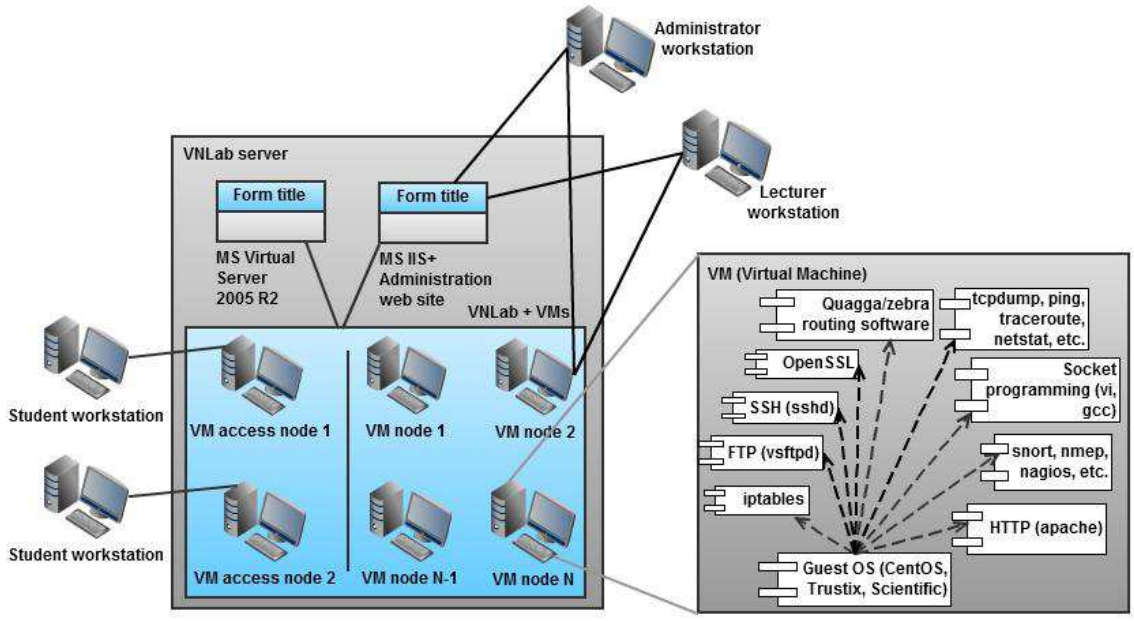

Figure 2. The VNLab v2.0 architecture

III LABORATORY EXERCISES FOR DATA AND NETWORK SECURITY COURSE

Following laboratory exercises are developed for usage at Technical Faculty "Mihajlo Pupin" for Data and Network Security course. These exercises are partly realized in VNLab environment and partly in the GNS3 environment. Some of the exercises are in experimental and prototype phase. Each presented lab is described with basic topics covered by an exercise.

SecLab00

SecLab environment and Linux OS

Introductory exercise. CentOs Linux basics, SecLab and GNS3 environment, Linux operating system, Linux file system, network settings, configuration files, commands: ifconfig, route and ping.

SecLab01

SSH protocol

Basics of SSH protocol, basic SSH server configuration, starting and stopping the server, basic usage of SSH client software. User creation for remote SSH login. Private and public key creation with RSA algorithm. Copying key to the SSH server using SCP protocol. Login to the SSH server using private key. SSH protocol analyses.

SecLab02

FTP server security

FTP, SFTP, SSL and TLS protocol basics. Basic FTP server (vsftpd) configuration. Stopping and starting FTP server. FTP and SFTP client basics. Using openssl for certificate generation. Configuration of FTP server for secure connection.

SecLab03

Web apache server security

SSL and TLS protocols. Basic HTTP server (apache) configuration. Stopping and starting HTTP server. Creation of self-signed certificate. Ssl.conf and its configuration. Access to the https site.

SecLab04

Firewall IPv4

Firewall IPv4 principles, configuration, iptables, packet filtering, NAT, port forwarding, network and system security.

SecLab05

Firewall IPv6

Firewall IPv6 principles, configuration, iptables6, packet filtering, network and system security.

SecLab06

IDS (Intrusion Detection System)

IDS basics. Basic snort configuration, basic rules, tests and experiments. The lab is in the prototype and testing phase.

SecLab07

System security assessment

Server ports an netstat, port scanning. Nmap options and usage. The lab is in the prototype and testing phase.

SecLab08

IPSec VPN

IPSec protocol basic. VPN basic. Strongwan package. Basic IPSec Site-to-Site VPN configuration and simple scenario. The lab is in the prototype and testing phase.

IV LABORATORY EXERCISES FOR NETWORK COMPUTER COURSE

Following laboratory exercises are developed for usage at Technical Faculty "Mihajlo Pupin" for Computer Network course. These exercises are realized in VNLab environment. Each presented lab is described with basic topics covered by an exercise.

VNLab00

VNLab environment and LinuxOS

Introductory exercise, VNLab environment, Linux operating system, Linux file system, network settings, configuration files, commands: ifconfig, route and ping.

VNLab01

IPv4 addressing and static routing – part 1

IPv4 addressing, IP address, netmask, network prefix, network address, broadcast address, routing introduction, static routing, commands: route add, route del, route, netconfig, ping and traceroute.

VNLab02

IPv4 addressing and static routing – part 2

IPv4 addressing, IP address, netmask, broadcoast address, static routing, network design,

default route, commands: route add, route del, route, netconfig, ping and traceroute.

VNLab03

IPv6 addressing and static routing

IPv6, IPv6 addressing, global-unicast address, site-local address, link-local address, IPv6 static routing, 6to4 tunneling, ND protocol, commands: route add, route del, route show and traceroute.

VNLab04

RIP routing protocol

Dynamic routing, RIP protocol basics, Zebra/quagga multiprotocol routing software, Cisco IOS-like environment, router configuration, commands: router rip, passive interface and network.

VNLab05

OSPF routing protocol – backbone area

Dynamic routing, OSPF protocol basics, interior gateway protocols, area 0 (backbone), path costs, Zebra/quagga multiprotocol routing software, Cisco IOS-like environment, commands: router ospf, passive interface, network, area and ipospf cost.

VNLab06

OSPF routing protocol – multiple areas

Dynamic routing, OSPF protocol basics, interior gateway protocols, multiple areas, area types, path costs, Zebra/quagga multiprotocol routing software, Cisco IOS like environment, commands: router ospf, passive interface, network, area and ipospf cost.

VNLab07

BGP routing protocol

Dynamic routing, BGP protocol basic, exterior gateway protocols, Zebra/quagga multiprotocol routing software, Cisco IOS-like environment, autonomous system, neighbors, commands: router bgp, network and neighbor.

VNLab08

Server software – part 1

TCP and UDP protocols and ports, server software, programming simple client and server software, compiling and installing server software (source code) and rpm packages.

VNLab09

Server software – part 2

File /etc/services, starting and stopping services, commands netstat and telnet. Server software configuration: apache (web server), proftpd (ftp server) and bind (DNS server).

VNLab10

Firewall

Firewall IPv4 principles, configuration, iptables, packet filtering, NAT, port forwarding, network and system security.

VNLab11

Firewall IPv6

Firewall IPv6 principles, configuration, iptables6, packet filtering, network and system security.

V CONCLUSION

This paper showed the main characteristics of virtual network laboratories used for modern education in computer networks and other related courses. The architecture of proposed virtual network laboratory, VNLab, is presented too.

Numerous learning environments based on virtualization technology are given together with their comparison. It showed that dominant virtualization software is UML (User Mode Linux), but variety of other software can be used with great effectiveness as well.

Presented lab exercises for two IT courses proved that usability of virtual laboratories is highly effective environment for IT engineering education.

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REFERENCES

[1] Li Feng, Yu Nana, Design and implementation of TCP/IP protocol learning tool, Proceedings of the Entertainment for education, and 5th international conference on E-learning and games, Springer-Verlag Berlin, Heidelberg, Germany, 2010.

[2] Nurul Sarkar, *Tools for teaching computer networking and hardware concepts*, Information Science Publishing, London, UK, 2006.

[3] Wojciech Kuczborski, A computer network laboratory based on the concept of virtual machines, World Transactions on Engineering and Technology Education 2005, UICEE, Vol.4, No.1, Perth, Australia, 2005.

[4] Jeroen van der Ham, Gert Jan Verhoog, Virtual environments for networking experiments "Analytical Network Project" Masters System and Network Administration, University of Amsterdam, Netherlands, http://staff.science.uva.nl/~vdham/research /publications/anp-jvdh-gjv.pdf, July 1, 2004.

[5] Kuthonuzo Luruo, Virtual Networking with User-Mode Linux, Linux for you pro, No. 27, March 2005.

[6] Kuthonuzo Luruo, Getting to Virtual Networking Nirvana, Linux for you pro, No. 27, May 2005.

[7] Dobrilović Dalibor, Stojanov Željko, Using virtualization software in operating systems course, Proceedings of the 4th IEEE International Conference on Information Technology: Research and Education - ITRE 2006, pp. 222-226, ISBN: 1-4244-0859-8, Tel Aviv, Israel, 16-19 October 2006, DOI: 10.1109/ITRE.2006.381569

[8] Charles Border, The development and deployment of a multi-user, remote access virtualization system for networking, security, and system administration classes, Proceedings of the 38th SIGCSE technical symposium on Computer science education (SIGCSE '07), pp 576-580, ACM New York, NY, USA, 2007.

[9] Xinli Wang, Guy C. Hembroff, Rick Yedica, Using VMware VCenter lab manager in undergraduate education for system administration and network security, Proceeding of ACM conference on Information technology education (SIGITE '10), pp 43-51, October 7–9, Midland, Michigan, USA, 2010.

[10] Kyle E. Stewart, Jeffrey W. Humphries, Todd R. Andel, Developing a virtualization platform for courses in networking, systems administration and cyber security education, Proceedings of the 2009 Spring Simulation Multiconference (SpringSim '09), Society for Computer Simulation International San Diego, CA, USA, 2009.

[11] Li Yang, Teaching system and network administration using virtual PC, Journal of Computing Sciences in Colleges archive, Vol. 23, Issue 2, Consortium for Computing Sciences in Colleges, USA, December 2007.

[12] Bullers, Jr., W. I. , Burd S., Seazzu, A. F., Virtual machines - an idea whose time has returned: application to network, security, and database courses, Proceedings of the 37th SIGCSE technical symposium on Computer science education (SIGSCE'06), pp 102-106, March 03-05 Houston, Texas, USA, 2006.

[13] Benjamin R. Anderson, Amy K. Joines, Thomas E. Daniels, Xen worlds: leveraging virtualization in distance education, Proceedings of Annual Joint Conference Integrating Technology into Computer Science Education (ITiCSE), pp 293-297, Paris, France, July 2009.

[14] Dalibor Dobrilovic, Modeling virtual network laboratory based on virtualization technology, LAP Lambert Academic Publishing, Saarbrücken, Germany, ISBN: 978-3-659-30198-8, pages 236.

[15] Netkit project (Web site), http://www.netkit.org, retrieved 2006.

[16] Rimondini M., *Emulation of Computer Networks with Netkit*, Technical Report RT-DIA-113-2007, Dipartimento di Informatica e Automazione, Universit`a di Roma Tre: Rome, Italy, 2007.

[17] Pizzonia M, Rimondini M, *Netkit: easy emulation of complex networks on inexpensive hardware*, Proceedings of the 4th International Conference on Testbeds and research infrastructures for the development of networks & communities (TridentCom2008), Innsbruck, Austria, March 2008.

[18] Netkit project (Web site) – section official labs, http://wiki.netkit.org/ index.php/Labs_Official, retrieved 2011.

[19] Weiqing Sun, Varun Katta, Kumar Krishna, R. Sekar, *V-NetLab: An Approach for Realizing Logically Isolated Networks for Security Experiments*, Proceedings of (CSET'08), San Jose, USA, July 28 – August 1, 2008.

[20] Valerie J. H. Powell, Christopher T. Davis, Randall S. Johnson, Peter Y. Wu, John C. Turchek, Ian W. Parker, *VLabNet: the integrated design of hands-on learning in information security and networking*, Proceedings of the 4th annual conference on Information security curriculum development (InfoSecCD'07), ACM New York, NY, USA, 2007.

[21] Jean-Vincent Loddo, Luca Saiu, *Marionnet: a virtual network laboratory and simulation tool*, SimulationWorks, March 4, Marseille, France, 2008.

[22] Davoli R., *VDE: Virtual Distributed Ethernet*, Proceedings of First International Conference on Testbeds and Research Infrastructures for the DEvelopment of NeTworks and COMmunities (TRIDENTCOM'05), pp 213-220, February 23-25, Trento, Italy, 2005.

[23] Jiang, X., D. Xu., *vBET: a VM-Based Emulation Testbed*, Proceedings of the ACM SIGCOMM 2003 Workshops, pp 95–104, Karlsruhe, Germany, August, 2003.

[24] Anuzelli G, *Dynagen: The Network Configuration Generator for Dynamips*, http://dynagen.org, 2007.

[25] Dalibor Dobrilovic, Vesna Jevtic, Borislav Odadzic, "Expanding Usability of Virtual Network Laboratory in IT Engineering Education", International Journal of Online Engineering, Vol. 9, Issue 1, pp 26-32,http://dx.doi.org/10.3991/ijoe.v9i1.2388, Kassel University Press GmbH, Germany, 2013.

[26] Dobrilovic D., Stojanov Z., Odadzic B., *Design and Implementation of Online Virtual Network Laboratory*, Advancement in Online Education: Exploring the Best Practices, Vol. 1, Chapter 10, Publication date: 2011 4th quarter, 2011.

[27] D. Dobrilovic, V. Jevtic, Z. Stojanov, B. Odadzic, "Usability of virtual network laboratory in engineering education and computer network course", Proceedings of joined 15th International Conference on Interactive Collaborative Learning and 41st IGIP International Conference on Engineering Pedagogy, September 26 – 28, Villach, Austria, 2012.

[28] Borislav Odadžić, Dalibor Dobrilović, "Softverski alati u nastavi računarskih komunikacija", XIII simpozijum o novim tehnologijama u poštanskom i telekomuikacionom saobraćaju, PosTel 2012, 04. i 05. decembar 2012. , Beograd, Srbija, pp 337-347.

[29] D. Dobrilovic, V. Jevtic, Z. Stojanov, B. Odadzic, "The Design Guidelines for Virtual Network Laboratories", Proceedings of IX IEEE International Symposium on Telecommunications, October 25-27, Sarajevo, Bosnia & Herzegovina, 2012.

[30] Robert Larson, Janique Carbone, *Microsoft Virtual Server 2005 R2 Resource Kit Chapter 7: Best Practices for Configuration and Performance*, Microsoft Press, Redmond, USA, August, 2007.

[31] http://www.gns3.net/gns3-introduction/, preuzeto septembra 2012.

EIGHT GRADE STUDENT`S MOTIVATION TO PARTICIPATE IN COMPETITION TEACHING OF TECHNICAL AND IT EDUCATION

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Abstract - The objective of this paper is increase student motivation eigth grade to participate the competition continues TIE. In the wix will be made site in the field of Information tehnology, that students can be helped to participate in the competition continues TIE. Students will be tested by two questionnaire. The authors will first examine the overall motivation of students to participate in the competition continues TIE, and then they will be present site which was created in wix. Then we will conduct another questionnaire and examine the students whether they liked the site presented and whether to increase their motivation to participate in the competition continues TIE.

I INTRODUCTION

„Competition itself is neither harmful nor beneficial. It became that depending on the organization as a whole, and respectively the method and quality of planning, preparation, implementation and monitoring of the competition". [1] The competitions are designed for students with special interests and achievements in certain fields. The aim is to reveal the students with high ability and motivation through the competition. [1]

II CONCEPT OF MOTIVATION

The motive is the driving force, the pursuit of some goal; psychological process that supports us to do things. [2]

Children, like adults, find motivation to learn in the various factors that can be divided into external and internal. Some of the external content may be interesting content, obedience, identification with a person who teaches it, rewarding learning outcomes, the desire for acceptance and other. Internal reasons are much more constructive drivers of the learning process. These are innate curiosity and love of exploration and discovery, the need to define the world around them and other motives, different depending on personality, situation, age, etc...

When we talk about the motivation of children for the competition, preference should be given to the internal motivation, because it is self-initiated. This motivation should be encouraged and fostered. [2]

III STUDENT'S MOTIVATION FOR COMPETITION

The motivation of talented students is a given. They are curious, know more and want more. At school competition can be verified knowledge, make selections, thus eliminating a large percentage of students with the achivement of less than 50% on the test. Reducing the number of participants, reducing costs and, consequently, greater ability to adequately reward the best significantly contribute to greater efficiency of the competition. At the school competition students improve their test solving skills, objectively assess their knowldge, and reduce discomfort due to poor results at the next level of competition. [1]

Competitions are a step forward from the traditional classroom, children are encouraged to demonstrate averment and the self-attestation. The teacher's role in the motivation of children for the competition si undoubtedly great. Apart from the intrinsic motivation that a child feels, it also needs external motivation by not only teachers, but the overall environment in which the child is. A teacher who knows the sources of motivation, how to encourage and awaken it in students, can expect positive results with their competition team. [2]

IV RULES OF COMPETITION FROM TECHNICAL AND IT EDUCATION

Regulations and rules for competition in the technical education of primary school complies with the ''Expert guidance on organizing competitions and festivals of elementary school'' issued by the Ministry of Education (Number: 610-00-01775//2008-06 in Belgrade 25.12.2008.).

This ordinance arranges the goal, objectives, types and levels, organization, method of evaluation, the requirements for implementation, monitoring and reporting on previous competitions and festivals. [3]

The aim of the competition is to involve as many students to have the opportunity to, depending on the content and type of activities;

- present knowledge, abilities, aptitudes, creativity, positive social values etc. which they have mastered during their development, education, upbringing and socializing;
- compare the results obrained with other participants, in order to motivate them for further advancement;
- assess and determine their realistic results compared to results of other participants, noting the failures, but also the quality in the process of its preparation. [3]

Train participants to compare their knowledge, skills, attitudes, creativity, behaviour etc. with the values of other students, and for the students to:

- seek to achieve better results, both individually and as team;
- better and more objectively know themselves and other participants in the competition;
- develop capabilities in emotional acceptance score of the results. [3]

The competition is organized at schools, municipalities, counties, cities and the State. This paper will examine how students are motivated to participate in competitions within the TIE subjects at school level. School competitions are organized by schools to separate the most succesful students, who will represent the school at the following copetitions. [3]

V RULES OF COMPETITION IN THE TEACHING OF TECHNICAL EDUCATION FOR ELEMENTARY SCHOOL PUPILS IN SERBIA

Participation in the competition is achived through the following three elements:

A. Test (test theoretical knowledge)

This element is realized through the quiz, which includes teaching materials and technical education for students of seventh and eight grade cirriculum and teaching technical and IT education for students of the fifth and sixth grades. Students have 60 (sixty) minutes to complete the test. [3]

B. Technical Documentation

The technical documetation shall include:

- General design;
- Sketches;
- Technical drawings;
- Operations-plan;
- Tools and materials.

In the application for the competition must specify the name of work, type, region and discipline from which the student competes. [3]

C. Demonstration and Defense of the paper

Competition TECHNICAL EDUCATION, area Informatics

- ARCHITECTURE AND BUILDING;
- MECHANICAL ENGINEERING (agricultural engineering, transportation systems...);
- ENERGY (electrical engineering, alternative energy sources);
- INFOMATICS AS A FUNCTION OF TECHNIQUE AND TECHNOLOGY;
- MULTIDISCIPLINARY WORK (cybernetics, robotics, ecology...);
- PHOTO/VIDEO TECHNOLOGY. [3]

The paper will use the discipline INFORMATICS AS A FUNCTION OF TECHNIQUE AND TECHNOLOGY. It will examine how much are students interested in participating in the competition in these areas.

VI MOTIVATION FOR THE CHOICE OF TOPIC

The motivation for the choice of topic is that we want to abandon the traditional way of working and offer students something different, and therefore try to increase the motivation of eight grade students to participate in the competition teaching of TIE. Teaching Information Technology area that is designated by the curriculum for the eight grade will be done in the wix-shaped site. Students will view the site through a link, and so will be to examine whether they liked the site and present how they are motivated to participate in the contest continued after the introduction of new software that can help them with the preparation of presentation with which they can participate in the competition.

VII THEORETICAL APPROACH TO THE PROBLEM

A. *Description of the problem*

The fact is that students today are less and less interested in participating in the competition. This study presents new methods to increase students' motivation to participate in the competition teaching of TIE. Broader problem is to examine whether and how students are interested in participating in competitions. The narrow issue is to examine whether wix as a new teaching method increases students motivation to participate in the competition.

B. *The achieved degree of research*

Not found any research that was done in wix in order to increase students' motivation to participate in the competition teaching of TIE.

VIII RESEARCH METHODOLOGY

A. *Subject of research*

Point of this research result from need to determine how much students, in eight grade elementary school "Laza Kostic", are exactly interested in competition in the subject IT. Starting from problem definition, subject of research is „Motivation of eight grade students for participation in competition in the subject IT."

B. *Research goal*

Basic goals in this research are: inquire students motivation for competition, classified the most usually areas in IT from which students go to competitions and examine if new wix method influence to increase motivation.

C. *Research tasks*

Based on the goals we will present research tasks by which we confirm or deny posted hypothesis.

Need to exemine:

- are the students and how much interested in competition in IT;
- examine the most interesting areas for students;
- conduct a poll whether students liked presented site or not.

D. *Research hypotheses*

Basic hypothesis is:

- There is a chance to increase students motivation for competition by using software created in wix.

Beside this basic hypotheses we could state and auxiliary hypotheses:

- It is possible increase students motivation for competition in IT;
- Sex of students does not affect the choice for competition.

IX RESEARCH

A. *Methods and techniques*

In this work is going to be used descriptive and causal method that is based on experiment. The main characteristic of this experiment is to examine efficiency upbringing and education impact. In the experiment we will see two variables: the procedure and the effect of procedure [1]. Technique which is going to be used is questionnaire. Under the supervision of class teacher the students will be asked how much they are interested to participate in competition in teaching IT.

B. *Sample survey*

This research will be conducted in a primary school "Laza Kostic" in Gakovo. The study will include two eighth grade classes of 25 students. The research will be conducted during the second semester.

C. *Test procedure*

For the purposes of this study is need for students to fill two polls in the presence of class teacher. The first survey will consist from that which would be interrogated overall motivation of students eighth grade to participate in the competition IT. Later they will be presented to site-teaching Information Technology unit. Each student will be able to download on his computer the link by wich he or she could overview made site. After that, students will once again give poll, which they will fill in the presence of class teacher. Based on this survey determine whether to increase students' motivation eighth grade to participate in the competition IT and whether they liked the site presented.

X DATA ANALYSIS AND CONCLUSION

Analyze the first survey which will show the total motivation eighth grade students to participate in the competition and give a graphical representation of the results obtained.

After the presented site, conducted a second survey and determine whether to increase motivation eighth grade students to participate in the competition and whether they liked the site

presented and provide a graphical display of results. Then compare the results and give its conclusion on the feasibility of this work. State whether the hypothesis is proved or disproved. If it is disproved write the reason. List the factors that led to confirm or refute the hypothesis. Briefly relate the results of work and make recommendations for further work.

REFERENCES

[1] Mužić Vladimir, (1979); Methodology pedagogical research, IGKRO „Light" – OOUR Institute for Textbooks, Sarajevo

[2] Šestanović M. (2004): Psychology education, Sarajevo: Educational academy

[3] Adamović Ž. (2007), Methodology research working, University of Novi Sad Tehnical faculty „MihajloPupin" Zrenjanin

[4] http://www.iccg.co.me/ispitni/images/IC%20izdanja/BROSURA%20TAKMICENJE.pdf (dawnload 16.01.2012.)

[5] http://www.tehnicka-apatin.edu.rs/attachments/179_Motivacija%20za%20skolsko%20ucenje.pdf (dawnload 16.01.2012.)

[6] http://www.mksirmium.com/dokumenta/pravilnici_pdf/pravilnik_i_propozicije_za_takmicenje_iz_tehnickog.pdf (dawnload 16.01.2012.)

[7] http://www.tehnickoobrazovanje.com/o_autoru.html (dawnlod 16.01.2012.)

THEORY AND MODEL OF FUNDS FOR MODELING AND SIMULATION IN TEACHING TECHNICAL EDUCATION

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Abstract - The paper discusses the theory of models, simulations and tools for modeling and simulation. Modeling of the scientific method when natural or artificial structures we study the structure, systems, processes or phenomena that are analogous to some other facility, system, process or phenomenon that for some reason it is impossible to study directly. Modeling is a scientific method of knowledge about the characteristics of models of natural and artificial systems transmit at such hearings.

The model represents a static state of the system. System parameters are not defined as a function of time. The simulation just follows all the system parameters as a function of time and there is a chronology of events in the system changes. Modeling and simulation belong to research and experimental techniques. The simulation is suitable for examining the state of the system.

I INTRODUCTION

We live in a time of rapid changes, the more requires fast and efficient acquisition of knowledge and its application. At the same time, science, engineering and technology will undergo tumultuous change thanks to the information technology and telecommunications.

Changes and developments in the field of science and technology affect the education system. Application of knowledge is the most important element. In this sense, the educational system of each country is an institution that will ensure that the company adapt to change, to ensure the future itself. It is therefore necessary to introduce into the education system dynamic changes that will provide rapid acquisition of special software tools are expensive and their use-value is reduced because of the frequent presence of those attributes that are important for research or for teaching.

The objectives of the technical and technological education of society to reflect the interest of scientific and technical literacy and for socio-economic development and prepare people for a wide range of science today, and for training those who will develop and direct the future.

This paper contributes to increased efficiency and modernization of computer simulations and technical education classes in our education system [1, 2]. Modeling and simulation is extensively used in many scientific disciplines, but in teaching and education it is not present, not sufficiently explored.

II THEORY MODEL

Modeling is the process of imitation phenomena, objects, processes and systems. The model thus contains only the essential features of the original or real system yet to be built. The model is a simplified aspect of the original. Simple models are the least expensive design, aspire to the ideal model can be easily described mathematically, but have the least validity, i.e. and practical usability. For such a model is said to have a high level of abstraction.

Models of low levels of abstraction, on the other side of the complex models that require functional knowledge. The aforementioned effects of education are largely reflected in the natural sciences mostly on technical education as a subject.

Modeling of the scientific method when natural or artificial structures we study the structure, systems, processes or phenomena that are analogous to some other facility, system, process or phenomenon that for some reason it is impossible to study directly. Modeling is a scientific method of knowledge about the characteristics of models of natural and artificial systems are transferred to an object of study [3, 4].

In the process of modeling we distinguish two types of modeling:

- THEORETICAL MODELING - every thought to the activity with the aim of the research of a phenomenon. Each equation or formula is a theoretical model.
- PRACTICALLY MODELING - means any material product of human activity (implements, tools, machines,) is a real model.

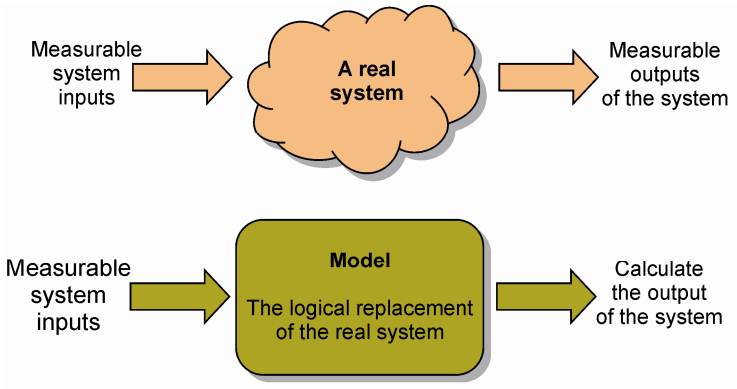

Figure 1. Model and real system

Cybernetics today appointed as the main objective of the research of complex dynamical systems and their functional design model. Such a complex structure modeling:

- An entity that cognitive function algorithm programmed machines,
- Program the machine that makes the algorithm, which imitates the model as a theoretical or modeled,
- Cybernetic machine (a physical model of a mathematical model or algorithm that performs machine).

In a double-reverse modeling process:

- The logic of the reviews is projected into the machine, i.e. modeled by a machine
- Mechanical logic is reflected in the brain.

The complex process of multiple modeling is done through the following phases:

- Natural and artificial models are described by function, to construct mathematical models of systems,
- Mathematical models to represent the technical models,
- Studying the model is studied, and I object, process or phenomenon.

Modeling is a thinking activity-theoretical construction of logical and mathematical systems, theoretical models of some objective system that is realistic models of various types (models, graphs, machinery).

Modeling is a complex cognitive-theoretical and practical, the active process. One definition of modeling is: Modeling is an educational and research procedures during which builds some real or ideal model is able to replace the real object that is being investigated [5].

The main objective of modeling is the deeper and more precise knowledge of an object, phenomenon or process. There are conditions that must be met in order to achieve this goal:

- There must be a similarity between the model and the original (physical, structural, functional),
- There must be a feature of object-original correspondence, i.e. model is a theoretical cognitive, practical and realistic, structural or functional reflection of the original,
- Based on the previous two conditions must be certain about the original.

The general definition of the model is limited to a science. According to this definition:

"Every model is theoretical, conceptual, practical and real case studies analog system (S1) by which explores the principal object or system (S0)." The aim of modeling:

- Use the model instead of the real system to a knowledge
- Avoids the risk of the experiment on the real system
- Analysis of the results should provide more efficient management of the real system

- You should not reproduce reality completely
- You need to show (formally described) of the structure or behavior of real systems.

Recommendations for model:

- Define a clear line system with the environment - to include phenomena of nature of interest
- Do not make too detailed and complex model
- Include important variables needed to describe the system
- Try to break down the components of the model - some functions of the whole
- Use proven methods for developing algorithms and programs
- Logical and check the accuracy of quantitative models.

III SIMULATION

The model usually represents the static state of the system, ie the system state that is a function of time. Simulation can track changes in a certain time interval. State of the system is simulated in the model (simulation model) [6].

Zaigler: Modeling and simulation are a number of activities to create models of real system and its computer simulation.

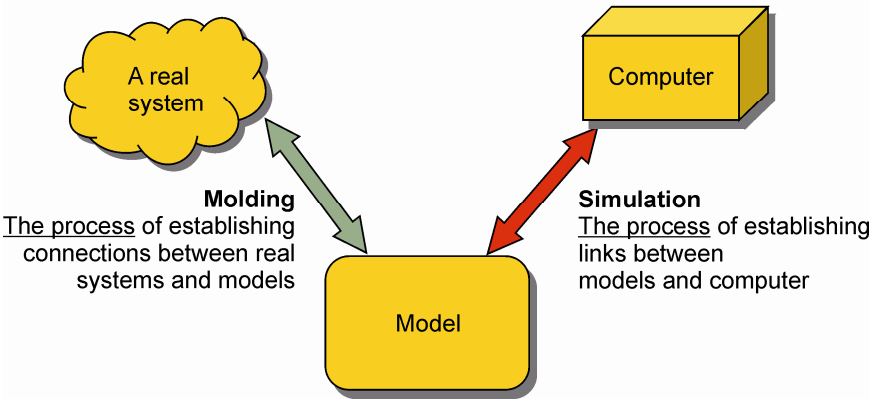

Figure 2. Modeling and Simulation

The system can be studied in several ways:

- Experimenting on the system itself is one way of testing the system but often not the best, because the experiment on the system and the most expensive and often dangerous for life and health researchers. Of course it is a real system that already exists. The experiment on the economic system, transport system and the like. certainly not desirable for two reasons: such an experiment is set in the case of incorrect assumptions of damage can be large.
- The study of the system in another way, using a model or simulation is often practiced as a rule,
- Many cases give good results. Groups of experts (system engineers) are trying to find a solution and how to reach solutions.
- Mathematical analysis provides a good solution and is applicable for systems of lower levels of complexity. The solutions obtained in this way are idealized. At a higher level of complexity of the system are obtained by a single global solutions, specific solutions to invent some other method.
- Modeling and simulation are typically implemented using a digital computer.

Cases of modeling and simulation are:

- Production facilities
- Banks, post offices, supermarkets,
- Distribution network - transport of materials
- Distribution of water, electricity, gas an EMS
- Computer Systems
- Saobradajni Systems (intersections, ports,)
- Factories
- Restaurants "fast food".

The model represents a static state of the system. System parameters are not defined as a function of time. Simulation monitors all system parameters as a function of time and there is a chronology of events in the system changes. Modeling and simulation belong to research and experimental techniques. The simulation is

suitable for examining the state of the system [7, 8]. Digital computers are now increasingly used in the simulation of system behavior. There are two possibilities in the way of simulating:

- The simulation using the simulation language
- The simulation without using simulation languages.

Today, the model for the design, modeling and simulation of the most commonly used computers:

- Analog,
- Digital and
- Hybrid computers.

If possible some real systems and models to describe the same mathematical model, then there is a mathematical analogy between the two objects. A mathematical model of computing as a subject in a physical model value mapped and the results of testing physical models can be directly applied to the mathematical model. By setting the input size is measured by the output of which is the required solution of the mathematical model.

Simulation in the broader sense includes:

- Experimenting on real system
- Recording of data on real system
- The formulation of the theory
- The construction of conceptual models
- Programming
- Planning of the experiments on the computer.

IV CONCLUSION

Teaching technical education is directly related to practical work and a great role in this is a workshop for Technical Education. It is important to introduce students to design, preparation, adaptation and use of equipment of varying complexity [9, 10]. Successful learning can be achieved using common, inexpensive devices (table, models, samples of the elements of machines and devices, a collection of electronic components). Using appliances and devices that exist in every household, the student is encouraged to work with teaching at home. It is important for the continuation of education in secondary schools. In laboratories for science and technology in secondary schools, the equipment is already quite specialized and standardized. In almost all laboratories in computer science and business research computers are located [11, 12]. In science labs for technical use of various digital electronic devices, but in laboratories for scientific subjects there are small computers.

New technologies allow the presentation of information or problems in a way that suits the student individually. This allows you to control the volume of unknown facts that are presented to the student, as well as optimization of the motivational states of students. It should enhance and improve the processes that allow for the feedback, which depends on the students' knowledge. Recent trends in the theories of motivation suggest that the feedback itself is neither the information nor that it increases motivation and encourages. The interpretation of feedback is that this is the connection between these two components on which the success or failure of students.

REFERENCES

[1] B. Egić, Modeling and Simulation, Branislav Egić, Technical Faculty "Mihajlo Pupin", Zrenjanin, 2005.

[2] K. Voskresensky, Didactics for teachers of computer science and technology, Technical Faculty "Mihajlo Pupin", Zrenjanin, 2004.

[3] B. Stojadinovic, Teaching technical education, Institute for Textbooks and Teaching Aids, Belgrade, 1995.

[4] B. Šešić, General methodology, Scientific Book, Belgrade, 1974.

[5] R. Kvaščev, Modeling learning process, Prosveta, Belgrade, 1978.

[6] B. Radenkovic, M. Stanojevic, A. Markovic, Computer Simulation, Faculty of Organizational Sciences, Belgrade, 2002.

[7] K. Voskresensky, Didactic individualization and socialization in the classroom, Technical Faculty "Mihajlo Pupin", Zrenjanin, 1996.

[8] N. Landa L. Cybernetics in pedagogy I and II, in Belgrade, the Belgrade, 1975

[9] D. Glusac, I. Tasic, Possibilities of computer games in teaching elementary grades, Teaching and Education, vol. 59, no. 3, 2010,pp. 390-400.

[10] D. Karuovic, D., Glusac, Effects of adjusting the characteristics of users of educational software preschool, innovation in teaching – ScientificPaper, vol. 22, no. 4, 2009, pp. 104-114.

[11] D. Glusac, Lj. Krneta, Compulsory computer education in elementary school - a prerequisite of quality IT education in high school,Educational,Reality, vol. 57, no.7-8, 2011,pp. 750-759.

[12] D. Glušac, D. Radosav, Educational software 'performance in mathematics' for preschoolers, Pedagogy, vol. 38, no. 3-4, 2000, pp. 180-184.

VISUAL PROGRAMMING ENVIRONMENTS FOR TEACHING OBJECT-ORIENTED PROGRAMMING

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Abstract - Object-oriented programming is currently very much in focus and object-oriented languages (such as C++ and Java) are used as the first language to teach programming at colleges and universities. The object-oriented concepts such as objects and inheritance are difficult for understanding by novice programmers. Due to their lack of general problem solving abilities, students do not know how to create algorithms, resulting in them not knowing how to program. This paper researches different educational visual programming environments in courses of object-oriented programming in higher education.

I INTRODUCTION

Programming is a major subject in Computer Science (CS) departments. However, students often face difficulties on the basic programming courses due to several factors that cause these difficulties. Maybe the most important reason is the lack of problem solving abilities that many students show. Due to their lack of general problem solving abilities, students do not know how to create algorithms, resulting in them not knowing how to program.

Learning programming requires the ability to decompose some real problems and to create the general (abstract) model of solutions. The next step is writing down the solution in the form of a program code in a programming language. Writing a program code for students is a difficult task and seems very demotivating because the smallest error in a code leads to failure.

Programming is a difficult cognitive skill to learn. It requires knowledge and skills in many areas, such as the syntax, semantics and pragmatics of programming languages, creative problem solving, development environment and a multitude of software tools (e.g. IDE, compiler), algorithms and data structures, programming concepts and paradigms (e.g. object-orientation, functions, variables), program design and programming patterns [1].

This paper gives an overview of some of the existing educational visual programming environments and compares some examples of their application.

II DEFINITIONS

"Visual Programming" (VP) refers to any system that allows the user to specify a program in a two (or more) dimensional fashion. Although this is a very broad definition, conventional textual languages are not considered two dimensional since the compilers or interpreters process them as long, one-dimensional streams. Visual Programming does not include systems that use conventional (linear) programming languages to define pictures, such as, Sketchpad, CORE, PHIGS, the Macintosh Toolbox, or X-II Window Manager Toolkit [2]. It also does not include drawing packages like Apple Macintosh MacDraw, since these do not create ‘’programs’’ as defined above. Visual programming contains various graphical approaches to specify programs.

"Program Visualization" (PV) is an entirely different concept from Visual Programming. In Visual Programming, the graphics is used to create the program itself, but in Program Visualization, the program is specified in a conventional, textual manner, and the graphics and animations is used to illustrate some aspects of the program or its run-time execution. Program Visualization systems can be utilized in program development, research, and teaching to help programmers and learners understand the structure, abstract and concrete execution as well as the evolution of software. Unfortunately, in the past, many PV systems have been incorrectly labeled "Visual Programming"

(as in [3]). PV systems can be classified using two axes: whether they illustrate the code, data or algorithm of the program, and whether they are dynamic or static.

"Data Visualization" systems show pictures of the actual data of the program. Similarly, "Code Visualization" illustrates the actual program text, by adding graphical marks to it or by converting it to a graphical form (such as a flowchart). Systems that illustrate the "algorithm" use graphics to show abstractly how the program operates. This is different from data and code visualization because with algorithm visualization, the pictures may not correspond directly to data in the program, and changes in the pictures might not correspond to specific pieces of the code. For example, an algorithm animation of a sort routine might show the data as lines of different heights, and swaps of two items might be shown as a smooth animation of the lines moving. The "swap" operation may not be explicitly in the code, however. "Dynamic" visualizations refer to systems that can show an animation of the program running, whereas "static" systems are limited to snapshots of the program at certain points.

"Visual Languages" refer to all systems that use graphics, including Visual Programming and Program Visualization systems. Although all these terms are somewhat similar and confusing, it is important to have different names for the different kinds of systems, and these are the names that are conventionally used in the literature appealing ideas for a number of reasons. The human visual system and human visual information processing are clearly optimized for multi-dimensional data. Computer programs, however, are conventionally presented in a one-dimensional textual form, not utilizing the full power of the brain. Two-dimensional displays for programs, such as flowcharts and even the indenting of block structured programs; have long been known to be helpful aids in program understanding [4]. Clarisse [5] claims that graphical programming uses information in a format that is closer to the user's mental representations of problems, and will allow data to be processed in a format closer to the way objects are manipulated in the real world. It seems clear that a more visual style of programming could be easier to understand and generate for humans, especially for non-programmers or novice programmers. Another motivation for using graphics is that it tends to be a higher level description of the desired actions (often deemphasizing issues of syntax and providing a higher level of abstraction) and may therefore make the programming task easier even for professional programmers. This may be especially true during debugging, where graphics can be used to present much more information about the program state (such as current variables and data structures) than is possible with purely textual displays. This is one of the goals of Program Visualization. Other Program Visualization systems use graphics to help teach computer programming. Also, some types of complex programs, such as those that use concurrent processes or deal with real-time systems, are difficult to describe with textual languages so graphical specifications may be more appropriate. The popularity of "direct manipulation" interfaces [6], where there are items on the computer screen that can be pointed to and operated on using a mouse, also contributes to the desire for Visual Languages. Since many Visual Languages use icons and other graphical objects, editors for these languages usually have a direct manipulation user interface. The user has the impression of more directly constructing a program rather than having to abstractly design it.

III EDUCATIONAL SOFTWARE VISUALIZATION

Most students are visual learners and instructors tend to present information verbally [7]. Some studies [8, 9] estimate that between 75% and 83% of students are visual learners. Because of their highly textual rather than visual nature, the use of either traditional programming languages or pseudo-code provides a counter-intuitive framework for expressing algorithms to the majority of students. Scanlan [10] showed that students understand algorithms presented as flowcharts better than those presented in pseudocode. Carlisle et. al [11] showed that, when given a choice, 95% of students chose to express algorithms using flowcharts rather than using a traditional programming language, even when the majority of their instruction had been done in a traditional language. Several studies [11,12,13] showed that students performed better in courses when taught with iconic programming languages.

Visual programming is the use of graphics and graphical techniques in computer programming. It is becoming more common to see many approaches to visual/graphical programming languages emerging that incorporate the object-oriented programming philosophy. To this end, developers of new programming languages and programming environments are exploring how to combine visual

programming with object-oriented programming by investigating how the basic concepts of OOP - data abstraction, instantiation, composition, and specialization−create new opportunities for programming using visual means of construction [14].

Software visualization (SV) is "the visualization of artefacts related to software and its development process" [15], and is used in the presentation, navigation and analysis of software systems. Price [16] presents the following general definition of software visualization: "Software visualization is the use of the crafts of typography, graphic design, animation and cinematography with modern human-computer interaction and computer graphics technology to facilitate both the human understanding and effective use of computer software."

The primary goal of visualization is to convey information. It should convey this information in an understandable, effective, easy-to-remember way [17].

Despite its intuitive appeal as a pedagogical aid, algorithm visualization technology has failed to catch on in mainstream computer science education [16]. While those few educators who are also algorithm visualization technology developers tend to employ their own algorithm visualization technology, the majority of computer science educators tend to stick to more traditional pedagogical technologies, such as blackboards, whiteboards and overhead projectors. Why do computer science educators tend to not use algorithm visualization technology? Instructors commonly cite several reasons, including the following:

- They feel they do not have the time to learn about it.
- They feel that using it would take away time needed for other class activities.
- They feel that creating visualizations for classroom use requires too much time and effort. Note that, in the algorithm visualization technology literature, this reason is frequently used to motivate new technology that is easier to use, and that supports the more rapid creation of visualizations.
- They feel that it is simply not educationally effective.

The reason that "it is simply not educationally effective" stands out as very important because there is no reason to adopt new technology if it does not bring some improvements in educational process.

IV VISUAL PROGRAMMING ENVIRONMENTS

This section presents an overview of some of the existing Visual programming environments for learning OOP. Each environment is described, and some results obtained by its application are presented.

A. Alice

Alice, by Carnegie Mellon University, is an innovative 3D programming environment that makes it easy to create an animation for telling a story, playing an interactive game, or a video to share on the web. Alice is a freely available teaching tool designed to be a student's first exposure to object-oriented programming. It allows students to learn fundamental programming concepts in the context of creating animated movies and simple video games. In Alice, 3-D objects (e.g., people, animals, and vehicles) populate a virtual world and students create a program to animate the objects [32].

In Alice's interactive interface, students drag and drop graphic tiles to create a program, where the instructions correspond to standard statements in a production oriented programming language, such as Java, C++ and C#. Alice allows students to immediately see how their animation programs run, enabling them to easily understand the relationship between the programming statements and the behavior of objects in their animation. By manipulating the objects in their virtual world, students gain experience with all the programming constructs typically taught in an introductory programming course [32]. Although Alice uses object terminology, it does not directly support inheritance [32].

Many studies were focused on how the Alice's environment had an impact on a student's learning process [18]. In study [19] was described an approach for introducing recursion by using Alice, as part of a course for novice programmers. The authors concluded that using Alice, offers computer science instructors an approach to introduce fundamental concepts to novice programmers, that allows them to quickly identify and learn from mistakes.

In study [20] development of a course for non-computer science majors to teach students computer science concepts and programming is

described. In that course students were given five visualization tools: HTML, JAWAA, StarLogo, Alice, and Karel++. Based on the evaluation survey that was given in the course, the author concluded that Alice was clearly the favorite and the easiest to use.

In [21] is presented implementation of Alice for an objects-first strategy. The authors concluded that the Alice's tool was quite useful in teaching objects-first strategy to help students master the complexities of object oriented programming, it provided stronger object visualization, and a flexible meaningful context for helping students to see object-oriented concepts.

The purpose of the research [22] was to assess the performance of novice programmers in King Abdulaziz University (KAU) female CS department in Saudi Arabia, and the effectiveness of the visualization environments in Alice. During the experiment students in the Treatment group statistically performed better in OOP than students in the Control group. It is believed that the success of using Alice was due to the visual representation of objects. Students could see and relate to the objects and their animation actions, thus developing good intuition about objects and OOP. The researchers concluded that Alice helped students (the treatment group) to master the complexities of OOP. Based on the statistical results of this research, the satisfaction survey results, and how Alice affected the students' performance in learning OOP, the researchers recommend that Alice must be integrated into the introductory OOP in the CS department in KAU in order to improve a high level of students' involvement and the ability to develop an intuitive understanding of OO concepts in a visual feedback environment [22].

B. Jeliot 3

Jeliot 3 is a program visualization application. It visualizes how a Java program is interpreted. Method calls, variables, operation are displayed on a screen as the animation goes on, allowing the student to follow step by step the execution of a program. Programs can be created from scratch or they can be modified from previously stored code examples. The Java program being animated does not need any kind of additional calls; all the visualization is automatically generated. Jeliot 3 understands most of the Java constructs and it is able to animate them [23].

Jeliot 3 can be used in several ways for teaching and learning to program. Here are some examples [25]:

- Lecturers can use Jeliot 3 as a part of the lecture material. They can explain the different concepts of programming through Jeliot animations. This will facilitate the construction by the students of the correct relationship between the animation and the concept, and enable them to apply it later with a reduced possibility of error [26].
- The students may use Jeliot 3 by themselves after lectures to do assignments.
- Jeliot 3 can be used in an interactive laboratory session, where students may utilize their recently acquired knowledge by writing programs and debugging them through Jeliot 3.
- Finally, Jeliot 3 provides a tool that can aid in courses where external help is not available (e.g. in distance education). Its visualization paradigm creates a reference model that can be used to explain problems by creating a common vocabulary between students and teacher [26].

The Jeliot family's key feature has been the fully or semi-automatic visualization of the data and control flows. The development of the Jeliot family has taken more than ten years with different kinds of stages. Several versions of the concept have been developed, namely Eliot (developed at University of Helsinki, Finland), Jeliot I (developed at University of Helsinki, Finland), Jeliot 2000 (developed at Weizmann Institute, Israel). This has led to the stage when the software has become product-like both usable and stable.

The new version Jeliot 3 is a free piece of software published under General Public License (GPL). This means that the future platforms can be developed by networked teams presenting the idea of learning communities. In these communities the distinction between a teacher, a learner and a developer disappears, thus learner can develop the tools he or she needs with the other members of the community. Jeliot—together with its documentation, research publications, and learning materials—can be downloaded for free from [27].

Boyle, Bradley, Chalk, Jones, and Pickard [28] defined the new curriculum for London Metropolitan University's course of introductory programming. They paid particular interest in a visual approach. Over 600 students took part on

the course. The increase in pass rates was between 12 and 23% compared to previous year. Boyle et al. reported some major issues in handling the course transition, but on average they described the graphical approach 'very successful with the students'.

Kannusmäki, Moreno, Myller, and Sutinen [25] evaluated the use of the Jeliot 3 program visualization system during the second course of programming in the Virtual Studies of Computer Science distance learning program at the University of Joensuu, Finland. Gathered data showed that the students most successful in the course used Jeliot more than the other groups involved in the research. However, most of the students in general still used other tools to code and test their programs. The usage problems reported were mostly technical or related to the usability of the editor. The animation was criticized on being too slow and some students even found the whole system unnecessary and unsuitable for advanced courses. The positive aspects identified in the feedback included the ability to make conditional statements, loops, and objects more understandable.

Hundhausen, Douglas, and Stasko [17] conducted a comprehensive meta-study, analyzing 24 experimental studies on effectiveness of algorithm visualization. They state that one of the main reasons visualizations are not widely used is because the teachers responsible for the courses refuse to use new methods in teaching. They also found out that the main focus in articles about visualizations is their visualization capabilities instead of their learning benefits. Of the 24 studies examined, 11 showed statistically significant results of visualizations positive effects on learning, meaning that the group using a visualization system gained better learning results than the control group. Hundhausen et al. [17] also discovered that the sole use of visualization systems doesn't necessarily improve the learning results; it is more important to engage the learners in the subject using visualization system as an aid.

The paper [24] discussed the problem of the applications of software for visualization Jeliot3 in learning the programming language Java. The study involved 400 students of two higher education institutions in Serbia. Students who were in the experimental groups after completing the course filled out the survey in order to obtain information about their opinion on learning using Jeliot3 visualization software. The students of the experimental group were asked what they think about the educational possibilities of Jeliot3. Their answers depended on the level of knowledge of Java and object-oriented programming concepts in general. Responses were ranged from the answer that Jeliot3 is a great help for beginners, that is a powerful educational tool thanks to the visualization and because of that it made learning Java easy, to the opinions of some students who have already had experience in Java programming that it was pure waste of time for them. Students who expressed a negative opinion about the Jeliot3 said that it was difficult for them to adapt their knowledge of object-oriented programming and their style of programming to the new tool; also they had objections about the elements of visualization code which disturb their attention. What all the negative comments had in common was that they were given from students who have already used the Java, but almost all of them pointed out that they believed that Jeliot3 can be very useful at the beginning of the process of learning Java. Based on the research, which lasted for two years, it can be stated that there are significant differences in the achievements of students who were taught in the traditional way, and those who have used Jeliot3.

C. Game Maker

Playing computer games is very popular among young people. Many of them dream that one day they will create a computer game. So, that could be used in teaching computer science. Developing computer games involves many aspects of computing, including computer graphics, artificial intelligence, human-computer interaction, security, distributed programming, simulation, and software engineering. Game development also brings into play aspects of the liberal arts, the social sciences, and psychology [29]. Game Maker is a program that was created in 1999 by Mark Overmars. It was designed in a way that can be used in education as a programming tool that develops logic and design skills through the programming and production of 2D and 3D games. The main feature of the program is that in the process of making the application it is not necessary to write code in the text mode, but the user could program by using drag and drop technique or by combining graphical icons. The graphical way of writing program code eliminates syntactic and lexical errors (that could occur in a textual form of coding) which make it easier for the students to come up with solutions and development of program code.

Educators have increasingly incorporated game design into high school computer science curricula. Generally, students respond enthusiastically to these courses because they prefer programming in Game Maker to doing their usual assignments. But game design offers more than mere programming. In order to design an effective game, students must think about the rules that define the game play. Such rules must be consistent and fair. A gripping storyline is often required for a game. The user-interface must be designed and effective artwork and sounds must be created or sought. Thus after the programming, the game must be tested and tuned for best playability. Finally, documentation must be written. Creating a game makes an excellent group project in which students can combine their creativity and interests [29].

The paper [30] presents a discussion about the topic of teaching fundamental programming to freshmen, along with a case study where computer games are meant to be developed by students in a first programming course, through the use of a game engine which allow students to develop fundamental programming skills without having to learn syntax and idiosyncrasies of any programming language.

This experience allowed the initial presentation of the concepts of visual programming, event-oriented programming and object-oriented programming, without formalizations or specifications. Students start to build these concepts themselves – or at least they begin the knowledge construction about these subjects – through teacher-oriented controlled experimentation, they practiced in a simple development environment and in collaboration with their classmates. It is possible to conclude that the use of a simple, interactive and intuitive development tool like the Game Maker engine allows teachers to introduce to freshmen the basic principles of programming logic, without dealing with paradigms' idiosyncrasies or in programming languages' details of syntax. Based on this analysis, the students' performance improvement in a posterior course on programming can be verified in the class of 2009, compared to 2008, when students did not have this course before having contact with real-world programming

In introductory courses, computer gaming can be used as a motivational technique to improve recruitment and retention in computer science. In such a course, the teaching and learning of fundamental concepts can be embedded in hands-on problem-solving and design activities focused on designing and building a game. Students can develop a more thorough understanding of the algorithms, data structures and other topics in computer science while engaged in active learning.

D. RAPTOR

RAPTOR (the Rapid Algorithmic Prototyping Tool for Ordered Reasoning) is an open-source tool that fully supports object-oriented programming, including encapsulation, inheritance and polymorphism. RAPTOR enables students to execute their algorithms within the environment, rather than having to separately compile and execute their programs. This means that debugging can be done on the visual representation of the algorithm, rather than the textual one and prevents having to use multiple tools. This combination of features makes RAPTOR unique, providing functionality not available with any other currently existing educational programming environment [31].

RAPTOR is written in a combination of Ada and C#, and runs in the .NET Framework. RAPTOR begins by opening a UML diagram, in which users can create classes, interfaces and enumeration types and specify relationships between them [31].

The UML Designer allows users to create classes, interfaces and enumeration types. These can be given the Java access modifiers of public, private, protected or default. Additionally, classes can be specified as abstract, sealed, or static. A zoom bar allows the user to resize the diagram as desired, or make it fit the current window. The UML diagram can also be annotated with comments. Each of these UML elements can be moved on the diagram. The UML window also allows for the specification of relationships between entities. Possible relationships are inheritance, interface implementation, class nesting, association, composition, aggregation and dependency. As with the elements, the arrows indicating the relationships can be moved on the diagram [31].

V CONCLUSION

Programming is a difficult cognitive skill to learn. Mastering the basis of a programming language for many students is a huge problem. In order to write a simple program they need to have a basic knowledge of variables, input/output of

data, control structures and other areas. An even greater problem is mastering the more complex concepts such as pointers, abstraction or exception handling. And even when they have the necessary theoretical knowledge, the problem arises when they have to apply their knowledge as a whole and actually write a programming code. The student groups in introductory programming courses are typically very large and heterogeneous in knowledge of programming concepts. In teaching system "one size, fits all" is very difficult to design curriculum that would be interesting and beneficial for everyone students. The novices to programming need to do a lot of independent work to keep up with the course and lot of them are unable to follow such a rhythm, thus the dropout rate on the introductory programming courses is high.

The aim of this paper was to give an overview of visual programming environments in courses of Object-oriented programming. Of course, further researches in this field are required. It must be noted that it is already clear there is a need for different tools for learning depending on the level of students' knowledge of the studied materials. Advanced students and even students with only superficial experience in programming are very sensitive to the change of tools that are used as a code editor, if it does not provide significant improvement over the tools they get used on. In other words, the individual characteristics of students, including the level of knowledge, must be taken into deeper consideration because the demands of students are changing rapidly.

REFERENCES

[1] Helminen, J. (2009). Jype-An Education-Oriented Integrated Program Visualization, Visual Debugging, and Programming Exercise Tool for Python. Master's Thesis. Available at: http://www.cs.hut.fi/Research/SVG/publications/helminen-masters.pdf [28.12.2011].

[2] McCormack, J. and Asente, P. (1988). An Overview of the X Toolkit, Proceedings of the ACM SIGGRAPH Symposium on User Interface Software, Banff, Alberta, Canada. pp 46–55.

[3] Grafton, R. B. and Ichikawa, T. (1985). eds. IEEE Computer, Special Issue on Visual Programming.

[4] Smith, D. C. (1977). Pygmalion: A Computer Program to Model and Stimulate Creative, Thought. Basel, Stuttgart: Birkhauser.

[5] Clarisse, O. and Chang, S.-K. (1986). VICON: A Visual Icon Manage, Visual Languages. New York: Plenum Press, pp. 151–190.

[6] Shneiderman, B. (1983). Direct Manipulation: A Step Beyond Programming Languages. IEEE Computer. pp. 57–69.

[7] Cardellini, L. (2002). An Interview with Richard M. Felder. Journal of Science Education 3(2), pp. 62-65.

[8] Fowler, L., Allen, M., Armarego, J., and Mackenzie, J. (2000). Learning styles and CASE tools in Software Engineering. In A. Herrmann and M.M. Kulski (eds), Flexible Futures in Tertiary Teaching. Proceedings of the 9th Annual Teaching Learning Forum. Available at: http://ccea.curtin.edu.au /tlf/tlf2000/ fowler.html [28.12.2011].

[9] Thomas, L., Ratcliffe, M., Woodbury, J. and Jarman, E. (2002). Learning Styles and Performance in the Introductory Programming Sequence. Proceedings of the 33rd SIGCSE Symposium, pp. 33-42. Available at: http://csta.villanova.edu /CITIDEL/bitstream/10117/196/6/ThomasLA.pdf [28.12.2011].

[10] Scanlan, D. A. (1989). Structured Flowcharts Outperform Pseudocode: An Experimental Comparison. IEEE Software. Volume 6, Issue 5, pp. 28-36. doi: 10.1109/52.35587

[11] Carlisle, M. C., Wilson, T. A., Humphries, J. W., and Hadfield, S. M. (2005). RAPTOR: a visual programming environment for teaching algorithmic problem solving. In Proceedings of the 36th SIGCSE Technical Symposium on Computer Science Education (St. Louis, Missouri, USA, February 23 - 27, 2005). SIGCSE '05. ACM, New York, NY, pp. 176-180.

[12] Cilliers, C., Calitz, A., and Greyling, J. (2005). The effect of integrating an Iconic programming notation into CS1. In Proceedings of the 10th Annual SIGCSE Conference on innovation and Technology in Computer Science Education (Caparica, Portugal, June 27 - 29, 2005). ITiCSE '05. ACM, New York, NY, pp. 108-112.

[13] Calloni, B. A., Bagert, D. J., and Haiduk, H. P. (1997). Iconic programming proves effective for teaching the first year programming sequence. In Proceedings of the Twenty-Eighth SIGCSE Technical Symposium on Computer Science Education (San Jose, California, United States, February 27 - March 01, 1997). J. E. Miller, Ed. SIGCSE '97. ACM, New York, NY, pp. 262-266.

[14] Hathaway, B. What Are Visual Object-Oriented Programming Systems? Available at: http://stason.org/ TULARC/ software/ object-oriented-programming/3-16-What-Are-Visual-Object-Oriented-Programming-Systems.html#ixzz1hXKEKf4Z [28.12.2011].

[15] Diehl, S. (2007). Software Visualization: Visualizing the Structure, Behaviour and Evolution of Software, Springer Berlin Heidelberg. doi: 10.1007/978-3-540-46505-8_6

[16] Price, B., Baecker, R. M, Small, I. S. (1998). An Introduction to Software Visualization, in Software Visualization, Stasko, J., Dominque, J., Brown, M., and Price, B., Eds., London, England MIT Press, pp. 4-26

[17] Hundhausen, C.D., Douglas, S.A., Stasko, J.T. (2002). A Meta-Study of Algorithm Visualization Effectiveness, Journal of Visual Languages and Computing, pp. doi:10.1006/S1045-926X(02)00028-9

[18] Baldwin, R. (2008). Alice Programming Tutorial. Online. Available at: http://www.dickbaldwin.com/alice/Alice0150.htm. [28.12.2011].

[19] Gross, P. and Powers, K. (2005). Evaluating Assessments of Novice Programming Environments. ACM Press, Proc. of the 2005 International Workshop on Computing Education Research, pp. 99-110.

[20] Dann, W., Cooper, S. and Pausch, R. (2001). Using Visualization to Teach Novices Recursion, Proc. 6th ACM SIGCSE Conf. on Innovation and technology in computer science education.

[21] Rodger, S.H. (2002). Introducing Computer Science through Animation and Virtual Worlds, Proc. 33rd ACM SIGCSE technical symposium on Computer science education.

[22] Cooper, S., Dann, W. and Pausch, R. (2003). Teaching Objects-first In Introductory Computer Science, Proc. 34th ACM SIGCSE technical symposium on Computer science education.

[23] Arwa A. Al-Linjawi and Hana A. Al-Nuaim. (2010). Using Alice to Teach Novice Programmers OOP Concepts, JKAU: Sci., Vol. 22 No. 1, pp: 59-68 (2010 A.D. / 1431 A.H.).

[24] Maravić Čisar, S., Radosav, D., Pinter, R., Čisar, P. (2011). Effectiveness of Program Visualization: A Case Study with the Jeliot3, International Journal of Computers, Communications & Control, ISSN 1841-9836, E-ISSN 1841-9844, Volume:6(4):669-682.

[25] Kannusmäki, O., Moreno, A., Myller, N., Sutinen, E. (2004). What a novice wants: Students using program visualization in distance programming course. Proceedings of the Third

Program Visualization Workshop (PVW'04), Warwick, UK. http://www.dcs.warwick.ac.uk/pvw04/p18.pdf. [28.12.2011].

[26] Levy R. BB, Ben-Ari M, Uronen P. A (2003). The Jeliot 2000 program Animation System. Computers & Education, 40(1), pp. 15-21.

[27] http://www.cs.joensuu.fi/jeliot

[28] Boyle, T., Bradley, C., Chalk, P., Jones, R., Pickard, P. (2003). Using blended learning to improve student success rates in learning to program. Journal of Educational Media, Special edition on Blended Learning, 28(2-3), pp. 165-178.

[29] Overmars, M. Learning Object-Oriented Design by Creating Games, http://www.cs.uu.nl/research/techreps/repo/

[30] Hernandez C. C. et al. (2010). Teaching Programming Principles through a Game Engine, CLEI Electronic Journal, Volume 13, Number 2, paper 3, pp. 1-8.

[31] Martin C. Carlisle, RAPTOR: A Visual Programming Environment for Teaching Object-Oriented Programming, pp. 1-4, http://www.martincarlisle.com/publications/ccsc_named.pdf. [28.12.2011].

[32] www.alice.org

MOODLE AS PEDAGOGICAL ENVIRONOMENT

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Abstract - The key words in this research are Moodle e-learning system and the teacher motivation for the application of Moodle to the teaching process.

Due to distance learning, teachers would be more informed about their course and with the help of e-learning, a well trained teacher would be able to get remarkable results from his or her students. Moodle provides teacher with an opportunity to create and manage the course as easily as possible and thus enables them to focus on teaching. The activities available in Moodle motivate both the students and the teachers and as a result, better results are achieved.

The significance of this research is that it may start a discussion. This project represents an effort to introduce contemporary forms of the teaching practises in our country, but moreover, it represents an effort to teach and motivate the teachers.

I INTRODUCTION

Moodle is a free source e-learning software platform, also known as Course Management System (CMS), Learning Management System (LMS), or Virtual Learning Environment (VLE). Since January 2010, its user base has included 45,721 registered and verified sites. Moodle was developed in order to help teachers create courses usually taught in English and the number of users is estimated to be around 32 million [1].

Moodle is the acronym for Modular Object – Oriented Dynamic Learning Environment). The working environment of Moodle system was being developed from 1999, and from 2001, with recognizable architecture. Moodle development as an open, gratis software is being continued and it is supported by a team of computer programmer and the international association of users. As a software of the open code under GNU Public Licence, it is copyrighted, but some additional privileges are allowed as: copying, using and changing Moodle, provided that the access to the open code is enabled to the others. It is not allowed to alter or remove the original licence or the information regarding copyright.

Moodle provides teachers with the technical support which they need for developing, organizing and teaching online courses and helping teachers create online course is one of its main purposes. In order to facilitate the creation of the courses, Moodle is equipped with various properties that can help teachers both to create a course and teach it. Some of those properties are [2]:

- planning the intensity and the dynamics of the course,
- managing user roles,
- managing user groups,
- incorporating the existing files and different educational material,
- creating different types of online tests,
- monitoring user activity,
- using tools for communication and team work,
- creating glossaries,
- complete system support etc.

Moodle is a standardized tool that provides continuity when content enrichment is in question; it helps students with active learning and enables the communication between students and teachers.

II MOODLE AS PEDAGOGICAL ENVIRONOMENT

The initial pedagogical philosophy on which is Moodle established, includes constructivism and social constructionism. Constructivism is a psychological knowledge theory established on assertion that knowledge can be acquired through experience, while social constructivism emphasizes that trainees (not only lecturers) can take part in education experience in many ways. The functions of Moodle environment reflect experience in a form of various design aspects, so that we can say that Moodle is enough adaptable for various teaching forms. For example, Moodle enables adding the resources that present materials read by users, but they have no interaction with them and activities that present the interactive teaching material. In the extension will be given the disposal for these possibilities, but test as the means of knowledge evaluation, will be stressed.

III AVAILABLE TOOLS IN MOODLE

Already now are obvious the advantages resulted from using distance learning program. In addition that very learning can be improved, through distance learning, this system experiences and familiarizes students, their families and teachers with the work on Internet during the education process. Distance education enables students to gain new skills and qualifications, and to prosper in new trends. The future will show that this kind of learning may be better and more interesting than traditional way of learning.

Combining virtual environment and classical methods, we create flexible, hybrid learning systems that adjust to users' necessities. Moodle is one of representatives of such way of education, and it is a significant factor in now–a–days education. Its successful integration with development of new technologies and modern communication has stipulated this system, so that it is now one of the leading systems of the environment.

Many advanced tools are very applicable in a pedagogical sense:

- **Lessons.** Lesson is a tool that is used for adding a lesson in a very flexible way.
- **Assessment**. It is used for assessing the knowledge of the students and there are numerous types of tasks:

  - Multiple choice questions,
  - True or False,
  - Matching,
  - Short answers,
  - Numerical answers,
  - Fill in the blanks.

- **Giving assignments.** Assignments are divided into:

  - Offline assignments – they do not require the students to be online while doing the assignment (these assignments are homework)
  - Online assignments– assignments that require the student to be online while the assignment is being done.

- **Communication tools**

  - Forums This activity is considered to be one of the most important ones as far e-learning goes. This is the place where students communicate and the place where the majority of discussions take place. A student's forum activity can be graded because teachers can give points for each discussion. This is an asynchronous form of communication.

  - Chats represent a synchronous type of communication.

  - Calendar is visible as one of the options on the main page of the course. Moodle automatically adds each activity that is added to the calendar of the course. A manual scheduling of the important events regarding the course is possible as well.

  - Progress Tracking is used for monitoring the students' progress.

  - Glossary is used for finding and explaining different terms and expressions used in the course.

  - Choice – A very simple activity where the teacher asks a question and specifies a choice of multiple responses. The teacher can use this tool in order to get feedback about anything relating to the course.

  - Wiki enables users to work together in order to create a document, but only one user can work at a time.

IV THE APPLICATION OF MOODLE (BY TEACHERS)

Creating a lesson in Moodle is very simple. A teacher does not need to have advanced computer skills in order to come up with a lesson that will be interesting to the students. This helps teachers accomplish their lesson objectives and it helps them improve the quality of teaching.

V CREATING COURSES IN MOODLE

The creator of the course is the main teacher who has control over adding a course and allowing access to other teachers. In order to add a new course, the creator has to go the page 'All courses' where he can select 'Add a new course'. Only those that have Administrator, Course Creator or Manager rights can add new courses.

A. Adding and editing a new course

B. By selecting the option 'Add a new course', a page will open where the title of the course, a short name, an identification number and a summary (a short description of the content of the course) have to be provided.

A course can have different formats:

- Weekly – with a clear start date and a finish date. Every week consists of different elements of the course. Some of them, such as the notebook, are available for a certain period of time, two weeks for example.

After that, they are no longer available to students.

- Topic is very similar to the weekly format, but it is organized into topic sections. The availability of topics is not limited and there are no start and finish dates.
- Social format is oriented around one main forum. The list of announcements is shown on the first page. This format is very useful for situations that are more free form and it does not have to be a course per say. It can be used as a notice board.

When a weekly or topic format is chosen, the number of weeks or topics in the course can be determined in advance so that the students can know how long and how intense the course is.

This page is the page where different parameters are adjusted. This includes information regarding the signing up process, deadlines for signing up and if necessary, the information regarding groups.

The availability of the course is defined here – the policy on guest access as well as the password setup (if the course is protected, the creator has to inform the students of the course about the password either personally or via e-mail).

The creator of the course must define one language as the obligatory one, but he or she can also add more languages. The option of adding more languages applies only to the names of the activities and labels for different options on the editing page. The option does not, however, apply to the resources unless the creator of the course added various resources of the same content in different languages.

The creator of the course can edit all settings relating to the course. He can access the course settings on the front page of the course by selecting the option Settings, then Course Administration and finally, the option Edit, which is marked with . The parameters that can be edited can be seen in the following picture.

The changes are confirmed by selecting the option 'Save changes'.

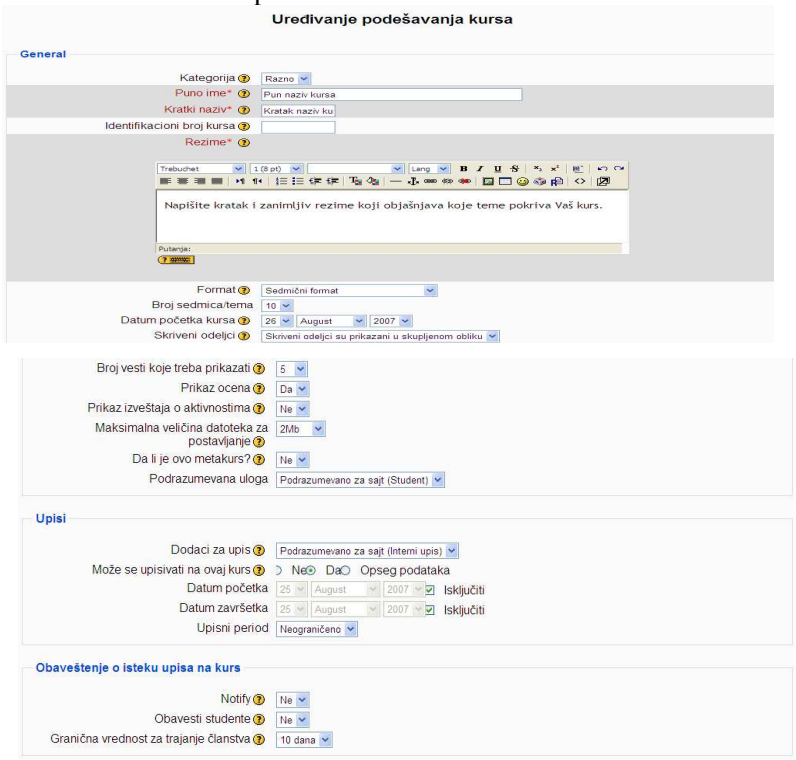

Figure 1. Course Settings

VI LEARNING ACTIVITIES IN MOODLE

One of the main advantages of the Moodle platform is a wide variety of activities that can be used in courses. For every topic or lesson, a teacher can choose from the list of activities by selecting the option 'Add an activity' (Picture 2.). By selecting some of the available options, a new window opens where teachers can set up different parameters regarding the activity selected.

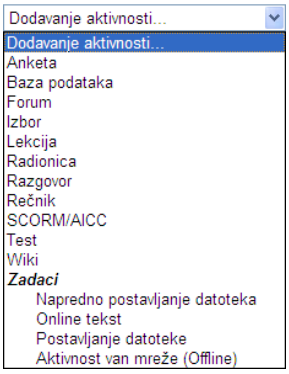

Figure 2. The Activities

The activities available in Moodle:

- chat,
- assignments,
- workshop,
- choices,
- quizzes,
- forums and
- glossary.

VII CONCLUSION

E-learning is a challenge and a means to improve and enhance education while also being one of the cornerstones of novel and improved ways to manage knowledge. Because of that, the introduction of information technology into the teaching practise has become a priority when it comes to educational institutions all over the world.

Students have an opportunity to be in charge of their learning and the role of the teachers has transformed into that of a mentor or coach. The courses are not limited by the working hours of regular schools and universities, which means that everybody has a chance to learn no matter how old they are.

Distance learning changes the habits of both teachers and students. Successful students become more hard-working and more organized while teachers gain the opportunity to perfect their skills when using information technology is in question. This type of learning does not include the use of computers and the Internet only. On the contrary, it includes much more. In order to make distance learning not only possible, but successful, teachers are the ones that need to be trained first because they are the ones that will train students, who are, after all, our future.

Information technology is developing very quickly and it plays a significant role in all lines of work. This is why our attitude to this science has to change. Even 12 years after IT was introduced into primary schools, this course is still an optional one. Students, who are the future of this society do not have to choose this course, which does not seem logical when we consider the importance of information technology.

All students in primary school should acquire enough IT knowledge so as to be able to utilize it in whichever profession they choose, as opposed to simply being able to 'turn on a computer'. In a research that was carried out at the Singidunum University, it was concluded that all teachers should be motivated to use Moodle e-learning system in the teaching practise, because this would improve the effects of teaching [2].

The most common problem is the lack of financial resources needed for investing in technology so that all teachers could implement what they know about new technology and so that they can enable their students to learn by using Moodle, a learning platform that is essential in cases when students are unable to come to school, when they have additional activities for homework or when they have to prepare themselves for various competitions.

REFERENCES

[1] http://www.singipedia.com

[2] http://moodle.org/

[3] Popkewitz, Tomas, S. (1994): *Professionalization in Teaching*, Teaching & Teacher Education, Vol. 10, No1, str.1-14.

[4] Kathy D. Munoz , Joan Van Duzer, Blackboard vs. Moodle, A Comparison of Satisfaction with Online Teaching and Learning Tools

[5] ttp://www.humboldt.edu/~jdv1/Moodle/all.htm

[6] http://www.cnti.info/mainportal/index.php

[7] http://www.pravni-fakultet.info/epravo/pluginfile.php/667/mod_resource/content/1/Manual%20za%20predavace%20Moodle.pdf

DEVELOPMENT OF WEB APPLICATION FOR STUDENTS' ADMINISTRATION INFORMATION SYSTEM IMPROVEMENT

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Abstract – This paper presents the main results of an internal project at the University of Novi Sad, Technical faculty "Mihajlo Pupin" Zrenjanin, Serbia. This project deals with the problem of efficiently of students' administration office work at Faculty and impact of information system to quality of work at that office. It also deals with the quality of services to students and possible ways of improvement. A prototype of web application is developed with the aim to enable improvement of quality of communication with students, as part of information system of students' administration office.

I INTRODUCTION

One of internal projects for improvement of quality of work at University of Novi Sad, Technical faculty "Mihajlo Pupin" Zrenjanin, Serbia is conducted in year 2010. Name of project was "Improvement of information system of students' administration office".

There are many motives that influenced starting this project. Generally speaking improvement of quality brings stability of work and enhancements to new working areas, within so called "chain reaction" (Edward Deming, [1])

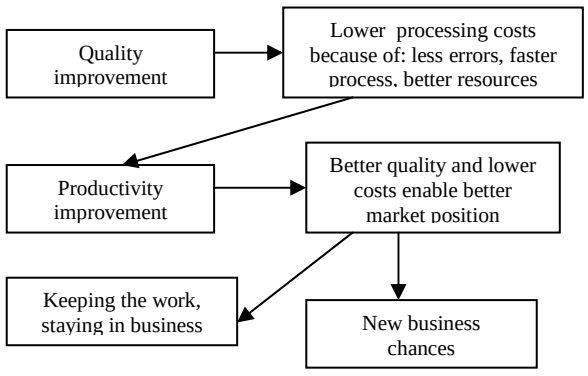

Figure 1. Deming's chain reaction of quality improvement [1]

In this paper we present detailed analysis of state of quality of information system of students' administration office at University of Novi Sad, Technical faculty "Mihajlo Pupin" Zrenjanin. This analysis presents a background for motives for starting previously mentioned internal project. We also present project elements and results. One of results is prototype of web application that could improve students' administration office information system.

II MOTIVES FOR STARTING PROJECT

Motives for project starting are based on previous detailed analysis of certain quality aspects of students' administration office services.

A. Information accessibility as estimated study problem

Within study [2] an analysis is performed upon results of questionnaire conducted with future students, i.e. high school pupils. This study shows that possible causes of problems at higher education at university could be estimated by future students:

- Most significant: professors behavior and criteria for giving marks to students' knowledge
- Second most significant: information accessibility level.

B. Number of students living in other cities

According to sample of data from students' administration office database [3] (sample is taken for several years of students registration), there is approximately twice as much students' whose home city is other city than Zrenjanin (72%, i.e. 3718 students from sample data), comparing to those that live in Zrenjanin (28%, i.e. 1421 students from sample data; Figure 2). This analysis shows the need for remote access to daily information regarding study process events, results etc.

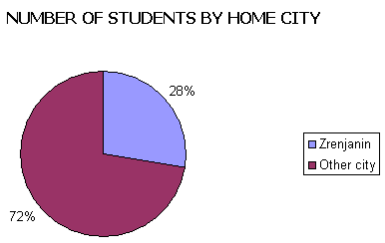

Figure 2. Diagram of number of students by home city

C. Graduate students' satistfaction with students' administration office services

Graduate students at University of Novi Sad, Technical faculty "Mihajlo Pupin" Zrenjanin at the day of final exam, i.e. graduation day had to fill a questionnaire regarding their impressions of quality of overall educational institution services and regarding specific segments, such as quality of students' administration office services. Figure 3. presents two diagrams showing statistics of overall satisfaction with quality of overall educational institution services (F) and with students' administration office (SO). These data were collected in school years 2001/2002 and 2002/2003. During these years, questionnaires were given to students in aim to conduct continual quality checking within ISO standards requirements [4].

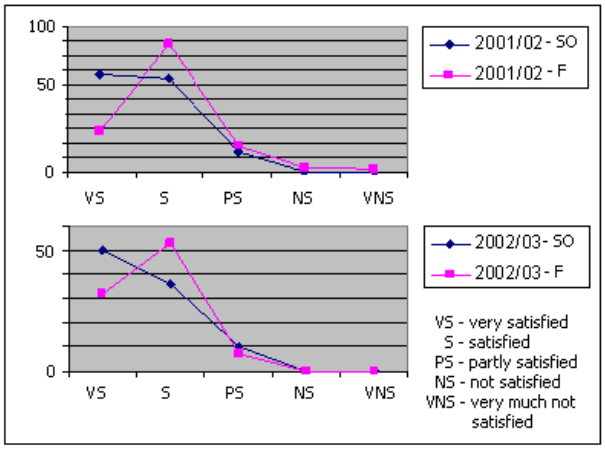

Figure 3. Diagram of overall educational institution services and students' office services quality satifaction

According to Bologna process, starting with school year 2007/08 regular quality checking is performed regarding all aspects of study process and educational institution services. Questionnaires are given to all students that are included in accredited courses. Results of statistic analysis regarding students quality satisfaction regarding students' administration office show that in school year 2007/2008 average mark was 8.45 (maximum possible is 10.00), while for school year 2008/09 was 8.50.

Even the average mark for quality satisfaction of students' administration office services is very high, still there are many students' free-form textual comments regarding issues and suggestions for improvements. These comments could be categorized as [3]:

1. Both positive and negative comments
2. Suggestions for improvements

Both positive and negative comments were given regarding behavior of employees at students' office [3]: professionalism, polite behavior, helpfulness, initiative, communication skills, patience, empathy, etc.

Suggestions for improvements of students' office quality of services include solving issues regarding: better availability and accuracy of information to students, organization of payments, working speed and correctness of employees at office, answering phone regarding information, better organization of work, errors in work, short period of working hours with students,

Students suggested that they find causes of issues in too high workload of students' administration office employees and the need for better information system, i.e. software support to speed up their work and increase availability of information directly to students (without the need for students' administration office employees work - for example - by personalized internet applications at official web site of this educational institution, where they could have access to list of passed exams and payments records).

III PROJECT PROBLEMS AND GOALS

A. Problems

Basic problems that this project aim to solve are related to quality factors of students' administration office:

- Level of accessibility of personalized information to students
- Data processing quality and speed.

B. Goals

Basic goals of this project were related to:

- Determine state of information system of whole educational institution, particularly of students' administration office information system.

- Propose model of solution to improvement of information system
- Create a prototype of a software application in aim to improve current state of information system.

IV STATE OF INFORMATION SYSTEM

A. State of information system of educational institution

In 2010, at project beginning, state of information system of this educational institution was as presented in Table 1.

TABLE I. STATE OF INFORMATION SYSTEM OF EDUCATIONAL INSTUTITION

LAYER	STATE
HARDWARE	computers - desktop workstations, servers, laptop printers network equipment - switch, ruter UPS devices device for automated SMS messaging
SOFTWARE	operative systems office software applications + databases web application + web site eLearning system
LIFEWARE	administrator for hardware and network equipment web administrator employees with computer skills
ORGWARE	laws and regulations

Regarding hardware, each office is equipped with workstations and printers and it is part of LAN network. Each of them has access to Internet.

Software in use (in 2010) at this educational institution is presented at Table 2.

TABLE II. STATE OF SOFTWARE AT EDUCATIONAL INSTITUTION LEVEL

SOFTWARE TYPE	DESCRIPTION
operative system	Windows XP, Linux, Windows 2000
office software	MS Office
software applications and databases	1. basic students' administration office software application and database 2. software for accounting office
web site	Web content management system for web site data publication (ASPX application and MS SQL database)
eLearning system	dLearn softver (ASP application and Access /SQL server database)
other software	software as tools in educational process multimedia software

B. State of information system of students' administration office

Students' administration office has 4 workstations with Windows XP operative system and MS Office and one workstation in the role of database server. Each of them have Internet access and use e-mail.

Software application was developed in 1994 in Fox development environment. It consists of two separate applications:

- Undergraduate studies administration (application ARSA)
- Graduate/master studies administration (application Nauka)

There is also another application developed in Visual Studio .NET environment for printing reports regarding exams, that uses basic ARSA's database.

Problems of current (in 2010) state of information systems at this office are:

- Incomplete functionality of software - it is not possible to enter all necessary data that are needed, especially for B diploma, i.e. diploma supplement.
- Statistics is not supported,
- Redundancy in administration of exams,
- Results of exams are delivered by teaching staff, which are obliged to publish exam results accurately at official web site, but sometimes students' office employees unnecessarily need to inform students about exams results by phone

Suggestions, made by employees at students' administration office, for improvement of current information system are:

- Creating completely new client/server application that could enable registration of all necessary data, as well as all other functionalities like printing all reports and statistics,
- Creating web application for students' exam registration and payments records to eliminate queues of students if front of students' administration office
- Creating web application that could enable personalized access to exam results lists, without the need for phone calls regarding exam results.

C. Strategic decisions

According to specified state of current (in 2010) information system of institution and students' administration office, problems and suggestions for improvement, there are three possible strategic directions:

- To complete (add) existing software
- To create the whole new client/server application and web application
- To buy off-the-shelf complete solution.

Each of these directions has some advantages and disadvantages.

- First direction advantages: low cost, in-house development, using existing software that employees are accustomed at, implement only additional features that are needed. Disadvantages: interoperability of different solutions, their integration
- Second direction advantages: in-house development, integral approach. Disadvantages: long time to implement, possibly long time to test and quality assurance
- Third direction advantages: short time to start working well-tested solution. Disadvantages: dependency on software author for any adjustments to specific needs, high costs.

Within this project, strategic decision was made toward:

- Second direction: complete, in-house development with necessary development results regarding business process modeling, data modeling and software modeling
- First direction: implementation of a prototype of software that brings additional functionality that is needed and not supported within existing solution and integration of that new software to existing software applications.

V MODEL OF SOLUTION

A. Business process model

According to text that describes knowledge about students' administration office workflow, detailed business process model has been created within CASE tool Power Designer.

The main workflow of students' administration office is presented at appropriate "swimlane", while other organization parts and actors in process outside of this office boundaries are also presented in separate "swimlanes". This way all activities within students' administration office, as well as activities that they depend upon are all presented at business process model at Fig. 4.

B. Analysis of business process and conceptual software design

Each of specified activity at previously presented business process model has been analyzed regarding current technology and organizational aspect of functionality at this office and for each of these activities specific solution has been proposed regarding software support in client/server and web application. This analysis has been performed within a textual table with structure:

- Business activity: Working role/Actor, Group of activities, Activity
- Current state of technology/organization functionality
- Proposed new solution: Actor/User of software function, Software function, Type of application / module (Client/server, Web, SMS, e-mail)

After textual analysis and matching business activities with software functions, the complete list of actors, software functions and software modules was defined.

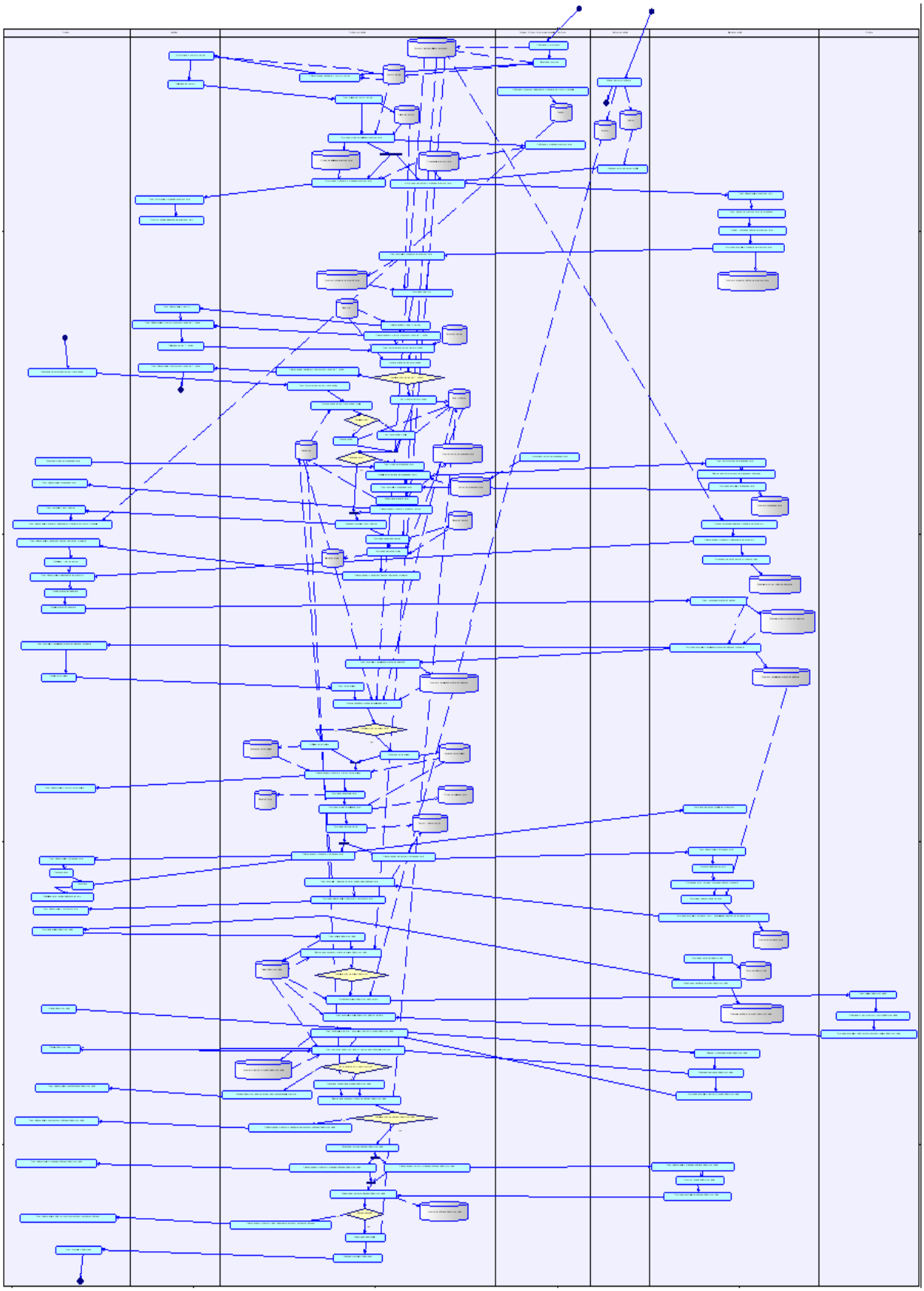

Figure 4. Business process model of students' administration office activities

C. *Actors*

One of results of business process-to-software solution mapping is list of actors. Diagram that represents all actors (types of users by working roles) of proposed new software application is presented at figure 5.

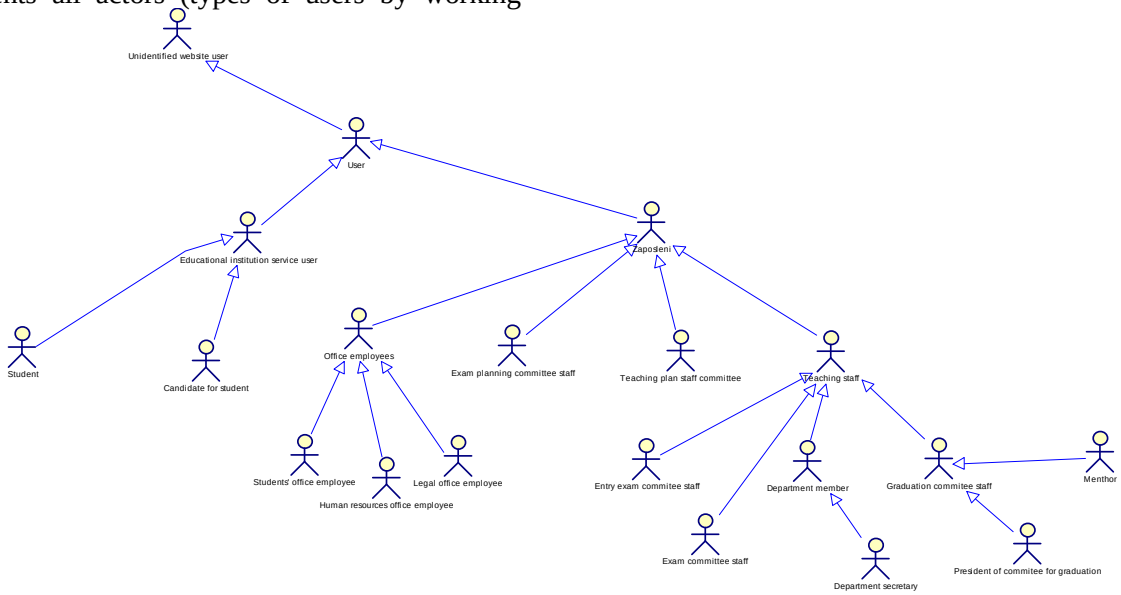

Figure 5. Actors of proposed integral software solution

D. *Software modules*

According to previously described tabular analysis, several software modules were identified as needed support to students' office administration as well as overall educational process (Figure 6).

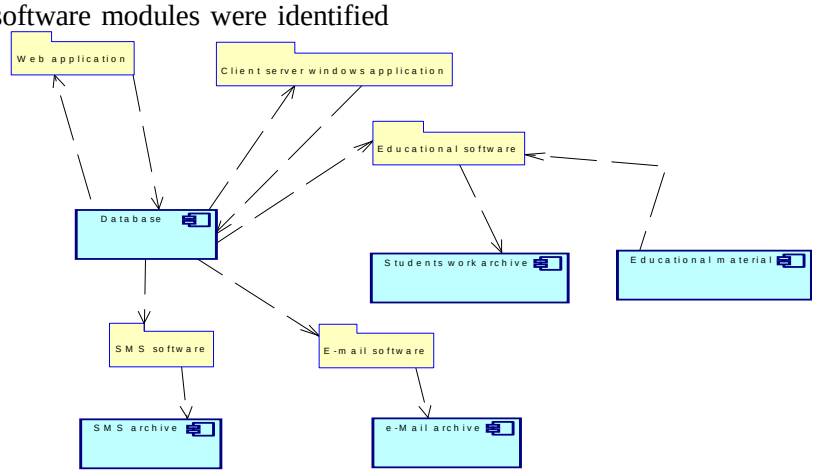

Figure 6. Software modules of proposed solution

VI PROTOTYPE OF SOFTWARE SOLUTION

A. *Scope*

Prototype of software solution has been developed as web application that could enable students to register for exam and to be informed about exam results.

B. *Technology*

Web application was developed as three-tier application:

- Lowest tier(layer) is MS Access database.
- Middle-tier consist of Java classes (developed by using NetBeans development environment) that enable user interface to connect to database and perform queries for presenting and updating data
- User interface is JSP (Java Server Pages) web application that runs upon Java runtime integrated with web server, like Apache Tomcat web server.

C. *Database model*

Database model is presented at figure 7.

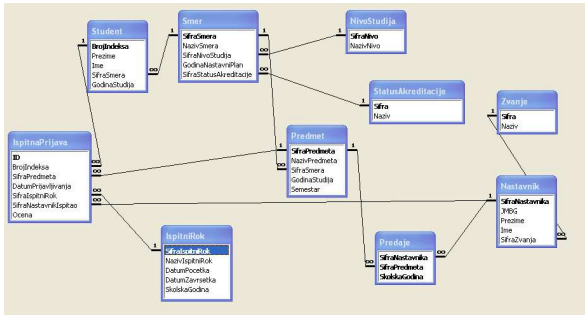

Figure 7. Relational database model for prototype application

D. *User interface*

In this section will be presented several main pages of user interface of developed prototype of web application. Figure 8. shows list of subjects/exams.

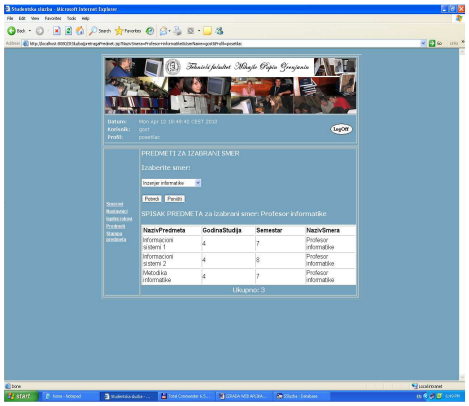

Figure 8. List of subjects within graduate course

Figure 9. shows page for exam registration by students.

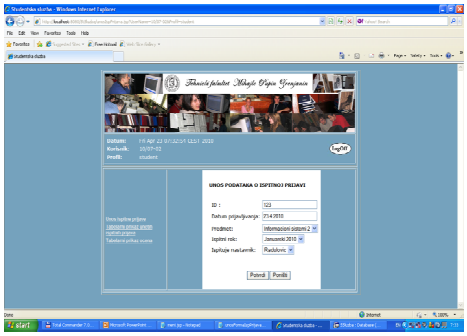

Figure 9. Exam registration by students

Figure 10. shows list of passed exams with marks for particular student (personalized display).

Figure 10. List of passed exams with marks

VII CONCLUSION

In this paper project results of improvement of students' administration office information system were presented. Motivations for starting project, current state and the process of information system development were explained. Prototype of implemented web application was presented. Further development of system should lead to improvement of prototype and integration with existing modules of information system of students' administration office.

REFERENCES

[1] D. Đorđević, D. Ćoćkalo: *Upravljanje kvalitetom*, Tehnički fakultet "Mihajlo Pupin", Zrenjanin, 2004.

[2] Lj. Kazi, "Methodical and organizational improvement of University education quality within development of integrated software system of technical faculty", Master of science thesis at University of Novi Sad, Technical faculty "Mihajlo Pupin" Zrenjanin, Serbia, 2005.

[3] Lj. Kazi, B. Radulovic, "Project documentation for project: Improvement of students' administration office information system", University of Novi Sad, Technical faculty "Mihajlo Pupin", Zrenjanin, 2010.

[4] D. Đorđević, D. Ćoćkalo, "ISO 9000 - Internal audit questionnaire for students", University of Novi Sad, Technical faculty "Mihajlo Pupin" Zrenjanin, Serbia, 2000.

MULTIMEDIAL FOREIGN LANGUAGE ACQUISITION PROCESS BASED ON HINTS, LEVERAGING SIDE-EFFECT

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Abstract - This paper presents novel approach in foreign language learning process, presented in attractive manner, using multimedia concept. Learning process is done rather by listening to foreign language, and spoken text understanding, than mechanical reading. Foreign language learning is conceived as a side-effect during other student's activity. Less known words are presented to students as hints. Those hints are laid directly into the context of appropriate problematic and are therefore helpful to better understanding and memorizing. This is resulting in a process, where student is focusing on the appropriate problematic and language learning is performed as a side-effect. Whole solution is conceived as low cost and is as simple as possible. We are using mainly existing technologies which are appropriately interconnected.

I INTRODUCTION

When someone speaks more languages he is able to learn new one easier, because of ability to compare newly learning language with already known languages. However as a child no one of us had this ability, there was no reference language that we could compare to language which we were trying to learn. When we ask our parents how we started speaking, probably the most frequent answer will be that we begun with sound mimicking and later trying to saying simple words.

There was no teacher that forced us to memorize grammar or vocabulary nevertheless many of us was able to communicate after few years [1]. Very important thing is also fact that we did not know the meaning of words that we were saying, we were just repeating after a parent, which gives us hints in a context. Probably those parents' hints and context in which the words were presented helped us to learn language so fast.

Another important factor is for sure that we start speaking in friendly, non-invasive, playful environment. During our early childhood we do not only start to learn language, we also begun with whole world exploring, "the sun is warm", "water is wet", "dog is barking", "banana is tasty", and many, many more little discoveries. In fact we can say that we have learnt our mother language as a side effect during other activities and learning.

Our proposal solution leverages those facts and tries to turn them on in a manner that is attractive mostly among young people, to simple video watching.

II DUBBING OR SUBTITLING

There are several studies which investigates influence to foreign language learning by watching not dubbed video (in original language) with translated subtitles [2][8]. Some of those studies show that this technique can improve language skills. Those studies also show that subtitles has not negative influence on video material and are not disturbing factor. According to [2] only less than 5 percents of whole time is spent on reading subtitles. Some people also prefer to watch video with original voice because of incorrect dubbing, also majority of (new) video materials simply are not available in dubbed form and subtitles is one possible option.

In fact some countries can be classified according to if their TVs or cinemas prefers subtitling or dubbing, for example typical dubbing countries are: Austria, France, Germany, Italy, Spain, Czech republic and Slovakia, on the other hand typical subtitling countries are Belgium, Denmark, Finland, Greece, Luxembourg, Netherland, Portugal and Sweden [2][3][6][7]. Some of those countries are shown in table 1, with appropriate EPI index, which represents amount of English speaking people in particular country. The average EPI index in countries which uses dubbing is 52.86, the average EPI index in countries which uses subtitles is 62.15. From those results we can conclude, that there are more English speaking people in countries which use subtitles instead dubbing.

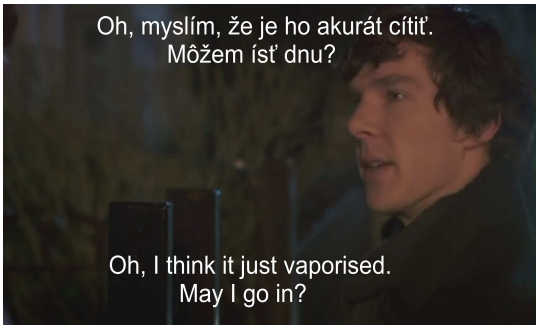

Figure 1. Original and transladed subtitles displayed simlutaneously

Another equally significant part of this problem is fact that subtitles are much more cheaper, and easier to make than dubbing equivalent [2][3][6].

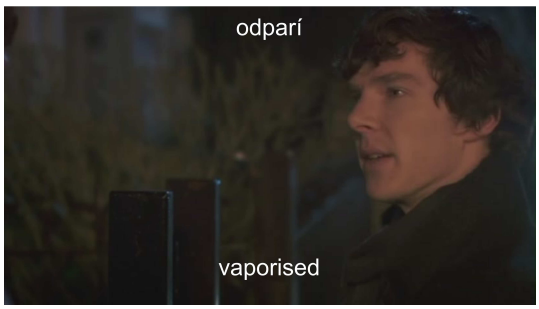

Figure 2. Original and transalted subtitles displayed simulteaneously, after removing most frequent words

We all know the situation, when we were listening to music and did not understand lyrics very well, but when we read the lyrics we already know many of the words and also understand the song meaning. Thus people often argue that they have no problem with listening but only if they have written text also. But reading, listening and whole context understanding is three different things.

We decided to try experiment in which we observed small group of native Slovak speaking people which watched video in English language with English subtitles. Those people fell into B1 group according to CEFR. We asked them simple question: were you reading subtitles or not? Almost all people answered, yes. We've also convinced if the people were able to reproduce the plot seen on video. Thus we made conclusion that if there is possibility to read spoken text in form of subtitles, the people utilizes it and rely on it, instead of trying to listen and deducting some not understood words from context. This can be caused by fact that people can read much faster than listen, [4] and thus they're reading forward and are still able to catch a video also.

Following lines presents proposal architecture of education process and its practical implementation, which is helpful in learning and practicing foreign language skills. This method is mainly focused on listening to foreign language and understanding whole concept of given problematic. This is achieved by hints which are available to students or observers. We have used group of Slovak speaking people which were watching movie in English language.

TABLE I. LIST OF DUBBING OR SUBTITLING COUNTRIES WITH EPI INDEX

Country	DUB/SUB	EPI
Austria	DUB	58.58
Germany	DUB	56.64
France	DUB	53.16
Slovakia	DUB	50.64
Italy	DUB	49.05
Spain	DUB	49.01
Netherland	SUB	67.93
Denmark	SUB	66.58
Sweden	SUB	66.26
Finland	SUB	61.25
Belgium	SUB	57.23
Portugal	SUB	53.62

* EPI = English Proficiency Index (Higher Better) [9]

III PROPOSAL SOLUTION

We had to face the main challenges of our proposed system uses during deploying the learning process. We focused to properly leverage and further implement the observations and factors mentioned in the previous paragraphs. We set the main key features of proposed solution as following:

- Lectures presented in playful, attractive manner – This means that student should have feeling of friendly non intrusive activity which should be profitable for him.
- Fast and easy preparation of lectures (within minutes, required basic computer skills) by teacher or student – This means that student and teacher can prepare lections witch basic knowledge and no special education or training is required as it often is in another approaches. This also reduces the whole cost of entire solution and time needed for preparing new lessons.
- Focusing lectures rather on specific problems and leveraging foreign language learning as a side-effect – This means that during lesson student even do not know or do not realize

that one of the purposes of class is to force him to learn or practice foreign language.

- Presenting foreign words in context, because of easier remembering – This means that all words which student learn are not presented separately (as it is often done by memorizing vocabularies) but rather in context where they are mostly used in real life.
- Using hints to help understand problematic and learning foreign words – This means that there are hints which are offered to students. Those hints should help to understand and catch the given problematic.
- Focusing on foreign language listening and understanding rather than reading – This means that students are indirectly forced to listen and try inferring even unknown words rather than simply read them.

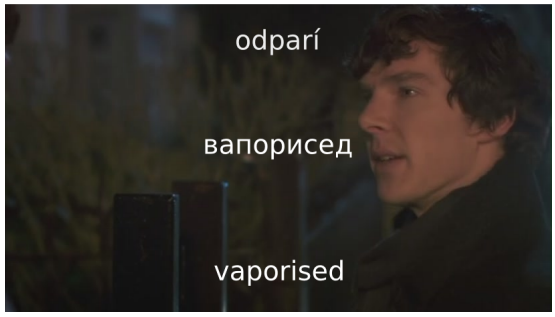

Figure 3. KMPlayer feature – displaying up to three subtitles streams in one video

After considering those factors we've infer that we can achieve those key features through non intrusive and popular activity, such as "simple" video watching. We proposed a concept where video is watched with "specially prepared" type of subtitles. This approach fits to all key features of proposal solution. Several ideas were tried with subtitles dealing:

First idea was the time adjustment of subtitles. We assumed that spoken language will outrun subtitles and therefore student should be able to firstly listen and after few (milli) seconds verify their assumption against read subtitles. However practical experiment shows that this was rather misleading than helping for students, probably the Stroop effect took place [5].

Second idea was to place foreign language subtitles to bottom of video and translated subtitles to upper of video (or vice-versa) (Fig. 1). Experimenting with this type of subtitles shows that bunch of text that user did not catch was misleading also.

Third idea was adopted as a best approach. We chose method where only unknown words with their translations are shown (Fig. 2).

Then we presented video with this type of subtitles to beholders and asks them the same questions. Observers were able to reproduce plot also if they watched the video with significantly reduced subtitles form. Thus we inferred that students were indirectly forced to focusing on listening and trying to understand context rather than simple reading.

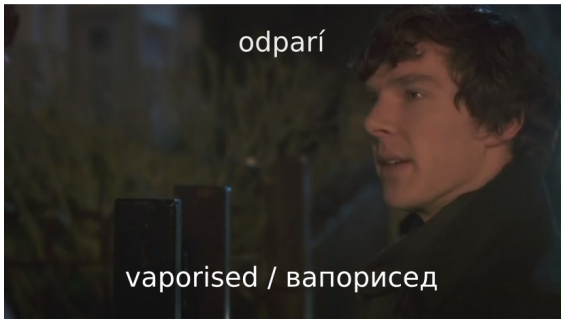

Figure 4. Script feature - displaying subtitles in three languages

IV TECHINCAL DETAILS

Whole solution is conceived as a simple GNU Bash [12] script which is running under Cygwin [11] environment. This script finds most frequent words in subtitle file given specified threshold and simply gets rid of them, because there is a high probability that those words are one of the most used words in English and students are already familiar with it. The script also removes commas, question marks, dashes and another non important character. Thus only less knows words remains and are used as hints.

The next step is translating remaining words to student's native language and creating another subtitle file. The result of this process are two separate subtitle files containing only less frequent (unknown) words translated into two languages, one in same foreign language as video and another in mother language of student. This process with examples is described on Fig. 6. As it is shown this is rapidly reducing the amount of text appearing on screen in contrast to Fig. 1.

As a translation engine we have chosen Google Translate [14]. We must say that using Google Translate environment for translation was chosen as a proof of concept solution. There could be used another tools such as StarDict [24] with its console version sdcv [25]. StarDict is an open source and can be extended with various languages and

dictionaries or even used as glossary of terms dictionary. The main advantage of Google Translate is that this database is periodically updated and is available from anywhere via internet connection. Second advantage can be fact that with little modification of our script we can also obtains in batch mode the pronunciation in form of audio spoken text directly from Google Translate. This can be further used for example in mp3 players for practicing pronunciation or

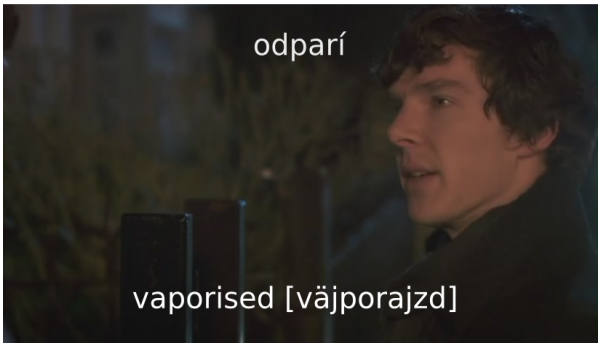

Figure 5. Script feature - displaying subtitles with pronunciation

listening by student.

On the other hand the internet connection is double-edged sword and it is needed during lesson preparation, which is mostly not problem nowadays but sometimes it cannot be achieved. Another pitfall of using Google Translate is communication with this online service using technique which can be nowadays considered as a “workaround”. As we are not aware of any official API for Google Translate we have to use own method to access this service. To obtain translations thus we decided to write own parser for retrieving results from http://translate.google.com page. It should be noted that this technique is not officially supported by Google and it is not guaranteed to work in future. However as it was mentioned Google Translate was chosen as a proof of concept and can be easily replaced by another (online or offline) services. Following lines contains snippet of code using to communicate with Google Translate and parse its outputs, this is modified version of script presented here [21]:

```
result=$(curl -s -i --user-agent "Mozilla/6.0 (Windows NT 6.2; WOW64; rv:16.0.1) Gecko/20121011 Firefox/16.0.1" -d "sl=$source" -d "tl=$target" --data-urlencode "text=$1" 'http://translate.google.com')

encoding=$(awk '/Content-Type: .* charset=/ {sub(/^.*charset=["'\"']?/,""); sub(/[ "'\"'].*$/,""); print}' <<<"$result")

iconv -f $encoding <<<"$result" | awk 'BEGIN {RS="</div>"};/<span[^>]* id=["'\"']?result_box["'\"']?/' | html2text -utf8
```

This script shows that Google Translate accepts three arguments in URL: sl, tl and text. The sl represents source language (language from which we want translate), tl represents target language (language to which we want translate) and text represents the string which will be translated. One of possible options for sl and tl following:

- sk - Slovak language
- cs - Czech language
- sr - Serbian language
- en - English language

Further options can be obtained directly from Google Translate web page using e.g. Firefox [22] with FireBug [23] plug-in.

The Google Translate is not only one component that can be replaced. Cygwin script can be easily replaced also, the good candidates are e.g. Ruby [15], Python [16], Perl [17] or their windows based implementations. As a video player KMPlayer [13] was chosen. KMPlayer is able to display up to three subtitle streams simultaneously (Fig. 3). We are not aware of any another multimedia player which is capable to display multiple subtitles streams.

For our purposes we used two subtitle sources because displaying three subtitles is rather misleading than helping even if KMPlayer supports vertical subtitle adjusting with “ctrl+[” and “ctrl+]” keyboard shortcuts (Fig. 3). KMPlayer allows opening multiple subtitles using following steps: right click mouse button on video, selecting “Subtitles”, selecting “Subtitle Languages”, selecting “2nd Subtitle”, and selecting “Load Subtitle”. This process and user interface of KMPlayer is shown on Fig 7. Unfortunately KMPlayer is only available for Microsoft Windows [19] and is not ported for GNU/Linux [20]. However Wine [18] emulator allows running Microsoft Windows native applications in GNU/Linux environment. Thus we can say that our implementation is compatible with GNU/Linux using some workarounds.

V FUTURE WORK

This paper presents novel approach and realized implementation as the proof of concept. However this realization is far from perfect. As it was mentioned there are several pitfalls which

were solved by using various workarounds. One of them is using Google Translate custom parsing engine, another is using KMPlayer on GNU/Linux through Wine emulator. Our next research will focus on using another multi/platform dictionary, we have outlines possibilities in afore text. We are also considering implementation of custom multi platform multimedia player (or plug-in) capable running two subtitle streams. The promising solution appears using SMPlayer [26] which is GUI front end for mplayer [27] with various scripts which are available to this software.

Another interesting solution can be Matroška SSA/ASS subtitle format [28]. We are also considering making current concept as online portal. This should benefit in several facts; first is that students are unburdened of any software installation and configuration. Second is that this service can be accessed from anywhere where interment connection is available. Another benefit is that this can be interconnected with user feedback, statistics etc. which can help to student's progress. Another improvement can be achieved by using more sophisticated dictionaries and considering adjacent words. Our current solution translates input text on per words basis. Therefore translation of phrases which are comprised of multiple words can be misleading. We also believe that further reducing of hints will force the students to be even more focused on problematic.

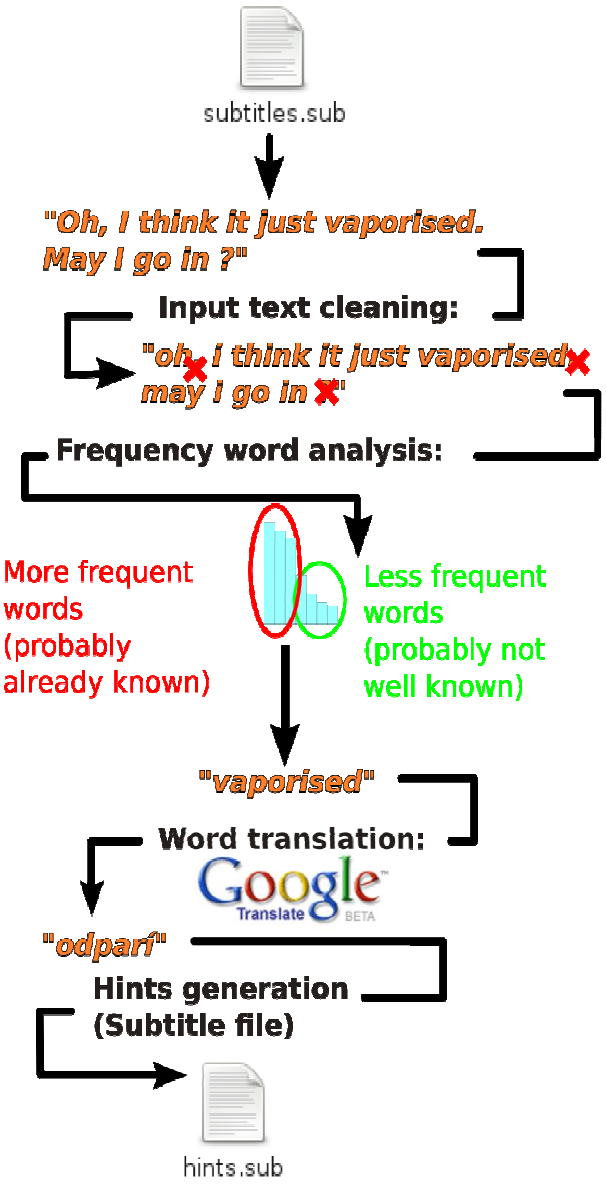

Figure 6. Process of hints creation

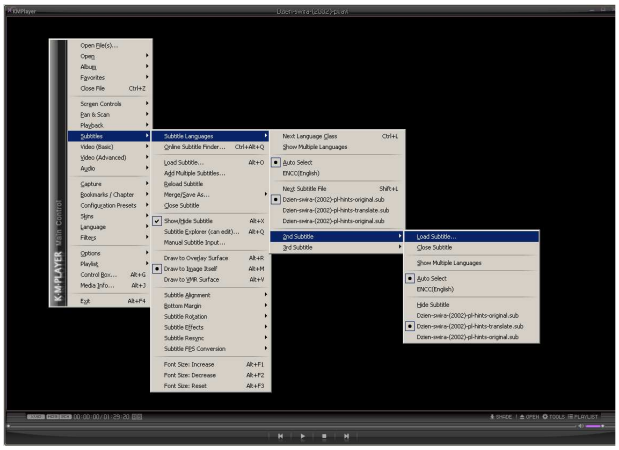

Figure 7. KMPlayer – UI - opening multiple subtitles streams

This can be easily achieved with more sophisticated dealing with various verbal forms of the same word and its inflections, this should ensure that only root of the word will be preserved. To achieve this we can use some stemming methods [29][30]. Several tools exists for this purpose, one of the most famous is hunspell [31][32] another are implemented as a perl modules [33][34]. We are also considering displaying pictures as hints to given words, as we are not aware yet of any player that is capable that, we are considering developing own solution. Another benefit could be displaying translations to multiple languages. KMPlayer is capable that but as it was mentioned the result is misleading and unclear (Fig. 3), however with little modification of our script we can achieve more readable results, as it shown on Fig 4. The little modification of script and using appropriate data source for dictionary also allows the pronunciation displaying (Fig. 5).

The method of choosing potentially already known and unknown words can be extended by using particular language statistics (most used words or most misspelled words in given language etc.) or building profile for user.

VI CONCLUSION

In this paper we presented solution that completely differs from traditional scholar methods. We presented learning of foreign languages as a side-effect of another learning or entertaining activity. Our experiments show that learning and mostly listening and understanding foreign language can be achieved with this non invasive, attractive form. Feature is also that students are able to prepare lessons on their own, just using internet and basic computer skills, this rapidly unload the teacher. Student is indirectly forced to learn foreign language with learning another material simultaneously. However we are recommending our technique as a supplementary to the traditional learning methods. We have also outlined some advances and pitfalls, however our solution was conceived as proof concept and this learning model shows as a promising alternative to currently used techniques. Only the further experiencing with this technique will show that if is worth to deploy in larger spectrum. We presented also some innovative ideas that we will deploy in near future. Those solutions can help e.g. to deaf people to learn foreign language. By expanding widespread broadband multimedia and internet our solution can deployed basically anytime and anywhere.

ACKNOWLEDGEMENT

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REFERENCES

[1] L. Kuniyoshi: “Language Acquisition and Brain Development”. Science 310 (5749): 815–819. doi:10.1126/science.1113530. PMID 16272114.

[2] J. Borell “SUBTITLING OR DUBBING? An investigation of the effects from reading subtitles on understanding audiovisual material” Lund: Lund University Sweden, 2000.

[3] C. M. Koolstra, A. L. Peeters and Herman Spinhof: “The Pros and Cons of Dubbing and Subtitling”, European Journal of Communication, 2002.

[4] G. C. D’Ydewalle, K. P. Verfaillie and J. van Rensbergen: “Watching Subtitled Television: Automatic Reading Behavior”, Communication Research 18: 650–66, 1991.

[5] J. R. Stroop: “Studies of interference in serial verbal reactions”, Journal of Experimental Psychology 18 (6): 643–662. doi:10.1037/h0054651. Retrieved 2008-10-08, 1935.

[6] Media Consulting Group In Partnership With PeacefulFish “Study On Dubbing And Subtitling Needs And Practices In The European Audiovisual Industry”, Executive Summary, 2007.

[7] F. Riggio: “Dubbing vs. subtitling” Multilingual computing & technology, 2010.

[8] H. Safar et. al “Study on the use of subtitling: The potential of subtitling to encourage language learning and improve the mastery of foreign languages”, EACEA 2009

[9] EF Education First Ltd. - English Proficiency Index, 2011

[10] L. Vokorokos, A. Pekár and N. Ádám: “Preparing Databases for Network Traffic Monitoring”, 2012. - 1 elektronický optický disk (CD-ROM). In: SAMI 2012 : 10th IEEE Jubilee International Symposium on Applied Machine Intelligence and Informatics : proceedings : Herľany, Slovakia, January 26-28, 2012. - Budapest : IEEE, 2012 P. 13-18. - ISBN 978-1-4577-0195-5

[11] Cygwin, Official Home Page, 2013, available at: http://www.cygwin.com/

[12] GNU Bash, Offcial Home Page, 2013, available at: http://www.gnu.org/software/bash/

[13] KMPlayer, Official Home Page, 2013, available at: http://www.kmpmedia.net/

[14] Google, Translate Official Home Page, 2013, available at: http://translate.google.com/

[15] Ruby, Official Home Page, 2013, available at: http://www.ruby-lang.org/en/

[16] Python, Official Home Page, 2013, available at: http://www.python.org/

[17] Perl Official Home Page, 2013, available at: http://www.perl.org/

[18] Wine, Official Home Page, 2013, available at: http://www.winehq.org/

[19] Microsoft Windows Official Page, 2013, available at: http://windows.microsoft.com/

[20] GNU/Linux, Official Home Page, 2013, available at: http://www.gnu.org/gnu/linux-and-gnu.html

[21] CrunchBang Linux Forums: Accessing Google Translate from a Terminal, 2013, available at: http://crunchbang.org/forums/viewtopic.php?id=17034

[22] Mozilla Firefox, Offical Home Page, 2013, available at: http://www.mozilla.org/en-US/firefox/new/

[23] FireBug, Official Home Page, 2013, available at: http://getfirebug.com/

[24] StarDict, Official Home Page, 2013, available at: http://code.google.com/p/stardict-3/

[25] sdcv - console version of StarDict program, Official Home Page, 2013, available at: http://sdcv.sourceforge.net/

[26] SMPlayer, Official Home Page, 2013, available at: http://smplayer.sourceforge.net/

[27] mplayer, Official Home Page, 2013, available at: http://www.mplayerhq.hu

[28] Matroška SSA/ASS Subtitles, Official Home Page, 2013, available at: http://matroska.org/technical/specs/subtitles/ssa.html

[29] David Hull: “A. Stemming algorithms: A case study for detailed evaluation”. Journal of the American Society for Information Science, 1996, 47.1: 70-84.

[30] Julie B. Lovins, “Development of a stemming algorithm”. MIT Information Processing Group, Electronic Systems Laboratory, 1968.

[31] Hunspell Offical Home Page, 2013, avaliable at: http://hunspell.sourceforge.net/

[32] Xah Lee:” Hunspell Tutorial”, 2013, avaliable at: http://xahlee.info/comp/hunspell_spell_checking.html

[33] Benjamin Franz, Lingua Stem, 2013, avaliable at: http://search.cpan.org/~snowhare/Lingua-Stem-0.84/lib/Lingua/Stem.pod

[34] Marvin Humphrey, Lingua Stem Snowball, 2013, avaliable at: http://search.cpan.org/~creamyg/Lingua-Stem-Snowball-0.952/lib/Lingua/Stem/Snowball.pm

FACEBOOK AS A FUNCTION OF TEACHING

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Abstract - Social networks are an increasingly popular way to communicate over the Internet, and increasingly replaced by writing emails. In addition to global social networks, there are also smaller networks of local or national character, as those are basically musical contents are intended for maintaining or business contacts to those used exclusively publish short messages, where users write about what they think now, what they do or feel. Currently the most popular social network is Facebook with 200 million users. Most beneficiaries are those with less than 30 years, although the mass use of specially recorded among persons aged 35 to 49 years. Recently, social networks are also applied in the teaching process. This paper will give some basic information about social networks, as well as some examples of application in the teaching process.

I INTRODUCTION

While technological differences abound, social network sites are "web - based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" [1].

As previous communication technologies (e.g. email, chat rooms, bulletin boards, etc.) have been integrated into the way we teach and administer our courses, social network sites may also have a place in our classroom.

To date, the reactions of using social network sites for educational purposes are mixed.

II CONCEPT OF SOCIAL NETWORK

Social network is a social structure made of individuals or organizations that are called "nodes" which are associated with one or more specific types of interdependency. These networks are connected to people looking for new friends, want to get in touch with people who are far away from them, who wish to express their views, participate in discussions with other people on a particular topic

The nodes are the actors within the network, and relationships are the connections between nodes, and so does social network. Social networks can be established on or off depending on need. It is displayed as a diagram, where the lines are shown as links and nodes as a great big point.

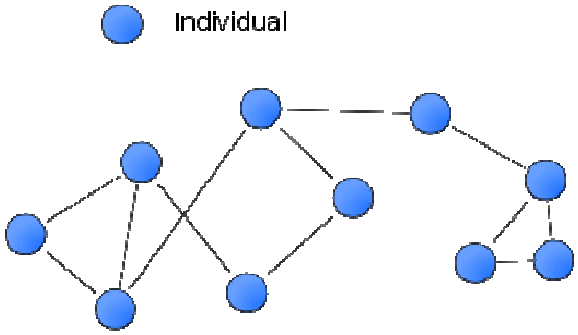

Figure 1. Example diagrams of social networks

The research in the academic environment has shown that social networks operate on many levels, from families up to the level of the nation, and play a key role in determining how to solve some problems, how organizations work, and the degree to which an individual will succeed in achieving individual goals.

A few years later, in 2002 and 2004 created the currently most popular networks MySpace and Facebook. Regular users of global networks are surprisingly quickly accepted mode of operation of these sites and social networks in general.

Virtual teams within social networks are associated with individual networks, which together achieve their goals, and that only a few times can be found in person.

The ten most used social networks in Serbia:

- FACEBOOK
- MYSPACE
- FLICKR
- HI5
- TAGGED
- KARIKE
- NEOGEN
- POZNANICI

- FURKA
- DODIRNI ME

III FUNCTIONING, ADVANTAGES AND DISADVANTAGES OF SOCIAL NETWORKS

Every registered user gets his station or profile. Settings and options for improving their profile is growing. For example including services from other sites, chat with those friends who are online.

The massive use of My Space and Facebook is the ease of use. When someone is register as a new member, I can decide who will be on his list of friends. Then has the option of inviting other members through their profiles, acceptance or rejection of one's call to be his friend, making a variety of groups and group members in a throw. Great interest and motivation inspire comments. Any registered user may comment on the image, status, or if it is a group of every group member can post video, status, pictures on the wall of the group and comment on the status of installed video and image from another group member.

The appearance of social networks had a great influence on society and drastically changed the way of communication between people. While older people refuse to accept such a way to communicate because they believe that this way of communication brainless, young people would rather say that social networks are extremely useful and easier to establish contacts and improve.

Social networks allow users to make new friendships, maintain communication with their friends from other places, other countries or even from another continent, connecting people with the same interests, allow business people to promote their own or another organization. Offer developers a set of APIs (Application Programming Interface) and tools that allows third-party developers to integrate with "open graph"-either through the application of social web site or through external sites and devices.

Despite the great benefits of social networks, there are **serious problems** they bring. **Addiction** is very prevalent problem among users of social sites. Such dependence was not included in the official list of mental disorders and illnesses, but some analysts believe that soon could be found in a medical publication. User **privacy** is compromised. All information users share on the social web site automatically belong to the company and are stored on their servers even when you close your account. Extremely big problem is the **abuse of children** for pornographic purposes. Social networks are an important segment, not only in the world of information, but also in everyday life for us.

IV FACEBOOK

Facebook is a website that serves as a social service network. Since September 2006, anyone who has over 13 years and have a valid e-mail address can become a facebook user. People use Facebook to communicate with their loved ones, with my friends, share pictures and videos and many life situations. It was founded by Mark Zuckerberg while he was a student at Harvard University, with his college roommates Saverino, Hughes and Moskovitz. Initially it was used only by students at Harvard, but later spread to Boston University, and now the whole world. Facebook now has 400 million users worldwide, and was banned for a time in some countries - Syria, Iran, China, Vietnam. Major drawback of Facebook is that people spend much time on it, and so many employees who work in firms were denied access to the social network.

In March 2006, the founder of Facebook Mark Zuckerberg offered $ 750 million for the sale of their site, which he refused, and later the price climbed to $ 2 billion from an unknown bidder. Microsoft bought 1.6 shares of Facebook for $ 240 million. This offer to buy Facebook speak only how much his popularity. Many companies advertise on it, and therefore pay large sums. Another advantage is that it is free for its users. Today we can go on Facebook and via mobile, which is also a great advantage of social networks - the so-called smart phones the first in a series was the Motorola Baya.

Figure 2. Facebook beginning page

V FACEBOOK AS A FUNCTION OF TEACHING

Arrival information and communication technology in the classroom is an inevitable thing that happens. Most of the teachers is ready for this innovation, but like all technology news, application of modern technology in the classroom from day to day changes.

"In addition to the incredible usage rate among students, there are a number of unique features that make it amenable to educational pursuits. For example, Facebook is equipped with bulletin boards, instant messaging, email, and the ability to post videos and pictures. Most notably, anyone can post information and collaborate within the system."[1]

Social networks, such as Facebook, can provide numerous other pedagogical advantages to both teachers and students.

Facebook increases both teacher –student and student - student interaction in the form of web - based communication.

Facebook helps instructors connect with their students about assignments, upcoming events, useful links, and samples of work outside of the classroom.

Students can use Facebook to contact classmates about questions regarding class assignments or examinations as well as collaborate on assignments and group projects in an online environment.

Facebook is a network that connects students with other students, indirectly creating a learning community Facebook provides instructors opportunities and structures by which students can help and support one another by building their courses atop the community already established by the students themselves.

There are two ways to use Facebook in the classroom. One is to have everyone add the teacher as a friend, then download the "Files" module and the "Questions" module. All assignments and other items get posted to the "Files" module and the teacher can use the "Questions" module to send out questions to their students.

"The other method is to do the above, but also create a group for the class. Within the group you can post homework notices and other class notices, as well as have an interface for students to discuss class issues."[2]

Pilot project on the use of Facebook for educational purposes in Serbia was first applied in the Fifth Belgrade High School, the teaching of literature, so they made profiles Serbian romantic poets, whose works are taught in second grade in the Serbian language and literature in high schools and vocational schools. According to Jasna Matić, Minister of Telecommunications, profiles of poets other than basic information, include and

descriptions of their lives, works and achievements.

"The project has met with great interest from representatives of youth in UNESCO because there is no additional cost, and motivate students to free time and as you spend on the Internet use in the teaching process," said Matić. [3]

Technical Faculty "Mihajlo Pupin" has opened a profile on facebook, where students have the opportunity to be informed about the examinations, teaching, library work, seminars are held at the Faculty, the work of lecture notes, teaching staff. Profile of the Faculty, students can communicate with each other and share information, ask questions.

Faculty profile is also set video for future students (Figure 3).

There are also information on the exams in French and Italian languages, and also set a photo album with Promotions 2012th (Figure 4)

Also, the profile can be found and information about the entrance exam and e-learning introduced by faculty to students who are unable to come to prepare for the entrance exam, to be able to follow lessons and working procedures of the task (Figure 5).

Figure 3. Video for future students

Figure 4. Information on the exams and a photo album with Promotions 2012th

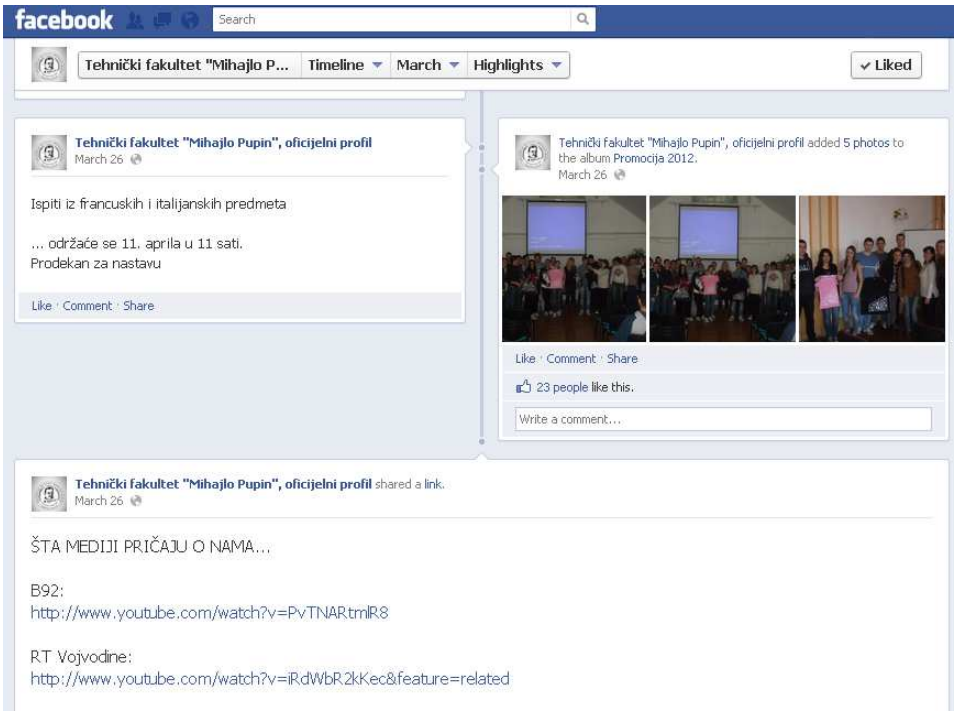

Figure 5. Information about the entrance exam and e-learning

VI CONCLUSIONS

The benefits of using Facebook and social networks are great. Increase the opportunities for communication to teachers and students, because in this way increases the number of learning styles, providing an alternative to the traditional lecture format, creating opportunities for online classrooms and increase student-teacher interaction and student-student.

Teachers should be able to expand your portfolio, promote active learning through learning communities, and to test the effectiveness of on-line learning through social networks like Facebook. In addition, the preparation of teachers can create opportunities for teachers who are

prepared to work through Facebook to get opinions about the experience with Facebook networks and to create more effective lessons to Facebook for their future classrooms.

REFERENCES

[1] http://www46.homepage.villanova.edu/john.immerwahr/TP101/Facebook.pdf

[2] http://www.webs05.com/2007/09/27/facebook-classroom-management-and-teaching.html

[3] http://dev.mtid.gov.rs/aktivnosti/aktuelno.835.html

[4] http://sh.wikipedia.org/wiki/Facebook

[5] http://www.facebook.com/tfMihajloPupin

[6] http://sr.wikipedia.org/sr/%D0%94%D1%80%D1%83%D1%88%D1%82%D0%B2%D0%B5%D0%BD%D0%B0_%D0%BC%D1%80%D0%B5%D0%B6%D0%B0

[7] http://www.ossvetisavacacak.edu.rs

EDUCATION IN THE FUNCTION OF ACQUIRING APPLICABLE KNOWLEDGE AS A RESPONSE TO THE GLOBAL CRISIS

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Abstract - This paper particularly points out the complex problems of the contemporary world that demand of education to abandon a form of stereotype way of transferring and using the acquired knowledge with the aim of training for the responsible and competent behaviour and problem solving. This requires radical changes in the coordination of education, what is reflected primarily in abandonment of the former traditional model of teaching and introduction of integrated developmental curriculum as well as abandonment of rigid programmes which reproduce inapplicable knowledge. By introducing open flexible model based on the interest and motivation of individuals and the community, and more contemporary methods of teaching, development of cooperative relations and team work followed by the greater investment in science and education, the result will be a production of the qualitative applicable knowledge that will ensure changes in the domain of educational practice thus creating perspective and alternative to the existing knowledge that led up to the certain crisis.

In the 21st century the illiterate will not be those who don't know how to read or write but those who cannot learn, discard the learned and learn again.

Alvin Tofler

I INTRODUCTION

Teaching process implies the activity of an individual resulting in acquisition of certain knowledge, skills and manners, attitudes and system of values. In the developed societies main developmental resource is knowledge which is called the human capital in the context of value itself, and its level is greatly influenced by the quality of education from which the competences derive. Education should contribute to the general increase through continual development of an individual. That is why in all developed countries knowledge is considered a national priority and many strategies of development of education that contribute to the economic, social and cultural development of the society as well to the personal development of its members are implemented.

„Do we learn for the school or for the life?“

Knowledge is exactly what it makes a value different from any other resource over the history defined as the most important means of the production of irreplaceable values of the contemporary society. Weaknesses that appear in the process of acquiring knowledge are ceartainly a quick obsolescence and inability of knowledge inheritance; everyone starts from the same level of ignorance and has to acquire the knowledge for himself and use it selflessly and share it with the others.

In the period of time when labour markets are more and more competitive, investment in the new applicable knowledges will become a priority in order to attract and maintain necessary talents, and train them effectively for high-technology.

Globalisation is often perceived as a great achievement in the contemporary world. But it can generate global crisis that warns us and asks for new requirements, new knowledges and skills compatible with the challenges of the contemporary world.

Actually, the goal of intellectual capital is to emphasize those knowledges that are in the function of development. The value of intellectual capital is equal to the future conversion of that impalpable or virtual value in relation to an individual as carrier of this intellectual capital. In this way the value of subject that learns is more widely and precisely shown, and is manifested trough the need for more investment in the new knowledges. Intellectual capital implies the ability of turning the knowledge into a value.

Participation of everyone or the majority of those in the process of learning with the aim of creating values that will be estimated by the future knowledge market is inevitable in the creation of

intellectual capital, where the investments in knowledge are not perceived as the expense but rather as an investment in the developmental component. (Human Resources Accounting).

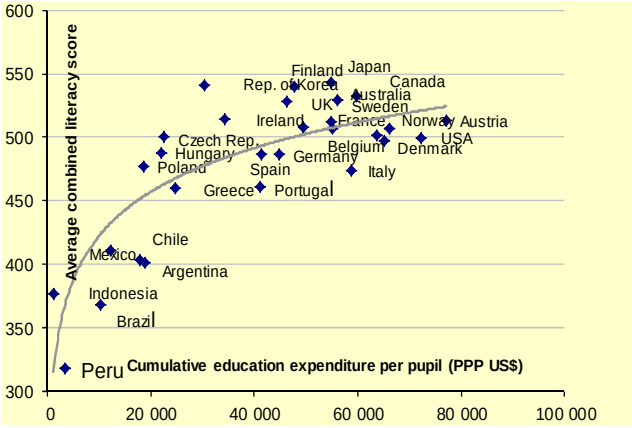

Figure 1. Achieved results and accomplishments of the quality of education in the countries that invested heavily in science and education

In today's economy (Knowledge Economy) or economy based on knowledge (Knowledge Based Economy) it is pointless to talk about the importance of learning and knowledge as in the institutions of formal learning so as in the informal learning (Long Life Learning) which is more and more present today.

Whereas today's society and technologies are developing rapidly, it is impossible to keep up to date with the new trends, systems and innovations without life long learning, and an individual as such is not in the position to rise to the challenges that are set up as an imperative reguirement of the modern individual. Thus, the responsibility of the academic community is greater if it fails to find a modality of permanent training of the employees as well as the preparation of the students for the process of accumulated problems that are inflicted upon by the system of wrongly set priorities.

When it comes to education, we are witnesses to many unsuccessful reforms that recur from time to time, and it is promoted pronuncedly and usually by the change of government when discontinuity of necessary changes happen, thus creating incalculable consequences for an individual and the community. The emphasis in life long learning should be placed on acquiring applicable knowledges, specialisation, improvement and training. The average time period of obsolescence of certain knowledges has never been so short so it is clear why such an emphasis is placed on the permanent training and specialisation within a framework of continuing education and life long learning.

Hence we confirm the already known conclusion that life long learning is of a crucial importance, and we substantiate it with the statistic data and studies from the most developed countries of the world, which show that organisations spend up to ten thousand dollars per year on education of their employees, up to 5% of the institution's income per year, and 5% of their working time (approximately 30 minutes) the employees have for their education per day.

The most common reasons for changes in the education system are first of all, an unstoppable progress of technology, a need for the new skills that are required nowadays and that are necessary for competitiveness and formal education that is rigid and inflexible and as such condemned to decadence and failure in relation to the alternative that starts from the need for the new competences.

The need for additional education can be analysed from the aspects of: analysis on the level of the learning organisation, necessary competences for specific professions and analysis on the level of an individual (what one lacks in order to be more successful).

General goals of permanent education should primarily be increasing their competitiveness and work success, their promotion to the complex professions in the hierarchy. Special goals of additional educational cycle are undoubtedly, among others, improvement of the team work, efficient time management, improvement of the work safety, increasing the level of motivation and creative way of thinking etc.

II TEAM WORK AND DEVELOPMENT OF COOPERATIVE RELATIONS AS A PRECONDITION OF THE QUALITATIVE PROCESS OF KNOWLEDGE MANAGEMENT

As a value category, knowledge comprises of all existing patents, processes and technology, competences, skills and experiences of everyone involved in the process as well as the information exclusively related to a person. Time management, which implies the process of gathering, organising and transferring knowledge with the aim of the effective and qualitative living is an equally important part.

The goals of time management are surely provision of reguired knowledges, development and transfer of the available knowledge, the use of

existing knowledge and its further development. Obstacles to the effective process of time management can be ineffective and vertical organisational structure from the seat of learning to the organisations that are the users of acquired knowledges, insufficient IT education, non-existence of the adequate informational-technical support etc. Preconditions of establishing a team work system as a result of the qualitative individual accomplishments with which a team is improved and trained in the process of creating data bank and knowledge that will be at everyone's service for browsing and learning. By using such approach and method, formal and informal learning are being integrated.

Theoreticaly set knowledge is evolved by the information networking and their shaping and connection with the related context, experience and/or expectations. Competitiveness and complementarity evolve on the pyramid of acquiring competences and skills in achieving uniqueness and comparability of quantity and quality of knowledge.

Let us remind us of the division of knowledge made by Earl, Scott, Nonaka i Takeuchi that is based on the following activities:

- identification, spreading, using and protecting the existing knowledge,
- discovering informal or implicit knowledge,
- transforming implicit knowledge into explicit knowledge,
- rising knowledge from an individual level to the level of team and organisation,
- integrating knowledge management with other activities.

Knowledge system consists of:

- bank of knowledge (knowledge based or knowledge warehouse),
- information-telecommunication team and time management team,
- means and persons that possess knowledge (logistical support team and knowledge carriers),
- knowledge transfer systems (videoconferences, teleconferences, presentations, Intranet, Extranet, publications, workshops, seminars and alike.)

If the afore-mentioned division of knowledge is set in the context of human values and capital, according to Lauc, it will be divided into a moral, an intellectual and a social capital, what gives a new human and cultural dimension of the process of acquiring and using knowledge together with the developmental communication component thus making new teams and knowledge networks. In keeping accordance with the development equating, Lauc from the human capital derives equating of the development of society (country)

$$Y=ax1+bx2+cx3+dx4+ex5+fx6$$

where Y is=term of complete development, a-f= weight with argument, x1=motivation, x2= competences, x3=mutual communication, x4=equipment, x5=money and x6=environment of the observed system. Relation of coefficients (arguments) is: a > b > c > d > e > f. (Ž.Požega, 2012, 243.)

Pupils and students should be given an option of choice and responsibility for their own education whenever it is possible.

Elizabeth Schulz

III TEAMS AND THEIR MULTIDIMENSIONALITY

Business Process Reengineering- philosophy that brings business processes to the fore has transformed the way of forming teams and their structure. Today's teams are multifunctional, i.e. multidimensional and their authority and influence are not restricted only in the domain of one function. Competences from various domains create conditions for achieving developmental concept with the purpose of accomplishing better results.

Teams that are regarded as the process of development of cooperative relations are in the function of determining clear settings of constant improvement of basic processes (value stream).

Fast, reliable and qualitative information and communication technology ensure radical improvements of the performance of those teams that are competent enough to get acquainted with them and use them. Advantages that this technology brings along are:

- Abandoning the functional organisational obstacles-information exchange;
- Abandoning the spatial organisational obstacles- members of the dislocated subjects can also be a part of the team;

- Cooperation, communication and coordination of activities are being set on the significantly higher level;
- The team possesses all the necessary information for independent decision making in due time.

The new category of software- groupware has been of great importance recently. This kind of a software is self-oriented to team work. Usually they integrate multimedia database, automatisation of workflow, e-mail, electronic meetings, conferencing and scheduling. The automatisation of the workflow has been given a special attention because it improves the level of harmony of activities within a specific process.

IV HOW TO REFORM EDUCATIONAL PRACTICE

Similarly, Stoll (1999) clarifies how real improvements and qualitative changes as in education process so as in other institutions can be realised only if they come from the inside, what implies active cooperation of the team experts from different domains, i.e. from the network of common acquired values, trust, norms, social and emotional relations, all of which form the culture of an educational institution.

In the domain of organisational theory, which is more and more illustrated by the examples in education, Senge (2002) emphasises the fact that every organisation is essentially a product of thinking and interaction of its members. "So the strongest lever for any kind of the organisational learning project is not in the hands of policies, budget or organisational diagrammes but in our own hands" (Senge, 36).

In other words, every individual should be trained for learning during his/her life in order to be able to adapt continuosly to changeable, complex and interdependent world. Senge (2003) claims that learning means increasing the ability by experience: "Learning is a longlasting process that develops in "the real life", and not in the classrooms and on the training classes (so called: "experience-based teaching"). This kind of learning could be difficult to control but it makes more permanent knowledges: an increased ability for the effective influence in the surroundings that are important and vital." In line with the definition of an organisation that learns and explores, it is important to point out that is a permanent process. In fact, since the changes in the surrounding never cease to exist, so the process of organisational learning is continually in progress. It is a kind of a "lifelong journey" towards the desirable and never completely accomplished goal (Senge, 2001, 10).

Practice is the best theory.

Einstein

Harmut von Hentig, a renowned pedagogue has turned this into a slogan: "Clarify matters-empower people!" (Hentig, 1987); and continued that by clarifing professional issues we grow up as people, and if we are being supported and empowered it will be easier for us to deal with many other issues. Meyer (2002) adds that the development and the investment in the educational system are not by themselves a goal and a purpose. Its sole justification lies in the fact that learning and teaching should be made more human and efficient for all participants in the educational process.

Mention should be made of the efforts of Fullan (1993, 1999), one of the first authors who explored the process of implementation of the reforms in the educational practice (in the 70ies and the 80ies) and implemented these discoveries on the institute of teacher training in Canada. Furthermore, (Leithwood, 2002, 101). Fullan (1999, 44) clarifies expediency of planning development of the school system in accordance with the development of the society as a whole. Many contemporary authors (Prosser, 1999, Bascia, Hargreaves, 2000, Kinsler, Gamble, 2001, Dantow and others, 2002) consider the unpredictability, complexity and multidemensionality to be the basic characteristics of the educational system instead of linearity and predictability. They call our attention to the fact that the teacher is focused only on the predictable and expected phenomena in the educational practice and in this way could become more and more insensitive to the phenomena of unexpected, unpredicted, unplanned and sometimes illogical situations which are very common in the educational practice (Fullan, 1993, 1999, Hopkins, 2001, Filippini, 2001). Meyer (2002, 163) clarifies that " students should be prepared for the future whose contours we can only flair", (...) as opposed to today's absurd that young people are educated for the professions that no longer exist."

New social relations as on the global so as on the national, local and family level put the teachers in the new position that they can deal with only by means of possessing new knowledges (new assignments but also new roles) and new competences (documents of the European Commission, 2002, 2004, 2005). The teacher is

regarded, first of all, as an initiator of changes, promoter of learning that takes care of his/her personal and professional development and who is a part of the system and the organisation that is developing and learning.

However, there should be a reason why a teacher should consent to such professional training. The frequent and imposed compulsion and obligations are the main reasons of discontent with the pre-existing condition in the educational practice. Our experience has shown the need for the regular inclusion and training of teachers for research as a way to the qualitative professional training, experience-based and creative learning that develops reflexive and self-reflexive practice thus increasing capacities for the change in the educational practice and new paradigms of the culture of the educational institution. (Miljak, Vujičić, 2002).

„Knowledge is what unites us, and finally becomes more important than what separates us.“

V INSTEAD OF CONCLUSION

What is important for the improvement of the quality in education?

- Quality of the teaching profession-competence
- Quality of the management on the national level-funding
- Quality of the management in the educational institutions (open and flexible model)
- Social projects for improving education
- Continuity of the education policies
- Comparability, competitiveness, complementarity, monitoring and evaluation.

Education for the competences in the 21st century

- Key competences for everyone
- Preparation for lifelong learning
- Contribution to the economic and the cultural development
- Response to the social challenges
- Education for everyone
- Preparation of the young people for active citizenship
- Teachers-the key carriers of changes
- Support and greater investments in development of the school and the academic communities

(Commission staff working paper: Schools for the 21st Century)

Learning how to learn

Learning how to learn is an ability of performing and preserving in learning, organising one's own learning, including effective time-, space- and information-management as an individual so as a part of the group. This competence implies the awareness of the process of learning as well as the needs for effective learning, identification of available possibilities and capability of overcoming obstacles for making the learning process more effective. Such competence induces an individual to upgrade the previous learning and life experiences in order to use knowledge and skills in different contexts. Motivation and self-confidence are the key pre-conditions for the overall process of education.

REFERENCES

[1] Armstrong, M., “Kompletna menadžerska znanja - upravljanje ljudima i sobom” knjiga prva, MEP Consult, Zagreb, 2001.

[2] Aronson, E., Wilson, T. D., Akert, R. M., “Socijalna psihologija” četvrto izdanje, Mate, Zagreb, 2005.

[3] Bahtijarević-Šiber, F., “Management ljudskih potencijala” Golden marketing, Zagreb, 1999.

[4] Baker, W., “Socijalnim kapitalom do uspjeha: kako crpsti resurse iz svojih osobnih i poslovnih mreža” Mate, Zagreb, 2004.

[5] Bebek, B., “Integrativno vodstvo – Leadership“ Sinergija, Zagreb, 2005.

[6] Beck, U., “Moć protiv moći u doba globalizacije: nova svjetsko politička ekonomija” Školska knjiga, Zagreb, 2004.

[7] Brajša, P., “Sedam tajni uspješnog managementa” Alinea, Zagreb, 1997.

[8] Collins, E. G. C., Devanna, M. A., “Izazovi menadžmenta u

[9] XXI stoljeću” Mate, Zagreb, 2002.

[10] Denny, R., “Motivirani za uspjeh – MEP Consult, Zagreb, 2000.

[11] Durkheim, E., “Obrazovanje i sociologija” Školska knjiga, Zagreb, 1996.

[12] Friganović, M., “Demogeografija: stanovništvo svijeta” četvrto dopunjeno izdanje, Školska knjiga, Zagreb, 1990.

[13] Fullan, M. (1990), Staff Development, Inovation and

[14] Institutional Development. In: Joyce, B. (ed), Changeing School

[15] Culture Through Staff Development, Alexandria: ASCD, 2-26.

[16] Gardner, H., Kornhaber, M. L., Wake, W. K., “Inteligencija –

[17] različita gledišta” Naklada Slap, Jastrebarsko, 1999.

[18] Goleman, D., “Emocionalna inteligencija” Mozaik knjiga, Zagreb, 1997.

[19] Grupa autora, “Izgradnja učinkovitog tima pomoću jedne minute rukovođenja” Poslovna knjiga, Zagreb, 1995.

[20] Grupa autora, “Organizacija koja uči” Hrvatsko društvo za sustave, Zagreb, 1998.

[21] Klippert, H., “Kako uspješno učiti u timu – zbirka praktičnih primjera” Educa, Zagreb, 2001.

[22] Kotter, J. P., “Vođenje promjena“ Lider, Zagreb, 2009.

[23] Lasić-Lazić, J., "Znanje o znanju" Zavod za informacijske studije Odsjeka za informacijske znanosti, Zagreb, 1996.

[24] Lauc, A., "Metodologija društvenih znanosti" Sveučilište J. J. Strossmayera u Osijeku, Pravni fakultet Osijek, 2000.

[25] Natek, K., Natek, M., "Države svijeta: 2000" Mozaik knjiga, Zagreb, 2000.

[26] Nikolovska, N., Sundać, D., "Globalization and economic

[27] downfall of countries in transition" Magor, Skoplje, 2002.

[28] Ozimec, S., "Otkriće kreativnosti" Znanstvena biblioteka "Tonimir", Varaždin, 1996.

[29] Pulić, A., Sundać, D., "Intelektualni kapital–21. stoljeća"

[30] International Business Consulting Center Rijeka 2001.

[31] Quelch, J., A., "The global market: developing a strategy to manage across borders"

[32] Srića, V., "Upravljanje kreativnošću" Školska knjiga, Zagreb, 1992.

[33] Senge, P. (2001), Peta disciplina u praksi, Principi i praksa

[34] učeće organizacije, Zagreb: Mozaik knjiga.

[35] Senge, P., McCabe, N.C., Lucas, T., (2002), Schools That

[36] Learn, New York: Doubleday.

[37] Senge, P., Ross, R., Smith, B., Roberts, C., Kleiner, A. (2002),

[38] Peta disciplina u praksi, Strategije i alati za gradnju učeće

[39] organizacije, Zagreb: Mozaik knjiga.

[40] Sternberg, R. J., "Uspješna inteligencija – kako praktična i kreativna inteligencija određuju uspjeh u životu" Barka, Zagreb, 1999.

[41] Stoll, L. (1999), School Culture: Black Hole or Fertile Garden

[42] for School Improvement? In: Prosser, J. (Ed.), School Culture,

[43] London: P.C.P.

[44] Vukasović, A., "Etika, moral, osobnost – moralni odgoj u teoriji i praksi odgajanja" Školska knjiga, Filozofsko-teološki institut, Zagreb, 1993.

[45] econpapers.repec.org

[46] public.srce.hr

[47] search.epnet.com

[48] unstats.un.org/unsd

[49] www.dzs.hr

[50] www.hnz.hr

[51] www.human.pefri.hr

[52] www.imf.org

[53] www.iqm.co.yu

[54] www.knexa.com

[55] www.liderpress.hr

[56] www.proquest.com

[57] www.revija-socijalna-politika.com

[58] www.scb.se

[59] www.sciencedirect.com

[60] www.skandia.com

[61] www.steelcase.com

[62] www.znanje.org

[63] www.zpi.hr

[64] www.worldbank.org

MODELING SNA RESULTS WITH BAYESIAN NETWORKS

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Abstract - In this paper we present two Bayesian network (BN) models in which the prediction of students' success at the final exam is based on students' activity in online learning community and on success at the midterm exam. This particular research is a part of long term project related to quality improvement of distance learning at the Faculty of information technologies of University "Dzemal Bijedic" of Mostar, Bosnia and Herzegovina. Indicators for students' activity are based on characteristics' of ego networks, such as the size of ego network, density, etc. In order to choose Bayesian network predictors, we first conducted statistical analysis of the available data. Then we modeled two naive Bayesian networks in open source software MSNBX, and finally we compared the models.

I INTRODUCTION

In the past years, we were involved in analysis of a large-scale online learning community at FIT Mostar. We investigated the topology of the communication, and it turned out to be a scale-free, small world network [1]. Investigating the network properties, we proved that parts of FITCS (Faculty of Information Technologies Community Server) provide knowledge sharing [2], [3]. In addition to this, we recently presented a semi-adaptive e-learning model suited for the limiting environment of Bosnia and Herzegovina [4].

FITCS exists for more than five years now. It was originally designed for distance learning students, but in time, it became the most popular way of communication for all FIT students. FITCS consists of several units, and one of them is reserved for communication on curriculum subjects. That part was designed for knowledge and information sharing. FITCS is now numbering around 800 active students. Their communication is grouped by the semester of study, where students can exchange experience on subjects, and personal interests, such as computer networks, security, etc. For the purpose of this research we used the data from FITCS concerning the communication on topics related to Programming 1 from the academic year 2010/11.

TABLE I. CORRELATION MATRIX OF EGO NETWORK VARIABLES

	Size	Ties	Pairs	Densit	AvgDis	Diamet	nWeakC	pWeakC	TwoStepR	ReachE	Broker	nBroke
Size	1											
Ties	0,99	1										
Pairs	0,94	0,96	1									
Densit	-0,45	-0,47	-0,47	1								
AvgDis	0,72	0,63	0,55	-0,04	1							
Diamet	0,71	0,63	0,55	-0,35	0,89	1						
nWeakC	0,27	0,19	0,12	0,63	0,75	0,46	1					
pWeakC	-0,53	-0,52	-0,40	0,67	-0,14	-0,36	0,32	1				
TwoStepR	0,52	0,44	0,31	0,30	0,82	0,64	0,84	-0,15	1			
ReachE	-0,52	-0,53	-0,41	0,66	-0,06	-0,28	0,38	0,94	-0,10	1		
Broker	0,90	0,91	0,99	-0,46	0,51	0,50	0,09	-0,35	0,25	-0,36	1	
nBroke	0,83	0,78	0,72	-0,63	0,80	0,90	0,21	-0,52	0,46	-0,45	0,67	1
EgoBet	0,87	0,88	0,97	-0,45	0,50	0,49	0,09	-0,33	0,24	-0,34	0,99	0,65
nEgoBe	0,68	0,61	0,60	-0,59	0,75	0,87	0,19	-0,41	0,39	-0,32	0,58	0,92

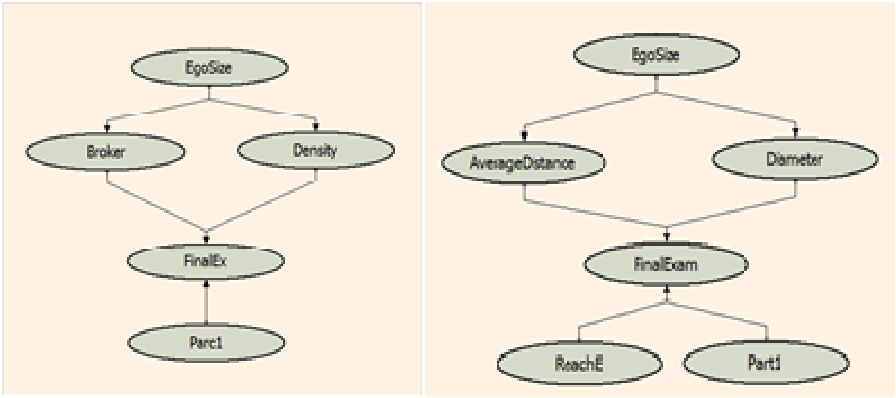

Figure 1. BN Model1 (left) and Model 2 (right). Source: MSBNX.

We will here briefly revise the basic characteristics of ego networks that we used in creation of Bayesian network model. Size is the number of alters that an ego is directly connected to, possibly weighted by the strength of a tie [5].

Density is the ratio of observed ties in a network to the maximum number of possible ties [6].

Reach efficiency (in further text referred to as ReachE) norms the two-step reach by dividing it by size. The information it provides is the scope of secondary contacts per primary contact, or the benefit from others' involvement in the network. If reach efficiency is high, then subject is reaching a wider network for each unit of effort invested in maintaining a primary contact [7]. In a knowledge sharing community this could be an opportunity to obtain information easily if one was observing direct communication (as analogy to e-mail network). On the other hand, in a model where a link exists if a student posted in a topic, and all acters in the topic are connected, this means that a student was not involved in many topics.

A broker, linking two network clusters, takes a share of the resources passing through that position. Indeed, a canny broker may impede transitivity by working to prevent the formation of other direct links between these clusters. Brokers, by their very structural position, cannot be full members of any network cluster. Often their marginal nature means they are not fully trusted because no single cluster can exercise total social control over them [8].

A Bayesian Network consists of a set of variables and a set of dependency arcs which are connecting some of the variables. As it is well known that BN models should not have too great number of categories, we grouped data as much as possible taking into account the specific aspects of each variable. The other reason for using as little categories per variable as possible is the number of data in each of them. We chose naive Bayesian approach since some recent researches indicate it is sufficiently good as well as easy to model [9].

We decided to analyze properties of students ego networks obtained using Ucinet 6.1. List of all available variables of ego network in the correlation matrix is presented in Table 1. In order to choose meaningful predictors, we calculated the correlation coefficients, and chose variables as representatives of highly correlated clusters. Furthermore, after analyzing the advantages and disadvantages of the selected model, we decided to exploit another possible model and compare the two results.

II BAYESIAN NETWORK MODELS

A. Choice of predictors

In order to select predictors for Bayesian network (BN) model, we preformed basic statistical analysis, but more importantly, we kept in mind relevant properties of ego networks. For example, if we are interested if a student is broker in own ego network, we decide to select that property taking into account the results of analysis. Furthermore, if we are not interested in number of connected components, we will choose to not select any of the related properties as BN predictors.

Statistical analysis consisted of two phases: preparatory analysis, and probability calculation. It was performed in MS Excel.

The purpose of preparatory analysis was to choose the best predictors for students' success at the final exam. For all numerical data we calculated the correlation matrix, presented in Table 1.

B. *Model 1*

As it turns out from our data, Size, Ties and Pairs all significantly correlated. Therefore, we decided that the size of student's ego network is representative of that group of characteristic. Furthermore, since density is mildly negatively correlated with size of ego network, we decided to choose density as a dependent predictor. At the moment we war more interested in the broker property then the number of connected components or average distance and diameter, so regardless of the high correlation coefficient we decided to select Broker as another dependent predictor.

TABLE II. THE ADVANTAGE OF BEING A BROKER IN MODEL 1

Node	State 1	State 2	State 3
FinalExam	VeryGood	Satisfactory	Unsuccessful
	0,094	0,236	0,670
PartExam	VeryGood	Satisfactory	Unsuccessful
	0	0	1
EgoSize	Isolated	Small	Medium-Large
	0	0	1
EgoDensity	0	Small- Medium	Large
	0	0,360	0,640
Broker	No	Small	Medium-Large
	0	0	1

C. *Model 2*

In the second model, we selected different predictors in order to broaden the scope of inference. We also wanted to include some basic graph theory terms such as average distance and diameter, regardless of their significant correlation, bearing in mind that we do not have to observe them simultaneously in the BN model. The latest fact is the reason why we treat those variables as independent. Again, the size is an immanent characteristic of ego network, and we kept it as independent predictor. Furthermore, we decided to select ReachE, a variable with predominantly negative and mostly insignificant correlations, as another independent predictor.

Concerning the analyzed data, we noticed there was only one isolated student, and we decided to exclude that record, for it demanded definition of more states in BN nodes.

D. *Modeling Bayesian network*

After selecting predictors we modeled the Bayesian networks with dependences shown in Fig. 1. Since one cannot be broker in a small-sized network we say that Broker depends on Size and the similar stands for Density. Success at the partial exam is an independent predictor, for it is also a control variable for determining if ones behavior in ego network is proportional to learning effort.

Since Bayesian networks demand rather small number of node states for predictors, we grouped all numerical data into three categories: Ego Size has states 0, small and medium-large, Density has states 0, small-medium and large, Broker has states no, small, medium-large while success at midterm and final exam (Parc1, FinalEx, respectively) have states 'unsuccessful', 'satisfactory' and 'very good to excellent'.

In Model 2, we kept the same BN node states where possible, such as success at exams. Furthermore, Ego size has only two states, small and medium-large, average distance has states 0, 1 and more than 1 (denoted as 1+), Diameter has states 1, 2, and 3, and ReachE has states <20, 20-40, and 40+.

The final steps in development of both models were calculation of probabilities and conditional probabilities, and input of those data into MSBNX. The probability calculations were performed in MS Excel.

III RESULTS

A. *Model 1*

In Model 1, it turns out that there were no students who passed Partial exam and were not involved in knowledge sharing community. Furthermore, students who got satisfactory grades at partial exam all had medium-large network and broker property, but small-medium density. Their chance of passing the final exam was minimally 61%. For the best students at partial exam it turns out that their ego networks have small-medium density. Additionally, regardless of the size of ones ego network, medium-large broker property increases their success at final exam by 10%.

The next fact to be noted for students unsuccessful at partial exam is that regardless of the size of their ego network, they have little chance of passing the final exam if they had small value for broker and small-medium density. Of the two later, being a broker can improve student's chances of passing exam regardless of density (Table 2), while for non-brokers, large density is decreasing chances of passing the exam (Table 3). The best chance for students that failed partial exam to succeed at the final is to have large values

for all three ego network variables, in which case their chances mount to 41%.

B. Model 2

For unsuccessful students at the partial exam in Model 2, it turns out that optimal value for ReachE is 20-40, increasing chances for final exam success by 20-30% (for values of <20 and 40+ respectively). In a small ego network, decrease of average distance by 1 increases chances for success by 5%, but chances for success regarding diameter increase for values 1 or 3, and decrease for 2. The best possible combination of BN node states for student's success is presented in Table 5.

TABLE III. THE DISSADVANTAGE OF HAVING LARGE DENSITY IN MODEL 1

Node	State 1	State 2	State 3
FinalExam	VeryGood	Satisfactory	Unsuccessful
	0,024	0,203	0,773
PartExam	VeryGood	Satisfactory	Unsuccessful
	0	0	1
EgoSize	Isolated	Small	Medium-Large
	0	0,436	0,564
EgoDensity	0	Small- Medium	Large
	1	0	0
Broker	No	Small	Medium-Large
	0,529	0,246	0,225

For students that were successful at the partial exam, it turns out that ReachE, when leaving all other nodes unobserved, has the strongest influence on student's success at the final exam. Regardless of the grade at the partial exam, for ReachE in the range of 20-40, a student should have doubled chances for passing the final exam than for 40+, and even greater than double for <20. Consequently, it is justified to fix ReachE to optimal value, and we did so in all further cases. Furthermore, for ego networks of all sizes, the diameter of value 1 should increase student's chance for final success by 40%, when compared to 2. On the other hand, optimal values of average distance are greater than or equal to 1 in a small network, increasing chances for success twice when compared to 0. For medium–large sized networks average distance of 1 is slightly better than >1.

IV DISCUSSION

A. Model 1

From Model 1 it is obvious that some students are using FITCS as a regular chat-forum, while others are actually exchanging knowledge, which is in line with our previous findings [3]. Therefore, our decision to include success from the partial exam into the predictive model is completely justified. Furthermore, the fact that there were no students who passed partial exam and were not involved in knowledge sharing community, implies that students should be encouraged to engage themselves in online discussions on learning content from the very beginning of semester.

When it comes to broker property [10], [11], [12] the medium-large value in our model implies that a student was involved in topics with various groups of students. This can be interpreted as a good practice of learning from the experiences of lot of other students, regardless of the quality or relevance of their posts, also including a good chance to learn from other students' mistakes.

When considering the observed density [13] for students successful at the partial exam, the optimal value is small-medium (<0,60). This fact can be interpreted as a warning that it is not advisable to meddle into all discussions, since in most cases that should be recognized as spam. On the other hand, as network size should be large, one can conclude that an ideal student should be involved in many, but not all topics, with various groups where they can both learn from others and help them learn.

For students that are not dedicated to learning, what can be said for those who failed the partial exam, involvement in a knowledge sharing community can be useful if they manage to join the right groups. Since their best chance is to increase values for all three characteristics of ego network, it follows that they should be advised to connect to student-tutors interested in helping them. In that way they can benefit from tutor's contacts too, as an attempt to change their social preferences, abandon "bad" company, and start socializing with the knowledge sharing elite. They should also get involved in a larger number of topics, where they should to contribute not only with their mistakes, but also with some fresh ideas, as a result of changed learning attitude.

The least important of predictors in Model 1 seems to be ego network density, so it should not be used as a predictor of student's success at the final exam.

B. Model 2

The common characteristics for both successful and unsuccessful students at the partial exam, is the fact that the optimal value of reach efficiency (ReachE) is the middle one (20-40), if their goal is to pass the exam. This fact implies that ReachE

should be considered as one of the predictors for student's success at the final exam. This again can be interpreted as the recommendation to students that they should choose their company, i.e. to adopt best possible social preferences with regard to knowledge sharing.

TABLE IV. MODEL 2: THE BEST POSSIBLE COMBINATION OF BN NODE STATES FOR STUDENT'S SUCCESS AT THE FINAL EXAM, ENCOUNTING THE STUDENTS UNSUCCESSFUL AT THE PARTIAL EXAM

Node	State 1	State 2	State 3
FinalExam	VeryGood	Satisfactory	Unsuccessful
	0,032	0,596	0,372
PartExam	VeryGood	Satisfactory	Unsuccessful
	0	0	1
EgoSize	Small	Medium-Large	
	1	0	
Diameter	1	2	3
	1	0	0
AvgDistance	0	1	1+
	0	1	0
ReachE	<20	20-40	40+
	0	1	0

For students unsuccessful at the partial exam with small sized ego networks, the optimal value of average distance is minimal, implying that they should fully use their contacts. On the other hand, since the most favorable value for diameter is 1, students can be advised to try to get involved in all topics of their contacts. Since average distance is in contradiction with reach efficiency, and is not as relevant, it would not be advisable to select it as a predictor of student's success in the early stages of network development.

TABLE V. MODEL 2: THE BEST POSSIBLE COMBINATION OF BN NODE STATES FOR STUDENT'S SUCCESS AT THE FINAL EXAM FOR STUDENTS SUCCESSFUL AT THE PARTIAL EXAM

Node	State 1	State 2	State 3
FinalExam	VeryGood	Satisfactory	Unsuccessful
	0,117	0,702	0,181
PartExam	VeryGood	Satisfactory	Unsuccessful
	0	1	0
EgoSize	Small	Medium-Large	
	0	1	
Diameter	1	2	3
	1	0	0
AvgDistance	0	1	1+
	0	1	0
ReachE	<20	20-40	40+
	0	1	0

On the other hand, if a student had a positive grade at the partial exam, ego size doesn't matter, for the optimal value of ReachE. All of such students had the value 1 for both diameter and average distance. Since the value of ReachE was fixed in all of the cases, we will not discuss causality of the other variables furthermore.

C. Comparison of models

As it turns out from the previous analysis, Model 2 seems to be more sensitive in prediction of students' success at the final exam. In other words, that model is showing a better possibility to indicate a way for students' performance improvement. Since the most important predictive variable in the model is reach efficiency, it follows that it should be on top of the list of predictive variables. As it turns out that ReachE is highly positively correlated to the probability of weakly connected components (pWeakC in Table 1), this implies that only the later could be considered as an alternative.

On the other hand, if one needs to deploy predictors in the context of dynamic SNA, the size of ego network should also be included as a predictor variable.

The broker property from Model 1 can also be considered as a predictor, but it should be combined with further analysis of post content, in order to verify student's contribution to knowledge sharing.

The student's achievement at the partial exam is another good predictor in both models. On the other hand, it is not available in the early stages of the knowledge sharing community development, so it is not relevant in the early stages of the dynamic network analysis.

V CONCLUSIONS

The goal of this Bayesian network modeling was to explore possibilities for the development of just-in-time guidelines for students' success at the final exam. The necessity for prediction is driven by the obligation to provide adequate and timely help to students who need it [14]-[16]. It is in line with our ultimate goal: enhancement of students' performance at the final exam. The predictive model should be a part of an interactive learning environment [17], [18].

The results of the analysis of various possible predictors and their impact to students' success imply that one should rely on such characteristics of ego networks as size, reach efficiency and broker, combined with some indicators of student's learning progress.

REFERENCES

[1] Bijedic, N., Burak, S. 2006. Cluster Analysis of a Scale-Free Network. In TMT 2006 Conference Proceedings.

[2] Hamulic, I., Bijedic, N., 2009. Social Network Analysis in Virtual Social network analysis in virtual learning community at Faculty of information technologies (FIT), Mostar. In Volume 1, Issue 1, Pages 2269-2273 (2009) World Conference on Educational Sciences, Nicosia, North Cyprus, 4-7 February 2009 - New Trends and Issues in Educational Sciences.

[3] Bijedic, N., Hamulic, I., 2009. Analysis of a Learning Community as a Social Network. In Cypriot Journal of Educational Sciences Vol 4, No 7 (2009): Cypriot Journal of Educational Sciences.

[4] Radosav, D., Hamulic, I., Bijedic, N., Junuz E., 2010. Model for adaptive e-learning in BIH environment. In TMT 2010 Conference proceedings.

[5] Burt, R. S., Minor M.J. 1983. Applied Network Analysis. Beverly Hills CA: Sage Publications

[6] Barry W., 1983. Sociological Theory, Vol. 1., pp. 155-200.

[7] Hanneman, Robert A. and Mark Riddle. 2005. Introduction to social network methods. Riverside, CA: University of California, Riverside (published at http://faculty.ucr.edu/~hanneman/).

[8] Gofman E., 1963. Stigma. Englewood Cliffs, N.J.: Prentice-Hall

[9] Cheng, J., Greiner, R., 1999. Comparing Bayesian Network Classifiers, *UAI 1999, pp. 101-108.*

[10] Cross, R. & Cummings, J. N. 2004. Tie and network correlates of individual performance In knowledge-intensive work. Academy of Management Journal, 47: 928-937.

[11] Stephen P. Borgatti, et al. 2009. Network Analysis in the Social Sciences. Science 323, 892 (2009); DOI: 10.1126/science.1165821

[12] R. S. Burt. 2005. Brokerage and Closure. Oxford Univ. Press,New York, 2005.

[13] Social Network Analysis for Organizations Author(s): Noel M. Tichy, Michael L. Tushman, Charles Fombrun Source: The Academy of Management Review, Vol. 4, No. 4 (Oct., 1979), pp. 507-519 Published by: Academy of Management Stable URL: http://www.jstor.org/stable/257851 Accessed: 10/03/2009 01:23

[14] Barnard, Y. (2006). Didactical and Pedagogical Aspects of e-Learning Tools. In: J.P. Pardillo, Proceedings of the Conference on European guidelines for the application of new technologies for driver training and education, Madrid.

[15] Serwatka, J. (2002). Improving student performance in distance learning courses. The Journal of Technological Horizonsin Education, Vol. 29, No.9, stranice 46-52.

[16] Russo, Tracy C and Koesten, Joy; Communication Education, v54 n3 p254-261 Jul 2005; Using Social Network Analysis to Understand Sense of Community in an Online Learning Environment

[17] Shen, Demei; Nuankhieo, Piyanan; Huang, Xinxin; Amelung, Christopher; Laffey, James; Journal of Educational Computing Research, v39 n1 p17-36 2008; How to Measure Team Communication in Web-based Collaborative Learning: The Application of SNA

[18] Pedro A. Willging, (2005) Using Social Network Analysis Techniques to Examine Online Interactions, USChina Education Review, Vol.2, No. 9

PREVENTING A BAD INFLUENCE ON CHILDREN FROM THE INTERNET BY PARENTS

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Abstract - The Internet today is a part of children's natural environment. Most children have access to the Internet at school and/or at home. Parents and teachers consider Internet to be a primarily educational/developmental tool. Children also go online for learning activities that are not connected directly with school. The absence of information filters, such as editors and peer reviewing, on the Internet presents a challenge to students, who are using the web to find information for their assignments. Children cannot properly estimate the validity of the information they find on the web. They rely upon search engines and accept information in visually appealing easily accessible pages. Given the enormous amount of web sites for children of all ages it is not easy to find a good or a useful one. There are some excellent starting points for parents and teachers to find appropriate sites. This composition describes threats that may occur due to lack of information related to Internet use. We have presented a few useful tips on how parents can have an influence on their children and their safety while spending time on the Internet.

I INTRODUCTION

Although the internet is full of very useful information there are many of those who present a danger to children. Parents should have knowledge about the bad but also about good facilities that are located on the Internet and in accordance with that set norms of behavior that apply to the whole family. The most important thing is to establish a reasonable and healthy communication between parent-child interaction in order to protect children on the Internet and in the real world. The Internet provides opportunities for acquisition of new knowledge and for socializing and entertainment. Because of its availability to everybody, the Internet carries big risks, because there can be found content and facilities which are not provided for children. It is quite important that your computer is under constant protection from an antivirus program because that is the best way to save personal data.

In less than a decade, the Internet has moved from an obscure communications medium to be an ubiquitous fixture in our homes, schools and workplaces. It enables us to perform routine tasks quickly and efficiently. And activities, such as: making flight plans, purchasing new books and clothing, checking movie schedules, searching for employment, catching the latest news, and performing research, are but only a few of the many tasks that now require little more physical effort than the click of a mouse [1].

The technological aspects of the Internet are developing exponentially, along with a reduction in the cost of both hardware and software to the consumer. It is unlikely that there will be a reversal of this trend, and what we face is a pervasive and continuing use of the Internet, however it might evolve, to meet many of our needs. This trend is also likely to be the case for nonwestern countries, although financial and commercial considerations may limit the speed of growth of domestic use [2].

However, the Internet does not only function to give us goods, but provides a social context for us to meet with others and to exchange information. For many people, such engagement with the Internet community can be beneficial. However for those with a sexual interest in children, accessing parts of that community may result in problematic cognitions and behaviors. However, it would be foolish to suggest that there may not also be some beneficial aspects to Internet use for this particular group. Our major concern in the context of people with a sexual interest in children is the content of the material accessed and the function of the social relationships in propagating behaviors that are ultimately exploitative of children. But the Internet brings with it other concerns. It is not only sex offenders for whom the Internet may be problematic. Increasingly, we see reference in the literature to "Internet Addiction", reflecting a use of the Internet that is problematic. Earlier research by Kandell [3] had defined Internet addiction as: an increasing investment of resources on Internet related activities; unpleasant feelings (e.g. anxiety,

depression, emptiness) when offline; an increasing tolerance to the effects of being online and denial of the problematic behaviors. Such a perspective characterizes Internet addiction as behavioral and similar in character to other impulse control disorders. Those who meet the criteria are thought to experience social, psychological, and occupational impairment. However, research by Caplan [4] suggested that the addiction framework suffers from three limitations: (1) it lacks conceptual or theoretical specificity; (2) there is a paucity of empirical research within the addiction paradigm and (3) it fails to account for what people are actually doing online.

In the context of child pornography, Quayle and Taylor [5] examined the explicit role that the content of the material may play in problematic Internet use. Like Caplan [4] the authors believed that terms, such as excessive, problematic, or maladaptive Internet use, may be more useful that those expressed within the addiction framework. What is also acknowledged in this model is that the escalation of Internet use may be a function not only of the material, but also of the unique role that the Internet may play in meeting other emotional needs. Davis [6] talked about problematic Internet use as being a distinct pattern of Internet related cognitions and behaviors that result in negative life outcomes, and that such use may be specific or generalized. Using the Internet to meet sexual needs is clearly specific, but there are many aspects of generalized problematic Internet use that are of relevance to the offender population. Generalized problematic Internet use is conceptualized as a multidimensional overuse of the Internet itself, which is not limited to any specific content. Caplan [4] suggested that “they are drawn to the experience of being online, in and of itself, and demonstrate a preference for virtual, rather than face-to-face, communication”.

Examples of generalized problematic Internet use cognitions would include obsessive thoughts about the Internet, diminished impulse control in online activities, guilt about online use, and experiencing more positive feelings about oneself when online as compared with when offline. Caplan [4] designed and piloted a new instrument to operationalize the theoretical construct of generalized problematic Internet use. Of interest to us in relation to Caplan’s study are the seven sub-dimensions that emerged from a factor analysis of their results. These included: mood alteration; perceived social benefits available online; negative outcomes associated with Internet use; compulsive Internet use; excessive amounts of time spent online; withdrawal symptoms when away from the Internet and perceived social control available online. These factors closely corresponded to the findings of Quayle and Taylor [5] in relation to the psychological functions of child pornography, and may suggest that, for this particular population, it is difficult to differentiate between the effects associated with interaction with the Internet and the function of the material itself.

The Internet is a social environment and there are acquaintances, but also a large number of unknown people. Most importantly, the children would be informed about risks and dangers that come with using of the Internet and their parents have to be available to talk about that topic.

II INTERNET ABUSE

The internet has revolutionized many aspects of human behavior, including the way individuals communicate and interact with one another. While it could be argued that the online environment is just another public space, reflecting the behavior of its users with both positive and negative aspects of human behavior manifested online, some evidence suggests that individuals may show different behavior and personas online compared to direct communication situations (i.e., “offline”). Such “disinhibition” may be particularly relevant when considered in the context of online grooming of children and young people. Internet crimes against young people regularly dominate the press and cause anxiety among parents, law enforcement, educators, and other child protection experts [7]. Therefore, it is important to develop our understanding of online grooming and the key characteristics involved in this type of crime, both in terms of perpetrators and victims.

The victimization of young people through sexual abuse was a fundamental focus of study for several decades prior to the existence of the internet [8], and grooming is now universally understood as a technique to help turn a sex offender's fantasy into reality, whether online or offline. The term “grooming” was first included in UK legislation as part of Section 15 of the Sexual Offences Act (SOA) 2003 [9], which was applied throughout England and Wales in May, 2004. The inclusion of the term was seen as progressive, since it enabled the criminalization of preparatory acts potentially leading to the sexual abuse of children [9]. However, the SOA 2003 fails to clearly define sexual grooming and, for example, fails to allow for one person grooming a child for

another to then sexually abuse [10]. Following a review of the literature, Craven, Brown, and Gilchrist [11] proposed the following definition: “A process by which a person prepares a child, significant adults and the environment for the abuse of this child. Specific goals include gaining access to the child, gaining the child's compliance and maintaining the child's secrecy to avoid disclosure. This process serves to strengthen the offender's abusive pattern, as it may be used as a means of justifying or denying their actions.”. This definition may apply to a real world setting, or that which occurs online. The behavior and the purpose of grooming behavior remain consistent across environments, despite potential variation in specific grooming techniques.

The main problem is in parents because they are not aware of the problems and dangers that are found on the Internet. Because of uninformed parents children easily become lightweight victims and offenders if they are exchanging illegal content. The group of abuse and violence on the Internet contains Web content with inappropriate information and sharing of illegal material (a milder form: music, film, heavier: pornography, pedophilia, and communication with the aim of exploitation, harassment and abuse). The right to freedom of opinion allows the existence of Web-Portal with incorrect content. Web-portals with illegal content are functioning illegally (but public) and offer different forms of abuse (sectarian, Nazi, pornographic and similar facilities). Parents have no choice except to get used to the existence of such types of content, since the laws have no effect in the prevention of this kind of abuse, the rights to freedom of opinion and speech. No one visitor is forced to use illegal content, but he decides by himself, which automatically removes the responsibility of the authors of these Web portals.

A. Chat

Children are not able to know with whom to communicate via chat. In their ignorance and desire for companionship and making new friends with other children easily reveal personal information and become lightweight victims. Through this communication the attackers are able to learn all about his victim and start to interest, over what the victim likes and dislikes to the relationships within the family. The most common victims are children who grow up in dysfunctional families because they are not getting enough parental attention. Children at the age of 12 to 17 years are the most common target for attackers.

B. Virtual girl

A virtual girl spent a total of eighty hours a month in Internet chat rooms. Without any emphasis on its own personality, and without showing the pictures, she has managed to achieve over 412 contacts (not on its own initiative) with 398 males. What belongs to the sexual harassment occurred 162 times, 24 times was subjected to sexual fantasies, and six times it was openly offered money for sexual services [12].

On Figure 1 [12] we can see the example of searching in chat room with virtual girl. Cases like this clearly directed towards the trafficking chain. Individual measures must be applied because it is the only way to save your child or his partner or friend.

Figure 1. For eighty hours in chat rooms, 14 years old virtual girl got 162 times sexual harassment, and invited to lewd acts

C. Human trafficking

Trafficking in human beings in modern times widespread and is in first place among the abuses of the Internet. The so-called trafficking skillfully infiltrated in all sphere of society and found a way to abuse the great opportunities of the Internet. Under the mask of good and well-paid business offers and opportunities to travel to various countries of Europe and the world there are people who are looking for victims. Mostly victims of this crime are children at the age of 12 to 22 years and usually come from dysfunctional and poor families. Deprived of all rights and documents, money and freedoms of victims of trafficking become slaves who were forced into prostitution and hard labor.

D. Illegal trade

A large number of criminal organizations deals with sale and purchase of prohibited items such as medicines, all kinds of drugs, weapons, etc. Under the mask easy and quick profits of such groups exist on the Internet and can easily become a member. The problem starts after you have finished a first job or when a member wants to leave the organization. Then, there is blackmail, threats, and applying of a force in order to further continuation of the work. Many children are attracted of beautiful stories, but at the same time false, stories about the high earnings and they

become easy victims of these criminal groups. The epilogue of this story is that these children quickly end up in prisons or correctional institutions for a longer or shorter time.

E. Violence between same age

This type of abuse of the Internet include: incitement of group hatred, harassment, monitoring, insults, threats etc. The most common forms of communication through which they perform this type of violence must possess sound, animation, photography and using this perpetrator are hidden and he is able to repeat the same attack, or perhaps on a new victim.

F. Facing with problems

As we have noted in the above cases the victims are children who willingly, but unaware of the consequences, put themselves in danger and the possible fatal outcome. Because of the freedom of the media can't be set more aggressive system that would provide greater protection for children on the Internet. Due to the fact that the law is powerless in some cases abuse the Internet parents must be prepared to react calmly, deliberately and without any hasty conclusions. In order to prevent misuse of the Internet primarily parents need to introduce their child.

III IT IS VERY IMPORTANT TO ACHIEVE MUTUAL TRUST

Parents need to take care of their children regardless of whether if they are on the computer or play football. Therefore they should know what their children are doing, what they like to do, they should to criticize them or give the support. So be careful with children, without excessive strictness and weight, as this can lead only to the extent that the children will deliberately try to hide their activities from parents. The Internet would not prohibit, but it would be an excellent source of useful and exciting information. If you use the Internet, it will be easier to talk about it with children. Children are curious, exploring, try everything and thus make mistakes. A child may be talented in technology but has no experience of parents and it is often crucial in these situations.

- We should all use a computer. If your PC is in a room where a whole family is, thus more people will use it and you'll have a better view on the situation what your child is doing on the Internet.
- Conversation is the key. Keep a dialogue with children about having fun on and off the internet as well as the dangers and unpleasant situations that may arise.
- Learn more about computers and the Internet. As more as you learn about computers and the Internet, it will be easier to help your child and to make the line between bad and good content.
- Spend time online together with your child. During this time, find some interesting content tailored for children, useful information related to school, sport etc. Adjusted favorite pages as a bookmark in the browser so the next time it will be enough a few clicks.
- Children should be given time to use the Internet. Children do not have to spend all day at the computer, not only for safety but also because of health. Therefore, determine a time when children can access web content and web addresses they can visit. In talking to children may be adopted a common solution.
- Establishment of passwords. Passwords should be created as a set of characters that people find it difficult to guess. Using letters and numbers will create a secure password. Never create passwords that friends can easily detectable (names, dates of birth, etc.).
- Anti-virus and filtering software. These programs allow you to restrict access to Internet sites with unwanted content (pornography, violence, etc.). You need to check the history pages often, sent and received e-mails etc. Because it is easy to remove [13].

What to do if you suspect that your child follows the suspicious content on the Internet?

- There should be a peaceful solution through dialogue to reach a situation in order to build a normal relationship between parents and children that will be useful in the future.
- Prove to child that this was not his fault, simply a common thing on the Internet.
- It is not bad to delete browsing history pages in the web browser, delete cookies and install an antivirus program.
- Emphasize your child not to open emails from unknown people, talk to him about some of the similar experiences of others etc.

Children's rights must be protected. Make use of laws relating to the Internet and contact the person responsible for the content that is placed on the site

A. It is important to remember

On the Internet are the same laws apply as in the real world. It is not allowed to insult or harass someone, violate someone's reputation etc. If this occurs, further proceedings may be transferred to the judicial process, penalties, damages and other sanctions. At the beginning you can call the police. So things should be taken seriously because anonymous users also can be detected. Children may not understand the seriousness of the situation and they are not aware that only a few clicks can change lives.

IV LEAVING DATA ON THE INTERNET

Each of us was in a situation on web sites where you need to leave your information. It may be in some Internet shopping, contests or to participate in the forums and discussions. Different organizations may collect information from children, but they should do this in a lawful manner or with the approval of parents. Data protection act provides storage of personal data, although many Web administrators do not respect law. Children should be advised to be very cautious and careful when leaving their personal information

- There should be agreed with the children. Do not allow children to leave the data on unverified sites.
- Check guarantees of privacy data and for what purpose will the same be used.
- Leave the only required data. In most cases it is sufficient to leave only the required information [14].
- Do not store personal information to Web browsers and similar programs. It is not advisable to record data and passwords on sites that are connected to the Internet [14].
- Do not trust too many in social networks**.** Do not leave too much information on social networks because it is so easy to become prey for anyone looking for "victims" over the Internet.

V CONCLUSION

Children must be aware of the threats on the Internet. Parents have to act before the sight of any danger and informed their children about these threats. It does not matter where kids are, the danger of the Internet is always there. In our country there are different organizations and sects involved in trafficking of children. These organizations use the current situation of economic crisis that is present in our country and because of that they can find victims by offering "good" jobs, good wages and a better life.

Social networks such as Facebook, MySpace etc. are major threats. Still in elementary school children are beginning to make a private profiles and become members of these networks not knowing how the other side has a fake profile with which people are lurking and waiting for what they are interested. However, the best protection is to rely on common sense. Organizing lectures and counseling on this topic could be of great benefit for both, children and parents. Children may not understand the seriousness of the situation and they are not aware that only a few clicks can change lives.

REFERENCES

[1] Weiser, E. B. (2001). The functions of Internet use and their social and psychological consequences. CyberPsychology and Behavior, 4(6), 723–743.

[2] Castells, M. (1997). The information age: Economy, society and culture. Vol II. The power of identity. Oxford7 Blackwell Publishe

[3] Kandell, J. J. (1998). Internet addiction on campus: The vulnerability of college students. CyberPsychology and Behavior, 1, 11 – 17.

[4] Caplan, S. E. (2002). Problematic Internet use and psychosocial well-being: Development of a theory-based cognitive-behavioral measurement instrument. Computers in Human Behavior, 18, 553–575.

[5] Quayle, E., & Taylor, M. (2003). Model of problematic Internet use in people with a sexual interest in children. CyberPsychology and Behavior, 6(1), 93– 106.

[6] Davis, R. A. (2001). A cognitive-behavioral model of pathological Internet use. Computers in Human Behavior, 17, 187– 195.

[7] Mitchell, K. J., Jones, L. M., Finkelhor, D., & Wolak, J. (2011). Internet-facilitated commercial sexual exploitation of children: Findings from a nationally representative sample of law enforcement agencies in the United States. Sexual Abuse: A Journal of Research and Treatment, 23, 43–71.

[8] Mitchell, K. J., Finkelhor, D., & Wolak, J. (2005). The internet and family and acquaintance sexual abuse. Child Maltreatment, 10, 49–60.

[9] McAlinden, A. (2006). 'Setting 'em up': Personal, familial and institutional grooming in the sexual abuse of children. Social and Legal Studies, 15, 339–362.

[10] Craven, S., Brown, S., & Gilchrist, E. (2007). Current responses to sexual grooming: Implication for prevention. The Howard Journal, 46, 60–71.

[11] Craven, S., Brown, S., & Gilchrist, E. (2006). Sexual grooming of children: Review of literature and theoretical considerations. Journal of Sexual Aggression, 12, 287–299.

[12] ES "Rudjer Boskovic",. 2003, educational system, "Abuse of the Internet - Predators on children", pages 2-20.

[13] "Security and protection on the Internet", Dr Dubravko Ćulibrk, www.dubravkoculibrk.org.

[14] www.microsoftsrb.rs, Access Time: April 2012.

CONTEXTUAL CONDITIONS OF LEARNING AND TEACHING IN EARLY CHILDHOOD

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Abstract - This paper represents the analysis of personal theory of preschool teacher on the importance of the context of kindergarten in the construction and understanding of learning and teaching of preschool children. Subjective professional concepts of preschool teacher as the representative of institutional context of educational process were observed by the model of qualitative interview. The answers of preschool teachers were classified in the system of categories, whereas their connection was defined with X^2 independence test. The results of X^2 teste were obtained according to the analysis of the relations of the systems of categories at the sample of 35 preschool teachers. The results showed there was significant correlation of the answers to the set of questions typical for the observation of the context and implicit pedagogy of preschool teachers at the significance level p= 0,01. The interpretation of the results leads us to the conclusion that preschool teachers do not use context as means of restructuring of learning and teaching sequences. Therefore, they do not use developmental potentials of the context as the resource in the building of knowledge structures of children at an early age.

I INTRODUCTION

Definition, structuring, redefinition and restructuring of working and educational conditions represent common concepts in the contemporary discourse of our society. The quality of learning and teaching from an early childhood should try to keep the pace with vast number of information which is multiplied extremely fast. (Parrot, 2002). Therefore, we have to find out the preconditions of efficient and effective educational process at the first level of educational system, in kindergarten, as well as to try to keep educational system up to date with progressive technical, technological and informational development in the 21st century. The greatest variance of this answer could be attributed to professional competencies of preschool teachers, although recent theories and reserch on learning (Barth, 2004., Kovač 1998., Pešić, 1998., Krnjaja 2008., Slunjski, 2006.) claim that learning and teaching are conditioned by the context. Therefore, the aim of this paper was to investigate preschool teachers' understanding of elements and efficency of the teaching process, as well as the understanding of institutional context of kindergarten as developmental potential for learning and teaching. Context as a set of circumstances in social and physical environment represents meaningful entirety of facts and events, which has particular meaning. Meaningful entirety is made by constant connection, mutual conditioning and interaction of elements which form particular meanings. The meaning is created and being changed in the process of interaction of all components. Therefore, each context is unique. This paper is based upon institutional context, as a micro context, which is defined by the structure and the means of space management, time management, relationships among children and the adults, openess of kindergarten to children's needs and to local community. If institutional context of kindergarten is defined in this way, then individual participants in specific environment, with their own needs and conditions to which they are exposed, represent its components. Therefore, institutional context of kindergarten is represented as an educational frame where specific meanings, which child structures as an educational sequence in cognitive, motor and social status, are constructed. Thus, context must be seen as a process, whereas teaching and learning of preschool children represent the construction of meaning.

II METHOD

The sample included 35 preschool teachers who work in kindergarten „Pčelica" in Sremska Mitrovica. Individual, qualitative interview was used in the investigation of preschool teachers' understanding of relationship between learning and teaching. Four questions were used as a frame for the interview: 1. What is the relationship between learning and teaching in your opinion? 2.

What is „good method“ of teaching in your opinion? 3. What does represent difficulty to you in the choice of particular teaching method? 4. What does learning and teaching context mean to you? Two researchers interviewed preschool teachers, the author of the paper and doctor of pedagogy. The interview was noted and recorded. The answers of preschool teachers obtained during the qualitative interview were classified in the system of categories, which was structured after the realization of the interview. Descriptive statistical methods of frequency distribution, central tendency measurements and causal non-parametric procedure X^2 test were used for the analysis of the results.

III RESULTS AND DISCSSION

The results of qualitative interview obtained at the question 1. What is the relationship between learning and teaching in your opinion? show that the greatest number of preschool teachers' answers (39,14%) is related to understanding of the learning and teaching as separate processes, which can be accepted from the point of view which regards learning as internal process, and teaching as creation of external conditions. If frequencies of answers (Table 1) are compared, it can be noticed that interpretation which considers learning as an active, and teaching as a passvie process has highest frequency (9). The second difference which can be noticed in this category refers to the definition of difeerent areas of learning and teaching, whereas learning is associated with play and building of knowledge, and teaching is associated with giving information, problem solving, habits and skills development.

TABLE I. WHAT IS THE RELATIONSHIP BETWEEN LEARNING AND TEACHING IN PRECHOOL TEACHERS' OPINION?

categories	**preschool teachers' answers**	*f*	Σ *f*	*%*
A)they interpret learning and teaching as identical processes	there is no difference, they are the same	5	5	12,11
B) they interpret learning and teaching as interactive processes which complement each other	-they are dependant on each other, they complement each other -everyone learns through his or her own activity, -preschool teacher ensures conditions and encourages learning	6 2	8	19,51
C)they interpret learning and teaching as processes which are linked in some way	-teaching guides learning -learning is process and inborn need, whereas teaching preceeds learning and it is shorter -learning is basis and teaching is superstructure	6 4 2	12	29,22
D)they interpret them as separate processes	-learnig is active, and teaching is passive process -teaching leads to problem solution, whereas learning is connected with play -learning is active process, whereas teaching represents giving information	9 3 4	16	39,14

Eight preschool teachers of 35 preschool teachers who were interviewed (19,51%) interpret the relationship of learning and teaching as interactive relationship in which these processes complement each other. The answers which describe this interactive relationship as "complementary", "mutualy depending", "the one which creates conditions, encourages", are the most frequent. These descriptions can become basis for understanding of complementary nature of learning and teaching. Five preschool teachers equal learning with teaching and interpret them as idetnical processes. Teaching is understood and programmed as applied learning psychology, whereas practical implications which overcome frames of learning knowledge were not taken into consideration. The second implication of regarding learning and teaching as identical process can be neglection of psychological rules of learning whereas whole attention is paid to teaching solely.

Another important characteristic of relationship between learning and teaching can be functionality of teaching method for maintaining of certain quality of learning. In their interpretation of „good method", preschool teachers had several statements. Their frequency is presented in Table 2. The greatest percent of answers (46,15%) refers to the relationship between „good method" and enabling of quality of learning. The analysis of individual answers shows that preschool teachers use several dimensions in their interpretation of „good method", such as "independence, encouraging of inner motivation, interest,

creativity, active realtionship of children in learning process, getting experience“. These dimensions represent preschool teachers' assumptions on quality learning, which shows that significant number of preschool teachers is aware of it, but it could also explain their definition of good method which is based upon the quality of learning. From the point of view of practitioners they describe “good method“ according to their understanding of quality learning. However, there is a dilemma why preschool teachers do not take the aspect of creation of conditions needed for quality learning into account while considering “good method“.

TABLE II. WHAT IS *“GOOD METHOD“ IN PRESCHOOL TEACHERS' OPINION?*

categories	preschool teachers' answers	*f*	$\sum f$	*%*
1) it ensures learning achievement	-it ensures good results -it makes knowledge acqusition easier	3 7	10	25,64
2) it ensures the quality of learning process	-it makes children interested for the activity -it enables children to take active part -it enables children to show their creativity -it satisfies children's needs -it enables children to develop individual traits in the activity -it enables children to experiment -it enables children to get new experience -it ensures good communication with children -it offers choices -it encourages childrens' inner motivation	6 4 1 1 1 1 1 1 1 1	18	46,15
3) method which is good in itself	- play -it enables understanding of a content -it is suitable for particular area -it unites all elements of the method -it represents combination of different methods	4 4 1 1 1	11	28,36

Lower percent of answers (28,36%) refers to interpretation of the method as “*good*“ in itself. In their interpretations preschool teachers mention play as the most common means of learning in preschool period. Other answers express connection between “good method“ and learning content or they associate it with combination of several different methods.

More than 25% of the answers referred to comprehension of “good method“ as the means of ensuring learning achievement. Even if we do not take the type of achievement into consideration, the importance which preschool teachers assign to achievement can have its basis in comprehension of learning as a process of production where “the product“ has the greatest value, whereas “the means of production“ are not important at all.

Environment has the highest frequency (41) in definition of difficulties in the choice of teaching method (Table 3). The lack of materials has the highest frequency (40) in individual comparison of parametres in categories. In additional questions preschool teachers confirmed that commonly used expression “unequipped environment“ includes the lack of “furniture“, as well as the lack of materials, so that they can be analyzed together. Preschool teachers tend to say there is “a lack of materials and equipment“ when they express their attitude on working environment. These answers could lead us to the conclusion that preschool teachers define equipment and materials as significant “in themselves“, and not in the relation to their purpose in stimulating different ways of interaction and different types of children's learning activities. According to these answers the following question could be asked: In what extent does the lack of equipment and materials represent technical problem in teaching or the problem of preschool teachers' reflection about the learning process?

Preschool teachers' answers considering the lack of materials could also show that they believe that only certain materials can help them achieve particular learning goal. Therefore, they associate the lack of materials nad equipment with the lack of learning possibilities, which prevents them from looking for different learning solutions.

TABLE III. WHAT DOES MAKE DIFFICULTIES TO PRESCHOOL TEAACHER IN THE CHOICE OF LEARNING AND TEACHING METHOD

categories	preschool teachers' answers	*f*	$\sum f$	%
1)space,equipment, materials	-the lack of working materials -working environment is not well equiped - inadequate working environment	19 14 8	41	33,06
2)the number of children	-large number of children in the group	24	24	19,35
3)children's interests and needs	-different developmental level of children within a group -children of different age within the same group -different interests of children -making a child interested for activity -the lack of motivation -children whose behaviour is inappropriate -children's mood and health -constant recognition of children's needs -a child with special needs -the level of children's previous knowledge -there is no feedback	7 6 6 4 3 3 3 2 3 2 1	40	32,20
4) cooperation	-the lack of cooperation between preschool teachers and parents -environment -child's unwillingness to cooperate -theory does not keep pace with practice -mutual planning	6 5 2 1 1	15	12,10
5) there are no difficulties	there are no difficulties	4	4	3,22

Large number of children within a group occurs in 19,35% as an obstacle in the choice of teaching method. Preschool teachers' answers do not give us sufficient information on particular dificulties associated with the number of children, such as social environment organization, time and space menagement. The answers "child shoud be interested in the activity", "the lack of children's motivation", "children whose behaviour is inappropriate" could lead us to the conclusion that preschool teachers observe children's learning only from the standing point of teaching. Teaching position is illustrated with words "child should be more interested, the lack of motivation, inappropriate behaviour" which illustrate preschool teachers failure to make children more interested and motivated for particular activities. Therefore we can conclude that possible solutions should include reconsideration of preschool teachers' notions on interests and motivation of children in learning process. 21,14% of difficulties were associated with number of children in the group in preschool teachers' definition of difficulties in the choice of teaching method. Additional statements were "we cannot hear what each child has to say","we cannot pay more attention to children who did not comprehend well","we cannot deal with observation, and we are asked to do that for each child", "there are no enough chairs for all children", "we cannot present everything that children did, there is no enough space". These answers show that preschool teachers interpret the number of children in relation to environment such as play room and that they think that it is not suitable.

As far as the fourth question (What does learning and teaching context mean to you?) was considered, preschool teachers gave answers which were similar to the answers to the third question. Therefore, it was not difficult to classify parametres of the fourth question since they were almost identical with the parametres related to the previous question.

TABLE IV. WHAT DOES THE CONTEXTOF LEARNING AND TEACHING MEAN TO YOU

CATEGORIES	PRESHOOL TEACHERS' ANSWERS	*f*	$\sum f$	%
1) space, equipment, materials	- Kinderagarten and its surrounding - working materials - well-equiped working environment	18 10 5	33	40,74
4) cooperation	-cooperation between preschool teacher and parents -environment , local environment	17 10	27	33,33
3) children's interests and needs	-different developmental level of children within a group -children of diffferent age within the same group	10 3	13	16,05
2) the number of children	-the number of children in a group	8	8	9,87

Statisticaly significant correlation of the answers, i.e. systems of categories of the third and the fourth questions was defined by X^2 independence test. The results of X^2 independence test presented in Table 5 show statistical significance at the level 0,01, which leads us to the conclusion that preschool teachers' answers are almost identical when problems of teaching and learning methods and definition of conditions in which these processes take part, i..e. definition of institutional context, are discussed. Therefore, we can conclude that capacities of context for redefinition of learning and teaching conditions in kindergarten are not paid enough attention in initial education.

TABLE V. RESULTS OF X^2 INDEPENEDENCE TEST

Number of degrees of freedom	12
X^2 value	25,47 п=0,01
Contingency coefficient	0,251

IV CONSCULSION

The relation between "implicit theory on education" (Pešić, 1987) and preschool teacher's practice work is specific and difficult to investigate for other researchers. Preschool teachers analyze their implicit notions using reflexion and reconsideration. Thus, they make it available for self control and change, because "the wholeness of the unconscious cannot be raised to the level of the conscious if it is not changed" (Konig, Zedler, 2001). Institutional context, micro context with its elements such as: environment, time menagement, materials, social environment (cooperative learning, mutual teaching) concepts of those who teach, represents reverse process, insufficiently used resource in knowledge building in early childhood. Pilot investigation in this paper undoubtedly confirms the fact that preschool teachers do not have sufficient knowledge about developmental potentials of micro context as an area for (re)structuringof learning and teaching sequencies, as well as about the role of the context in creation of knowledge structures of children in early childhood.

REFERENCES

[1] Barth, M., Razumjeti sto djeca razumiju, Zagreb: Educa, 2004
[2] Dosen-Dobut,A., Malo dijete-veliki istrazivac, Zagreb: Educa, 2005
[3] Dryden,G.,Vos,J., Revolucija u ucenju, Zagreb: Educa, 2000
[4] Kognitivni razvoj deteta, Zbornik radova, Beograd: Savez drustva psihologa Srbije, 1983
[5] Kovac - Cerovic,T, Kako znati bolje, Beograd: Institut za psihologiju, 1998
[6] Mattes, W. Nastavne metode, Zagreb, Ljevak, 2007
[7] Pesic M., Vrednovanje predskolskih vaspitnih programa, Beograd: Zavod za udzbenike i nastavna sredstva, 1987
[8] Pesic, M, Pedagogija u akciji, Beograd: IPA, 1998
[9] Sljunjski, E., Stvaranje predškolskog kurikuluma, Zagreb: Mali profesor, 2006
[10] Terhart, E, Metode ucenja i poucavanja, Zagreb: Educa, 2001
[11] Krnjaja Z, Miskeljin, L., Od ucenja ka poducavanju, Lacarak, AM Graphic, 2006
[12] Krnjaja Z, Mijailovic, G, Savicevic, D, Unapredjivanje nastavnog procesa obrazovanja vaspitaca, Beograd: Nastava i vaspitanje, vol 4-5, 2004
[13] Krnjaja Z Krnjaja, Ž., Ucenje i poducavanje kao zajednicko razumevanje, Beograd: Nastava i vaspitanje, vol 4-5, 2008
[14] Parrot J, Nove uloge, novi ciljevi: promisljanje obrazovne prakse, Thinking Classroom, vol. 3 No 3 2002. str.32
[15] Konig, E., Zedler, P., Teorije znanosti o odgoju, Zagreb: Educa, 2001

THE STRATEGY FOR IMPROVING CULTURAL VALUES OF THE YOUNG BY MEANS OF EDUCATIONAL SOFTWARE

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Abstract – This paper presents a modern approach to the strategy for improving cultural values of the young by means of educational software. The software which is the result of the analysis of National strategy for young people is described here. This software is designed by the students of Technical faculty »Mihajlo Pupin« in Zrenjanin, it is created for this type of work with young people and covers the field of gender equality.

I INFORMATIZATION OF EDUCATION

Informatization of education is a term frequently used in pedagogy and it also represents the process which requests a synchronized institutional activity of all levels of management within educational system. Within National strategy for the young (we'll use Strategy in the text) in Republic of Serbia which was adopted by the Government in 2008 [1] young people were recognized as active participants of the society and their education was postulated as the state's priority. In the same document the stress was put on the necessity of developing mechanisms in the society for increasing the level of information literacy of the young. Information literacy assumes the basic knowledge in computer work and the ability for using aplications. The strategy's imperative represents the integration of Serbian educational system in European educational system.

In all countries, especially in developing countries, such as Serbia, the education and training of manpower is considered a cultural, social, economic and political development strategy. Economically, the education and training of manpower is considered a long - term strategy whose benefits have always been significant. Education plays several roles: first it prepares and trains skilled workers at all levels to manage capital, technology, services and administration in every sector of the economy. The education and training of manpower, on the one hand, is the most important means for development, on the other hand, it provides the substructure of all including development goals. Therefore, today, the role and importance of education of human resources is emphasized as a means to increase and hasten the speed of economic development.

International examinations [2] have shown insufficient quality of educational achievements of students in Republic of Serbia as well as their tendency to reproduction and not to research and problem solving. As a result, it is necessary to make formal changes in teaching programs and in methodic approach to teaching. Frontal work and traditional approach cannot respond to fast and multimedia requirements of students' perception in current social and civilization moment.

Introducing computers in teaching process can overcome these difficulties in communication and influence, in great deal, students' motivation and maintaining their attention. Combination of good and irreplaceable features of traditional teaching and modern methodic design of teaching activities (and free activities, too) represents a complex process which requires exceptionally great involvement of all management structures in educational process. Apart from its educational function school participates in upbringing of young people and modern social tendencies impose themes such as ecological consciousness, interculturalism, tolerance and sustainable development. Specific goals of the Strategy are: building the system of informing young people at all levels and in all fields, increasing the level of information literacy, making relevant information available, making and developing information programs for the young, reducing prejudice towards different social groups, systematic monitoring of problems, needs and attitudes of young people, increasing the number of young people who participate in different kinds of formal and informal education, improving living conditions and developing safety culture among young people.

II "COMPUTER CONSCIOUSNESS" OF YOUNG PEOPLE

The beginning of XXI century was certainly marked by exponential rise in computer using in all segments of computer action. Children, from their early age, are faced with digital devices and their upbringing goes along with them. Mobile phones, Internet communication, various types of electronic entertainment, availability of information are all parts of young people's lives. If the teaching process does not include these modern phenomena, it is strange and uninteresting to the young so it cannot give good effects. Consciousness shaping is directed towards multimedia perception, globalization and permanent search for the new. Schools still do not recognize these activities, they do not use valuable resources of Information technologies. Using computers in free time is completely without any control and it makes negative effects. Young people acquire new knowledge and experience mainly individually and diffusely. It is necessary to integrate all resources in educational system aiming at setting computers in the function of building a positive system of values among the young. Such integrated action should respond to real needs in the society: respect of human rights, interculturalism, equality, high level of health, ecological consciousness.

III EDUCATIONAL COMPUTER SOFTWARE AS MEANS OF COMMUNICATION

It has been already proved that introducing computers in educational system has positive effects on children and that it increases the level of their motivation. However, the main requirement of educational technology is that computers are used properly, in other words, proper organization and methodology in relation to computer usage are necessary as well as appropriate didactic material (software). This software is called educational computer software.

Evidence whose validity has been proved by numerous scientific researches related to using computers in education show that a computer is the only means which can contribute to visualization and simulation of natural processes. Apart from technical possibilities, very strong evidence represents a high level of motivation which a computer itself achieves concerning young people. [3] When we say "computer" we think of educational software which is designed and licensed to be used in education. Criteria for designing educational software are nowadays defined differently in different countries and there are differences in methodology of their design. Evaluation aspects of software are also different, going from format, technical, educational and summarized. Each of them is equally important and it influences the final quality of software.

Teaching, as a form of human affair which deals with education and upbringing of young generations, is a complex communication process that influences directly the development of a society. The communication process in information includes teachers, students and contents which are being exchanged, as well as communication channels or media or even wider – educational technology. They are the elements of so far mentioned didactic square. Communication in education contains two crucial components: (1) information-knowledgeable component and (2) socially-emotional component. Students have certain information needs from both fields, they accept and interpret both information categories, react on them and forward these information.

Communication channels are similar to sensor acceptance of messages (visual, audio, tactile, etc.), types of messages (linguistic/verbal and non-verbal communication) and media for their transmission which may be natural (exs. voice, facial expression, etc.) and technical – in this concrete situation, computer one.

Computers are now only means capable to provide complexity of communication channels and to affect the formation of attitudes, belifs and models of behaviour.

Educational computer software combine verbal/notion and audio/visual information and in this way they enable:

- interactive learning, current correction of errors and determination of acquired knowledge and skills;
- help in creativity and development of other skills for problem solving such as determinatioin, persistence and step by step method;
- individualization and differentiation of work;
- emotional influence which directly affects the building of attitudes and consciousness formation.

Communication is performed by means of sending and receiving messages. A teacher sends information and receives them from students and a

student/attendant is not only a receiver but he is a sender, too. Feedback information show how the sent information is accepted and interpreted by a receiver/student. Feedback information are very important because they enable control of the process of exchanging messages and the interaction among the students. The basic principle of communication in education is that a sender should adopt the message to a receiver. Processing of receiver's message can be the following:

- perceptive – makes conditional which information a student accepts by various sensor channels and the way he does it (attracting attention, aesthetics, contents reader-friendliness, etc.);
- cognitive – determines in what extent are presented information comprehensive to students;
- emotional – affects the student's emotions in relation to accepted information;
- associative – it is related to free associations that can appear in connection to certain information

In teaching communication the notions of authoritarian and democratic communication are very important as well as the notion of communication atmosphere/climate. **Authoritarian communication** is based on using superior position, power or influence of a teacher/instructor who decides what contents the students should learn and the method they should use. **Democratic communication** is characterized by respecting individuality, interests and independence of students, the possibility of mutual influence, adjustment of teachers/instructors to the needs and wishes of students, equality, development of democratic culture in mutual relations, encouraging students to express their opinions, suggestions as well as listening and respecting the others. **Communication climate** represents a general atmosphere in which communication is performed during educational process and it may vary on account of experience and the extent of freedom in relation to openness, sincerity and free expression of ideas, mutual relationship, the level of cooperation, accepting the others within a group, etc.

Starting from the very nature of the teaching process and the fact that one more crucial element is involved in didactic square – a computer, which is often classified in educational technology by many authors and sometimes identified with tutors or instructors, we are approaching a new didactic potential. Development of educational computer software points at the conclusion that maximum effects of applying computers are achieved in individual work. Therefore, development of educational computer software is mainly oriented towards individual interaction appropriate to knowledge, capabilities and tempo of individuals. For all these reasons different methodic solutions have been worked out which enable the use of program packages adjusted to personal features and wishes of students. These program packages provide students with a possibility to master educational content in their own tempo and with maximum effects.

Designing such software and respecting this methodic paradigm show that these program packages are efficient in the process of self-education.

These strategies have been made according to the world trends. Serious limitations in relation to limited time and financial means in schools as well as Informatics' struggle with other priorities have been considered. This model is for sure burdened with numerous problems because it is really reformistic in comparison to the previous models in all fields. It requires teacher training, innovations within curriculum, testing in classrooms, development of web site, making guide books and more challenges as well.

IV THE EXAMPLE OF EDUCATIONAL SOFTWARE WITH CULTURAL CONTENT: EQUALITY OF GENDER

As an illustration of this theme the final-year-students from Technical faculty »Mihajlo Pupin« in Zrenjanin, Teacher of Informatics Department, designed educational software whose purpose was not strictly linked to teaching programs but it represents an additional educative means directed towards shaping positive social consciousness of the young in accordance to directions determined in the Strategy for the young. The selected theme is Equality of gender.

The concept Gender equality is one of necessary conditions for achieving a balanced participation of men and women in decision making processes which can lead towards positive results in the whole society. It is also one of the most efficient ways for making political strategies, decisions and solutions which will improve the life

of all population within a country and permanently represented their interests and needs.[2]

Building correct attitude towards this issue begins in the early childhood, in the family. However, in school age children form a priority attitude related to this issue.

The proof for actuality of this theme is the project of Institution for Gender Equality which has made the project "Gender Equality" and incorporated it in school plans and programs aiming at studying the current plans and programs in order to determine the way men and women are presented in them. Another goal is to find out if there is any disparity between boys and girls concerning possibilities for education and the available options [3].

The software is designed for primary school pupils from 5th to 8th form. It may be used as an additional means in the subject Civil Education. The content of the software "Gender Equality" was designed on the grounds of National Strategy for the young. The guidelines for theoretic part of the software were taken from National Office for Employment, Subotica.

Figure 1. Intro screen

The structure of the software was designed to cover the following fields: Gender equality, Stereotypes, Prejudices and Discrimination. The program Macromedia Director MX was chosen for designing the software. Within this software there is an exercise which pupils should do and discuss the conclusions. At the end, there is a test for checking the acquired knowledge. The test is based on the lessons from the software.

The software is easy to use, it is multimedia, intuitive, easily navigated by the menu which also serves as the front page. It is adopted to a user in technical sense, fulfills hardware and software requirements (resolution of 800x600 (24bit) is the only requirement) so it does not cause any problems concerning the program work.

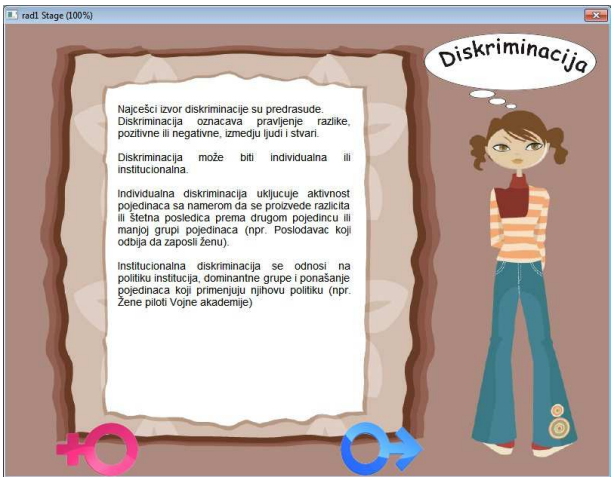

Figure 2.

The following steps are taken in order to make the work for the pupils from 5th to 8th form easier:

- The whole software is designed in order to motivate pupils –there are lots of pictures.
- Communication student-computer is performed through «mouse».
- Students can go back whenever they want to to repeat the lesson or they can go ahead to the next lesson.

By double click of the left button on the mouse the software is started and the introductory screen of „Gender equality" is opened.

Lesson selection is done by clicking the title.

After selecting the lesson the process of screen changing begins within the lesson and going to the next lesson is done by hand (by clicking buttons).

Moving backward – one or more steps - is enabled as well.

Last but not least, the role of a teacher is still irreplaceable as well as the work with didactic material.

Figure 3.

V CONCLUSION

Communicating cultural values to young children is a part of every society. Educational software is one of way for young to learn about the cultural norms and values of a society.The new education age requires a modern approach to the strategy for improving cultural values of the young by means of educational software. This software which is described here is one of the the results of the analysis of National strategy for young people. The main problem here is extra time and management skills of teachers. The main goals of this works are:

- Be open to developing their knowledge and understanding of different cultural groups and of diversity within those cultural groups.
- Explore the impact of their own cultural background on the development of their values and beliefs.
- Reflect on how their own values impact on their approach to their work with families.
- Be aware of the limited value of stereotyping individuals from certain cultures or ethnicities.

The most important factor is to encourage young to interact with each other, and computer communication may be the best way to foster this interaction.

REFERENCES

[1] Strategija za mlade, Vlada Republike Srbije 2008.

[2] Strategija u oblasti ravnopravnosti polova u APV, Pokrajinski sekretarijat za rad, zapošljavanje i ravnopravnost polova

[3] Projekat Rodna ravnopravnost u školskim planovima i programima, Zavod za ravnopravnost polova, APV, 2008