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Sadržaj · *Content*

Uvodne riječi · *Introduction*

Riječ glavnih urednika
specijalnog izdanja časopisa Polytechnic and Design

Editorial by co-editors
of the Special Issue of Polytechnic and Design

Petar Jandrić   **Milan Bajić**

In 2015, Zagreb University of Applied Sciences has joined the international consortium aimed at advancing practice and research in the field of video education. The consortium has 8 partner institutions: Wilf Malcolm Institute of Educational Research, University of Waikato (NZ), Philosophy of Education Society of Australasia, Institute of Education, Massey University (NZ), College of Educational Studies, Chapman University (USA), Department of Learning and Philosophy, Aalborg University (Denmark), Faculty of Education, University of Auckland (NZ), Department of Informatics and Computing, Zagreb University of Applied Sciences (Croatia), National Taiwan University (Taiwan).

The consortium has developed its activities in three distinct directions. First, order to explore opportunities of digital video for scholarly publishing, the consortium has partnered with Springer publishers and established the first video journal that captures the latest developments in educational practice: the Video *Journal of Education and Pedagogy* (http://videoeducationjournal. springeropen.com/). Second, the consortium has established the learned society registered in New Zealand: the *Association of Visual Pedagogies* (http://www.visualpedagogies.com/). Third, the consortium has started the annual series of themed conferences. The first conference in the series, *AVPC 2016: Visual Pedagogies and Digital Cultures*, was organised by Zagreb University of Applied Sciences and took place in June 2016 in Zagreb, Croatia (http://avpc.tvz.hr/). With almost 100 participants, and 55 presented papers, AVPC 2016 has significantly contributed to development of the international (and especially European) video education community.

Quality of presentations at AVPC 2016 has reached far beyond expectations. In order to make the best of these presentations, conference programme committee has decided to publish them in several dedicated special issues. In this Special Issue of Polytechnic and Design we were specifically interested in contributions to three interrelated areas: practical experiences related to using video in education, technical aspects of video education, and the (historical and contemporary) relationships between video, design, visual culture, and (distance) learning. Also, while the official language of AVPC 2016 was English, we felt the need to also include quality presentations written in Croatian. All received articles have been double peer-reviewed and evaluated according to their significance, originality, content, style, clarity and relevance to the Special Issue. These articles display the current state of the art in video education, and point towards future research developments in this new and exciting area. It is with great pleasure, therefore, that we present this selection of 11 papers in Polytechnic and Design.

Co-editors of the Special Issue of
Polytechnic and Design

Petar Jandrić and Milan Bajić

VISUAL PEDAGOGY PRACTICES: AN INSTITUTIONAL EXPERIENCE

VIZUALNA PEDAGOGIJA U PRAKSI: INSTITUCIONALNO ISKUSTVO

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Abstract

Visual pedagogy as a new concept slowly penetrates academic world. Visual content is very important part of learning as it creates unique experience based on the previous experiences, memories and emotions connected with them. By incorporating visual pedagogy in educational process of teachers it is meant to influence development of visual teaching and learning in their field. By connecting ICT and other technology courses prospect teachers learn how to produce their own visual content, from images to animations and videos. First experiences give high level of satisfaction in learning through visual content and applying underlying Multimedia design principles. Not to be neglected is that students were having very creative and fun time in learning by creating their own individual or team projects as part of curriculum. One of the challenges we are facing continually is that of proper evaluation.

Keywords: *Visual Pedagogy, Higher Education Practice, Visual Learning Outcomes*

Sažetak

Vizualna pedagogija kao novi concept polagano prodire u visokoškolsko obrazovanje. Vizualni sadržaji su važan element učenja jer stvaraju jedinstvena iskustva koja se temelje na prijašnjem iskustvu, sjećanju i osjećajima povezanima s njima. Uključivanjem vizualne pedagogije u obrazovni proces učitelja i nastavnika, cilj je utjecati na razvoj vizualnih elemenata u poučavanju i učenju u njihovom području. Povezivanjem IKT i drugih tehnološki orjentiranih predmeta mogućim nastavnicima i učiteljima omogućuje se stvaranje vlastitih vizualnih sadržaja, od fotografija do animacija i videa. Prva iskustva govore o visokoj razini zadovoljstva učenjem kroz vizualne nastavne sadržaje i primjenu osnovnih načela dizajna multimedije. Ne treba zanemariti da je studentima bilo zabavno kroz kreativnost u stvaranju vlastitih ili timskih uradaka u nastavi. Jedan od izazova s kojim se kontinuirano susrećemo je ispravna evaluacija tako nastalih sadržaja.

Ključne riječi: *vizualna pedagogija, iskustva iz visokog školstva, vizualni ishodi učenja*

1. Introduction

1. *Uvod*

The renowned psychologist and philosopher of the art, Rudolf Arnheim, stated that "vision is the primary medium of thought"[1]. Vision is not only a sensory process, but also a cognitive one: the human mind is actively involved in interpreting visual representations according to the individual life experiences, memories and emotion of the viewer and generates a great variant of associations. Integrating visual representations into teaching and learning materials has a proven potential on knowledge acquisition, comprehension, retention and transfer of knowledge. As academic teaching strives finding engaging learning experiences that also encourage high-level thinking skills, those characteristics of the visual language have the potential to turn it into such a practice. Furthermore, current technologies make visual representations available, accessible and easy to manipulate and integrate into teaching materials.

Despite this proven potential and ease-of-use, data of Visual Pedagogy practices in academic teaching is still limited. Over the past three years, the ICT & Learning Graduate Program of The College for Academic Studies

Or Yehuda in Israel, has gradually incorporated Visual Pedagogy into its curriculum and teaching methodologies. This paper will present our institutional experience with Visual Pedagogy practices.

2. Theoretical Background

2. *Teoretska podloga*

Humans have a remarkable ability to remember pictures compared to words [2,3,4]. Words and pictures that are coherent and presented spatially close to each other, are retained in our memory even longer[5,6], improve comprehension – effect called by Mayer "The Multimedia effect" [6]create interest and have a positive effect on learning, knowledge acquisition, retention and transfer [7,8,9]. Based on these characteristics, educators can much benefit from integrating Visual Pedagogy practices into teaching and learning. But using Visual Pedagogy practices requires first to acquire Visual Literacy skills.

Visual Literacy, a term coined by John Debes is 1969, is a set of abilities that enables an individual to effectively find, interpret, evaluate, use, and create images and visual media. [10]. It involves a set of skills ranging from simple identification to complex interpretation on contextual, metaphoric and philosophical levels [11]In Higher Education, student's academic work with images and visual materials requires research, interpretation, analysis, and evaluation skills specific to visual materials. These abilities cannot be taken for granted and need to be taught and integrated into the curriculum [10]. Once taught and practiced, these skills can be developed and enhanced [12,13,14,15].

In today's Higher Education, using Visual Pedagogy practices is both effective, as well as up—to-date and relevant to the 21st century learners. As current stated goal in education is providing all learners an engaging and empowering learning experiences, focusing on learning activities that are meaningful and relevant to learners, Visual Pedagogy provide Higher Education relevant practices that cannot be ignored.

3. Description of the Institutional Experience

3. *Iskustva iz prakse*

At The College of Academic Studies Or Yehuda Graduate School of Education in Israel, the ICT & Learning Program faculty have initiated a gradual incorporation of Visual Pedagogy into the teaching and learning practices. With 85 students per class, over 90 percent of the students are teachers. Thus, we percieve Visual Pedagogy not only as a teaching and learning practice but also as modeling for future leaders in education in their field.

3.1 Constructing a theoretical base of knowledge

3.1 *Konstrukcija teorijske baze znanja*

Being aware of potential contribution of Visual Pesagogy, our jurney started in reviewing the relevant literature and building our theoretical base of knowledge. As a Graduate Program, it was important to create a sound theoretical basis, which will provide the scientific and academic rational for the practical uses (table 1).

Table 1   *Visual Pedagogy theoretical base - the ICT & Learning Graduate Program of The College for Academic Studies*

Tablica 1   *Teorijska baza vizualne pedagogije – diplomski program za IKT i učenje Koledža za akademske studije*

1. Visual Literacy
2. Visual Thinking
3. Vision & the brain
4. Vision as a cognitive process
5. Vision, intuition and emotions
6. Visual metaphors and higher-level visual thinking skills
7. Components of visual language: content, graphic execution, context and format (Avgerinou & Pettersson, 2011, Pettersson, 2012)
8. Multimedia Cognitive Theory (Mayer, 2009)
9. Multimedia Learning & Multimedia Design
10. Social clues in the Multimedia learning environment and Personalization
11. Video and animation in learning process
12. Visual Pedagogy – Pedagogical considerations

As we acquired this knowledge, we belived it important to share it with both collegues and students. A seminar was presented to the staff of the Graduate School pf Education, and a new course was designed for our students and added to the curriculum. The objective of the course was to present the above theoretical base of knowledge to the students, enabling them to create visual learning products thoughtfully.

3.2 Visual Pedagogy practices in teaching

3.2 *Praksa vizualne pedagogije u podučavanji*

Based on our growing theoretical knowledge, we incorporate even more intensively visual pedagogy to different courses in our program in lectures, teaching materials and learning activities:

Visual representations are incorporated into teaching materials for organizing information (figure 1).

Images and videos are widely used for visualizing and realistically present data and process (figure 2).

Visual representations are also integrated as visual metaphors into the teaching materials: using images that symbolically communicate an abstract concepts, visual messages that are used
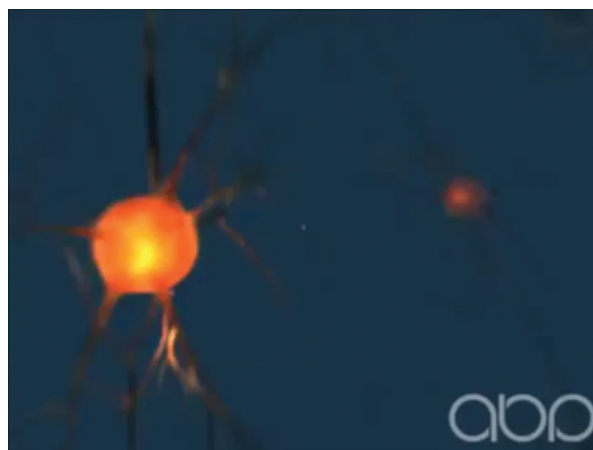
Figure 2   *3D Animation of a Neural Network by Animated Biomedical Productions©. (https://youtu. be/-SHBnExxub8, ABP Youtube channel). This animation was used to teach neural brain function in Sciences of Education in the 21st Century course.*

Slika 2   *Animacija neutralne mreže autora Animated Biomedical Productions©. Ova animacija korištena je u poučavanju neuralne funkcije mozga u kolegiju Znanst edukacije u 21. stoljeću*

to facilitates understanding. Some examples of visual metaphors are shown in figures 3 & 4. The metaphors are always accompanied by precise explanations in order to avoid misunderstanding of the visual message. Those images are very helpful simplifying complex and abstract ideas.
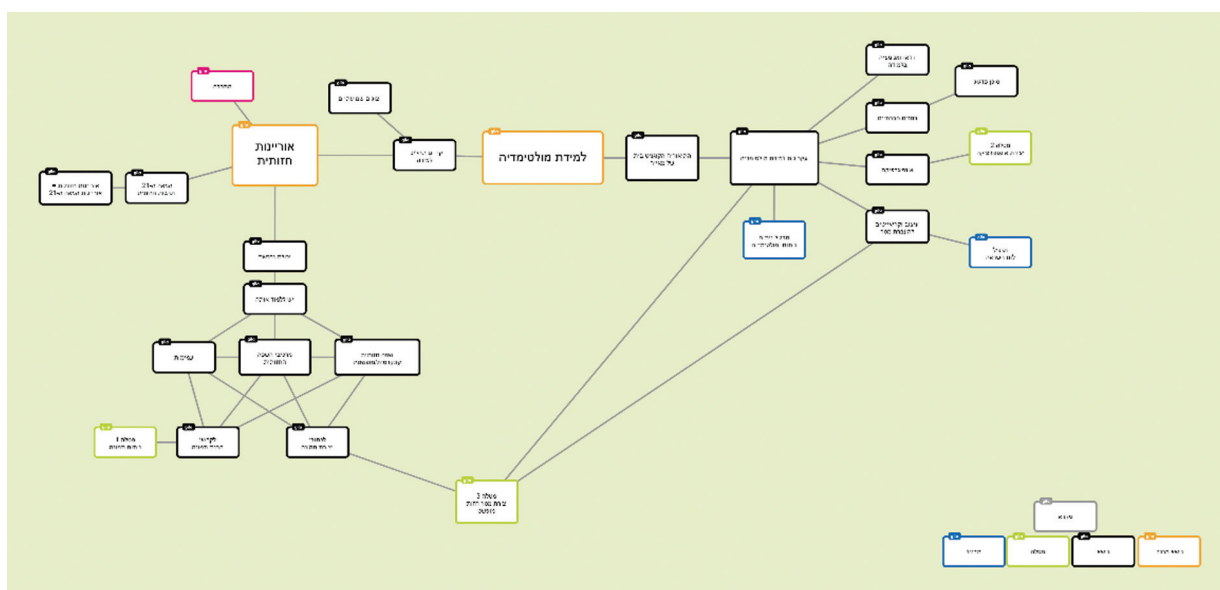
Figure 1
Course map (created by Gila Levi Atzmon with Popplet)

Slika 1
Mapa kolegija (izradila Gila Levi Atzmon pomoću alata Popplet)
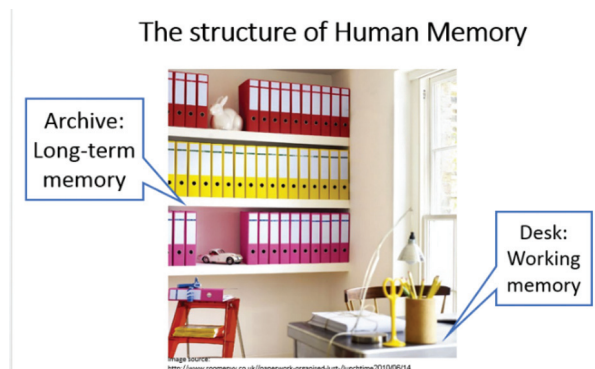
Figure 3   *The structure of human memory is not easily understood. This image was used as a visual metaphor to explain the primary characteristics of working memory and long-term memory and the flow of information between them (all tags translated from Hebrew).*

Slika 3   *Strukturu ljudskog sjećanja nije lako razumjeti. Ova slika korištena je kao vizualna metafora za objašnjenje primarnih karakteristika radne memorije i dugoročne memorije i tijeka informacije među njima (prevedeno s hebrejskog)*
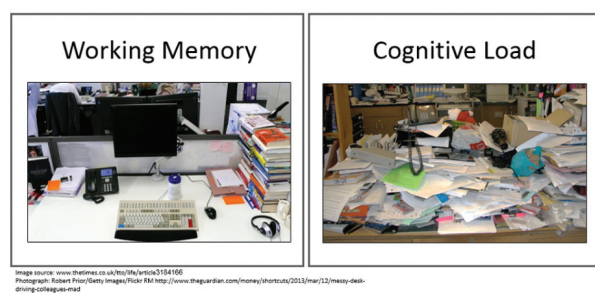
Figure 4   *Continuing the previous metaphor, the concept of Cognitive Load was demonstrated by an overloaded office desk.*

Slika 4   *Nastavak prethodne metafore, concept kognitivnog zasićenja je prikazan pomoću pretrpanog uredskog stola*

Videos are used to create interest in our lessons, emphesize points of view, orgenaize and add coennctivity between ideas and perceptions. For example, the Pink Floyd's clip, "Another Brick in the Wall", was presented to demonstrate a percieved industrial model of schooling. This video was used as a learning anchor while provoking student interest and providing macro-context (Bonk, 2008). The combination of a powerful visual metaphorical images and the familiar and intensive soundtrack, made a memorable impression.

4. Visual Pedagogy practices in learning

4. *Prakse vizualne pedagogije u učenju*

Gradualy we gained confidence to require our Graduate student to produce visual learning outcomes (figure 5 to 9). An emphesize was made to use the visual representation thoughtfully, commmunicating a precise message and applying their knowedge of the visual language and the Cognitive Theory of Multimedia Learning principles. Students products include creative images as photos, scatches, posters etc. (figures 5 to 7), animations (figure 8) and video (figure 9). Some of the video products are filmed and edited by the students and some are an integration of available materials.

Figure 5   *Group visual outcome:. The students have explored the 21-century skills in a collaborative learning process. They were asked to visually present part of them. All images were taken by the students on campus.*

Slika 5   *Grupni vizualni rezultat: studenti su istražili vještine za 21. stoljeće kroz kolaborativan proces učenja. Bili su upitani da vizualno prezentiraju neki njihov dio. Sve slike su izradili studenti u kampusu.*

All products are the final outcomes of a comprehensive individual or collaborative learning process. As students of the ICT & Learning Graduate Program, different digital tools are used to produce most of these products. It is therefore important for the faculty to collaborate and synchronized the technological courses with the requirments of the courses that have incorporated visual learning outcomes. As our students advance with their learning, higher requirments are presented for higher standarts of their technological performance as well as

Figure 6 *Students were asked to reflect on their learning experience and present it as a visual message. Students Aida Badarne & Imann Mahamid titled this image "We have discovered a whole new world!"*

Slika 6 *Studenti su upitani da reflektiraju na svoje iskustvo učenja i prezentiraju ga kroz vizualnu poruku. Studenti Aida Badarne & Imann Mahamid ovoj slici dali su naziv: "Otkrili smo čitav novi svijet".*
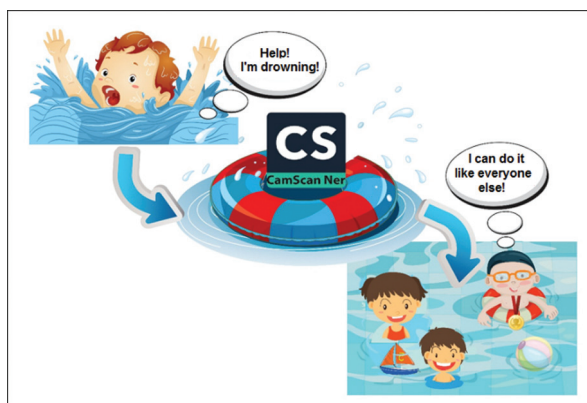
Figure 7 *As a part of their Master's degree final project, students are asked to present their findings visually. This qualitative research by Michal Inon and Galit Zawi, evaluated a technology which assisted a CP student. The technology was described as a life vest, saving the child with special needs.*

Slika 7 *Kao dio magistarskog završnog projekta, studenti su zamoljeni da vizualno prezentiraju svoje rezultate. Ovo kvalitativno istraživanje Michal Inona i Galit Zawi evaluira tehnologiju koja je pomogla CP studentima. Tehnologija je opisana kao pojas za spašavanje, koji spašava dijete s posebnim potrebama.*

their ability to produce visual contant of higher-order thinking skills and implement the rules of Multimedia design.

Figure 8 *Animation by students Limor Ben-Ari & Ronit Ya'acov, presenting diversity in education (https://youtu.be/toLu_RJz7ME)*

Slika 8 *Animacija studenata Limor Ben-Arija i Ronita Ya'acova, koja predstavlja raznolikost u edukaciji (https://youtu.be/toLu_RJz7ME).*

Figure 9 *Student Inbal Smith edited a video as a learning product. The learning task was to describe an educational paradigm with its related theoretical background. Inbal, a teacher and an architecture, presented a visual metaphor of a dynamic building with a static core (https://youtu.be/VUILzATNo-M)*

Slika 9 *Student Inbal Smith obradio je video kao projekt za učenje. Zadatak učenja bio je opisati obrazovnu paradigmu sa povezanom teorijskom pozadinom. Inbal, učitelj i arhitekt, prezentirao je vizualnu metaforu dinamičke zgrade sa statičnom jezgrom (https://youtu.be/VUILzATNo-M)*

5. Discussion

5. *Diskusija*

Our institutional experience have led us to believe that the use of Visual Pedagogy practices enable us to provide our Graduate students a better learning process. Although still considered unconventional in other Graduate programs, taking this path in our program allows

our students to better understand and remember complex concepts, be engaged with tasks that requires creativity, collaboration, careful planning and high-level thinking skills. Preliminary feedbacks from the students show very high satisfaction level from their visual outcomes. One repeated feedback is the appreciation and enjoyment from a creative and fun learning activity, which is flexible and allows the diversity of the students to shine through. Feedbacks like these strength our belief that Visual Pedagogy practices not only promote high-level thinking skills but provide all learners an engaging and empowering learning experiences.

A challenge for the near future will be to categorize the different types of visual representations used for teaching and learning and focus on those supporting abstract thinking.

As we continue to incorporate more Visual Pedagogy practices, we carefully consider the required evaluation methods. We gradually extend these practices to more courses and to other programs in the Graduate School of Education. This requires constant pedagogical and technological collaboration with our colleagues.

We continue evaluating the advantages of Visual Pedagogy and we look forward continuing this path and gain more knowledge on its impact on the learning process.

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AUTHOR · *AUTORICA*

Gila Levi Atzmon

After graduating Hadassah Dental School at The Hebrew University in Jerusalem with B.Sc.Med. and D.M.D degrees, Gila took part for over 12 years in the innovative development of Virtual Reality Dental Education Simulators (DentSim) with DenX and Image Navigation as Vice President and Dental Simulator Product Manager. In 2009 she joined the UDENTE (Universal Dental E-learning) project, led by Professor Patricia Reynolds from King's College London Dental Institute. After many years of developing and implementing innovative dental technologies, Gila completed a Masters with distinction in Education. She then joined the faculty of the School of Education at the College of Academic Studies Or Yehuda in Israel. Her current position is Senior Lecturer and Coordinator of the ICT & Learning Graduate Program.

Gila Levi Atzmon

Nakon što je diplomirala na koledžu Hadassah na Hebrejskom sveučilištu Jeruzalem, Gila Levi Atzmon je preko 12 godina sudjelovala u inovativnom razvoju simulatora dentalne edukacije u virtualnoj stvarnosti (DentSim) sa DenX and ImageNavigation u svojstvu dopredsjednicce i projektne menadžerice. Godine 2009 priključila se projektu UDENTE (Universal Dental E-learning) pod vodstvom profesorice Patricia Reynolds sa King's College London Dental Instituta. Nakon mnogo godina u razvoju i primjeni inovativnih dentalnih tehnika, Gila je magistrirala edukaciju. Nakon toga se zaposlila u Školi za edukaciju pri Koledžu akademskih studija Or Yehuda u Izraelu. Trenutno je zaposlena kao viša predavačica i koordinatorica diplomskog programa IKT i učenje.

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SELF-EVALUATIONS OF STUDENTS' DEVELOPED COMPETENCES DURING SEMINAR PRESENTATIONS IN THE ONLINE PROGRAM

STUDENTSKA SAMOPROCJENA KOMPETENCIJA RAZVIJENIH TIJEKOM PREZENTACIJA SEMINARA NA ONLINE PROGRAMU

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Abstract

The purpose of this article is to present the results of students' self-evaluations of their developed presentation competences during their seminar presentations as a part of both a human resource course and an organizational dynamic course in the online master program International Management. Video pedagogy employed in the courses was assessed and its effect on competency development was questioned.

The main research question was which aspects of presentation competence the students develop while delivering, watching and discussing online presentations, according to their self-assessments. The methodology of self-assessment of the gained competences questioned the development course-embedded presentation competence in a virtual learning environment. A questionnaire was sent to all students attending the courses during two academic years. Students rated their acquired skills on the 7-point Likert scale. The results proved hypothesis that students had developed their online presentation competences and that they had become more self-confident.

The course designers gained the feedback regarding the collaborative tool, course organization and original aim to develop presentation skills in the virtual classroom. Improvement of these exercises, meaning instruction, design, and feedback will be employed the following next year.

Keywords: online presentation competence, blended online learning, experiential learning, learning by doing, self-assessment

Sažetak

Svrha ovog rada je prikazati rezultate samoevaluacije studenata, u kojoj su studenti evaluirali razvoj svojih prezentacijskih kompetencija na kolegijima ljudski resursi i organizacijska dinamika, održanim na online specijalističkom programu Međunarodni menadžment na DOBA Fakultetu. Procijenjena je video pedagogija tih kolegija i propitan njen utjecaj na razvoj kompetencija.

Glavno istraživačko pitanje je koji vidovi prezentacijskih kompetencija studenti razvijaju prezentirajući, sudjelujući i diskutirajući tijekom online prezentiranja, a prema vlastitim procjenama. Metodom samoprocjene propituju su stečene prezentacijske kompetencije u virtualnom obrazovnom okruženju. Upitnik je bio poslan svim studentima koji su sudjelovali na navedenim kolegijima tijekom dvije akademske godine. Studenti su ocjenjivali svoje stečene vještine na 7 stupanjskoj Likertovoj skali. Rezultati su potvrdili hipotezu da su studenti stekli online prezentacijske kompetencije i povećali svoj samopouzdanje.

Dizajneri obrazovnog sadržaja dobili su povratnu informaciju o suradničkom alatu, organizaciji kolegija i originalnom cilju da razviju prezentacijske vještine u virtualnoj učionici. Poboljšanje korištenih vježbi, konkretno uputa, dizajna i povratnih informacija, provest će se iduće akademske godine.

Ključne riječi: online prezentacijske kompetencije, kombinirano online učenje, iskustveno učenje, učenje kroz praksu, samoprocjena

1. Introduction

1. *Uvod*

Generic competences are evaluated almost as important as functional knowledge by employers [1].

"The conjoint analyses show that interpersonal skills (communication skills, teamwork skills et cetera) are almost as important as professional expertise.", was stated in European Commission's final report of Higher Education Graduates: The Employers' perspective [2]. Fluent online multimedia and synchronous communication positively influence the overall quality of life and therefore provides the ability for active social inclusion and global cooperation. Generic competences, from the educational point of view, are much more effective and easier acquired if they are embedded in specific professional courses [3] [4]. Since learning by teaching others provide the highest learning retention rate [5], presentations are one of the most common way to provide experiential learning opportunity [6]388 in Books to students engaged in blended online program [7].

The purpose of this article is to present a case study related to an effort to develop student multimedia online presentation competence[1] during human recourse management and organizational development courses. Seminar presentations were included as assignments in two courses in the online master program International Management of DOBA Faculty for Applied Sciences, during the academic years 2014/2015 and 2015/2016. The study program is delivered fully online via Blackboard learning management system. The students' seminar assignments were presented via Blackboard Collaborate[2].
The main research question was which aspects of online presentation competence the students develop while delivering, watching and discussing online presentations, according to their self-assessment. A questionnaire was sent to all students attending the course in three different languages (Slovenian, Croatian and Serbian) during this academic year. Students rated their acquired skills on the 7-point Likert scale. The

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1   For the purpose of this article, definition of online presentation is a speech or talk in which a work is explained to the audience, performed using the Internet based collaborative tool, providing multiparty video and audio presence, a Power Point presentation and chat room.
2   BlackBoard Collaborate is real-time collaboration platform included in Blackboard LMS, which allows video & sound conferencing, desktop, application and whiteboard sharing among multiple participants.

methodology of self-assessment of the gained competences questioned the development course-embedded presentation competence in a virtual learning environment. The results proved hypothesis that students had improved their online presentation competences.

2. Background

2. *Okruženje*

The playground for the research if a fully online master program, which provide blended online learning environment according to Power. Blended online learning provides both synchronous faculty led learning opportunity with asynchronous system managed self-paced learning, based on online designed and delivered course [7]. In our case, the simultaneous development of the student centered, experience-based, "learning by doing" approach and online learning caused the development of a new, online presentation competence. Those competences are crucial for global, distributed work contribution.

The courses, which were included in the research were Organizational dynamic for success of a company and creative change management and Creative human resource management for competitive advantage. The duration of each of them was five full weeks. Students were in the center of their learning. A professor and one of his assistants/online mentors provided facilitation, mentoring and motivation. The professor designed the course, and each week performed webinars and online meetings with interested students. The mentor was available 24/7 during the courses, with the obligation to respond to any request within 24 hours. Responses included: providing the advice, encouragement and weekly announcements, which introduced the successor week with emphasis on the major milestones and deadlines.
The development of several generic competences were included in the course. Individual seminar work and presentation was focused on the four key competences for LLL[3]: learn to learn, communication in both mother language and in English as a foreign language and digital competence [8]. In order to develop the competence "learn to learn", students were

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3   Life-long learning

asked to define the topic and find references alone, without any assistance or approval. They were advised to start with their seminar works approximately in the middle of the course, having till then good overview of the courses' scope. The majority of the references are in English and students were in the position to develop vocabulary both in English and mother tongues.

The students' seminar works were presented via Blackboard Collaborate, using audio and video presence and Power Point, controlled by students. In both courses the grade of the individual seminar work consisted of the course final grade (50%), out of which 16% was earned by the online presentation of the seminar. Students' presentations were evaluated with "four eyes": by the mentor in the synchronous mode during online presentations and the professor, checking video recorded presentation asynchronously.

The students' self-assessments were organized five months after the courses had finished, with the aim to evaluate their competences before and after the course. A behavioral competence description used in the questionnaire was developed based on the observation of students' behavior during the course, and having in mind necessary knowledge, skills and attitude for successful online presentation. Proposed concept is based on the European Commission's Key competencies for lifelong learning – European reference framework, where each competency is described from the point of view of knowledge, skills and attitude [8].

The main research question was which aspects of presentation competence the students develop while delivering, watching and discussing online presentations, according to their self-assessments. A questionnaire was sent to all students attending the course during the academic years 2014/2015 and 2015/2016. Students rated their acquired skills according to the provided rubric on the 7-point Likert scale. Students' provided feedback on the methodology and this kind of presentation exercise in the online environment acquired through open-ended questions. Online presentation competence is crucial for participating in virtual teams and for international management, so the results will influence

any improvement of the courses for the next generations.

3. Self evaluation
3. *Samoprocjena*

3.1 Questionnaire
3.1 *Upitnik*

The online presentation competence is not usually developed in the course of education in the countries of interest (Slovenia, Croatia and Serbia). Power point presentations usually do not follow good presentation practices and are loaded with too much text. Engagement in the discussion is very superficial, mainly in a chat mode, very rarely by audio contribution. Students are very reluctant to start the camera and show up in the course of their presentations. Enthusiasm and joy are very rarely present in their voices. Witnessing such presentations for several years motived authors to run this research, with several aims:

- to describe online presentation competence based on current experience and observation of students' behavior during online presentations;
- to prompt students again and make them aware of behaviors that prove presentation competences;
- to provide students with a chance to reflect on their performances and experiences;
- to measure differences in self-perceived competence levels before and after the courses;
- to gain feedback regarding the collaborative tool, course organization and original aim to develop presentation skills in a virtual classroom;
- to improve these exercises, meaning instruction, design, and feedback for the following next year.

The questionnaire was organized in three parts. In the first part students evaluated their experience with Internet, e-learning systems, computer literacy and public speaking. In the second part they evaluated their attitudes towards e-learning. Finally, the third part of the questioner was devoted for students to assess development of their online presentation competence, rating their behaviors before and after the courses.

The first part of the survey was based on the published survey in the article "Investigating students' perceived satisfaction, behavioral intention, and effectiveness of e-learning: A case study of the Blackboard system" [9]. In this component, participants were asked to indicate whether they had experience using the Internet and e-learning. Those questions were answered using all 7-point Likert scale (ranging from 1 which means "no experience" to 7 which means "well experienced"). In the part Attitudes toward e-learning, participants were asked to indicate their attitudes toward e-learning. These 26 questions were answered using a 7-point Likert scales (ranging from 1 which means "strongly disagree" to 7 which means "strongly agree").

Following the behaviors of the best and the worst presenters among students, the authors made up a list of necessary activities for a proficient online presentation. The list was used as a base for the second part self-evaluation questioner:

- I create good power point presentation (concise, comprehensive, without too much text, visually attractive, with animations).
- I use key elements of a good presentation (sound and clear speech, self-confidence, concise expression, no stutter or buzzwords, body language).
- I easily use Blackboard Collaborate tool to present tasks, projects and idea.
- I use camera in presentations via Blackboard Collaborate.
- I finish presentation in time.
- I encourage discussion after my presentation.
- I am confident presenting via Blackboard Collaborate.
- Blackboard Collaborate enables me effective presentation of my idea and successful communication with my colleagues and a teacher.
- I identified possible questions from the professor and colleagues and prepared answers.
- I check all technical equipment before the presentation and they were functional.
- I receive negative feedback as encouragement for improvement.
- I enroll in the discussions.
- I provide my feedbacks with a sole intention to help others to improve.

- I provide positive feedbacks and encouragement to my colleagues.

In the survey, those statement were evaluated using a 7-point Likert scales (ranging from 1 which means "strongly disagree" to 7 which means "strongly agree").

The hypotheses of this study were:

H1: "Students improved their online presentation competence through "learning by doing".

H2: "Students are much more confident after experiential learning of online presentation."

3.2 Participants

3.2 *Ispitanici*

The research, developed competences during a seminar presentation in the online program, was conducted at the DOBA Faculty of Applied Business and Social Studies Maribor. There were 158 students who attended the school years from 2013/2014 to 2014/2016. They attended courses Creative Human Resource Management for Competitive Advantages and/or Organizational Dynamics and Innovative Change Management (table 1). 64 students responded, representing 41% of the population.

Table 1   *Survey population*
Tablica 1   *Uzorak ispitanika*

	Enrolled	**Survey**	**Response rate**
Total	158	64	41 %

Demographic information: The demographic component covered gender, age, current status, study year of subscription in school and the completion of Master's degree.

Participants were asked to complete a questionnaire that included demographic information (table 2) and three different components of their experience (E-learning experience, Attitudes toward e-learning and Learning by doing). The link to the questionnaire and a cover letter were distributed to students participated in the courses by e-mail. The questioner was open and was available to be completed online, on the 1ka.com website between 9th May and 18th May 2016. All students were asked to respond to the questionnaire and they were

guaranteed confidentiality. 64 students answered the questionnaire. Missing responses were found on questionnaires from different 15 students. Only the available data was analysed. Missing data were ignored and were not replaced with any values. Calculations used only available data.

Table 2   *Demographic information*

Tablica2   *Demografski podaci*

Gender	Total	Valid percent
1 (Male)	26	46 %
2 (Female)	31	54 %
Valid	57	
Age	**Total**	**Valid percent**
1 (24 years)	4	7 %
2 (25 - 40 years)	30	53 %
3 (41 - 60 years)	23	40 %
4 (61 or older)	0	0 %
Valid	57	
The current status	**Total**	**Valid percent**
1 (employed)	51	89 %
2 (unemployed)	6	11 %
3 (retired)	0	0 %
Valid	57	
Year subscription	**Total**	**Valid percent**
1 (enrolled in the academic year 2010)	1	2 %
1 enrolled in the academic year 2013)	17	30 %
2 (enrolled in the academic year 2014)	18	32 %
3 (enrolled in the academic year 2015)	20	36 %
Valid	56	
Finished Master's degree	**Total**	**Valid percent**
1 (yes)	4	7 %
2 (no)	51	93 %
Valid	55	

3.3 Results

3.3 *Rezultati*

E-learning experience: In this section of the questionnaire, participants were asked to indicate whether they had experience using the Internet and e-learning before any of the courses. These four questions were answered using all 7-point Likert scale (ranging from 1 which means "no experience" to 7 which means "well experienced").

The e-learning experience is presented in (table 3). As it can be see, the students have "Experience using the Internet" (mean 6,49), and "Computer literacy" (mean 5,95). They feel insecure presenting (the mean "Experience with presentations" is 5,06). Their previous experiences with e-learning were pretty modest (4,38). Nevertheless, we can conclude that the students have a fairly large experience with e-learning (average mean 5,47) before they start with those courses.

Table 3   *Descriptive statistics of e-learning experience before period of lecture*

Tablica 3   *Deskriptivna statistika iskustva s e-učenjem prije prezentacija*

	N	Min	Max	Mean	Std. Dev.
Descriptive statistics of e-learning experience before period of lecture					
Experience using the Internet	63	3	7	6,49	,896
Experience with e-learning	64	1	7	4,38	2,264
Computer literacy (office)	64	3	7	5,95	1,147
Experience with presentations / public speaking	64	1	7	5,06	1,726
Average	63,8			5,47	1,508

Attitudes towards e-learning: Participants were asked to indicate their attitudes towards e-learning. These 26 questions were answered using a 7-point Likert scales (ranging from 1 which means "strongly disagree" to 7 which means "strongly agree").

The variables of Attitudes toward e-learning were presented in (table 4). Students have experience with Blackboard. It is a fairly educated generation. The average of the first set of statements "**Perceived self-efficacy**" (I feel confident using the e-leaning system; I feel confident operating e-learning function; I feel confident using online learning contents) is **6,39**.

The average of the second set of statements "**Perceived satisfaction**" (I am satisfied with using e-learning as a learning assisted tool; I am satisfied with using e-learning functions; I am satisfied with learning contents; I am satisfied with instruction) is **5,78**.

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The average of the third set of statements "**Perceived usefulness**" (I believe e-learning contents are informative; I believe e-learning is a useful learning tool; I believe e-learning contents are useful) is **6,13**.

The average of the fourth set of statements "**Behavioral intention**" (I intend to use e-learning to assist my learning; I intend to use e-learning content to assist my learning; I intend to use e-learning as an autonomous learning tool) is **6,02**.

The average of the fifth set of statements "**e-learning system quality**" (I am satisfied with e-learning functions; I am satisfied the Internet speed; I am satisfied with e-learning content; I am satisfied with e-learning interaction) is **5,91**.

The average of the sixth set of statements "**Interactive learning activities**" (I would like to share my e-learning experience; I believe e-learning can assist teacher-learner interaction; I believe e-learning can assist learner-learner interaction) is **6,04**.

The average of the seventh set of statements "**E-learning effectiveness**" (I believe e-learning can assist learning efficiency; I believe e-learning can assist learning performance; I believe e-learning can assist learning motivation) is **6,04**.

The average of the eighth set of statements "**Multimedia instruction**" (I like to use voice media instruction; I like to use video media instruction; I like to use multimedia instruction) is **5,73**.

Learning by doing: In this component, participants were asked to indicate what was, or is their behavior before and after the experience with the implementation of lectures. These fourteen questions were all answered using 7-point Likert scale (ranging from 1 which means "no experience" to 7 which means "well experienced"). They assess the behavior before and after the completion of the lecture.

The Learning by doing experience is presented in (table 5). We can see improvement for all statements after the experience with Learning by doing.

First statement "**I create good power point presentations**" was designed to determine the knowledge of making presentations. Respondents rated skills prior experience with 5,12. After the experience with 5,96. Improvement of behavior amounts to 16%.

Second statement "**I use key elements of a good presentation**" was designed to determine if they use key elements of a good presentation (before 5,05; after 5,86). Improvement of behavior amounts to 16%.

Third statement "**I easily use Blackboard Collaborate tool to present tasks, projects and idea**" was designed to determine the how they use Blackboard Collaborate (before 4,55; after 5,90). Improvement of behavior amounts to 30%.

Fourth statement "**I use camera in presentations via Blackboard Collaborate**" was designed to determine how they use camera (before 3,44; after 4,70) and the lowest estimated before this experience. Improvement of behavior amounts to 38% and it is the largest among all arguments.

The results of the fifth statement "**I finish presentation in time**" are: before 5,16; after 6,14. Improvement of behavior amounts to 19%.

The results of the sixth statement "**I encourage discussion after my presentation**" are: before 4,25; after 5,00. Improvement of behavior amounts to 18%.

The results of the seventh statement "**I am confident presenting via Blackboard Collaborate**" are: before 4,25; after 5,59. Improvement of behavior amounts to 32%.

The results of the eighth statement "**Blackboard Collaborate enables me effective presentation of my idea and successful communication with my colleagues and a teacher**" are: before 4,49; after 5,64. Improvement of behavior amounts to 26%.

The results of the ninth statement "**I identified possible questions from the professor and colleagues and prepared answers**" are: before 4,51; after 5,14. Improvement of behavior amounts to 14%.

The results of the tenth statement "**I checked all technical equipment before the presentation and they were functional**" are: before 5,78; after 6,50. This statement is the highest rated. Improvement of behavior amounts to 12%.

The results of the eleventh statement "**I received negative feedback as encouragement for improvement**" are: before 5,23; after 5,79. Improvement of behavior amounts to 11%. This and the thirteenth statement have the lowest improvement. The results of the twelfth statement "**I enrolled in the discussions**" are: before 4,50; after 5,63. Improvement of behavior amounts to 25%.

Table 4   *Descriptive statistics of attitudes toward e-leraning*

Table 4   *Deskriptivna statistika stavova prema e-učenju*

	N	Min	Max	Mean	Std. dev.
Perceived self-efficacy:					
I feel confident using the e-leaning system (the Blackboard)	63	4	7	6,44	,736
I feel confident operating e-learning functions	63	4	7	6,37	,768
I feel confident using online learning contents	63	4	7	6,35	,845
Average	63,0			6,39	0,783
Perceived satisfaction:					
I am satisfied with using e-learning as a learning assisted tool	63	3	7	6,14	1,045
I am satisfied with using e-learning functions	63	3	7	5,94	1,076
I am satisfied with learning contents	63	2	7	5,67	1,320
I am satisfied with (multimedia) instructions	63	2	7	5,37	1,371
Average	63,0			5,78	1,203
Perceived usefulness:					
I believe e-learning contents are informative	62	2	7	5,85	1,069
I believe e-learning is a useful learning tool	61	4	7	6,39	,822
I believe e-learning contents are useful	60	2	7	6,13	,982
Average	61,0			6,13	0,958
Behavioral intention:					
I intend to use e-learning to assist my learning	61	3	7	6,21	1,035
I intend to use e-learning content to assist my learning	61	3	7	6,33	,944
I intend to use e-learning as an autonomous learning tool	60	1	7	5,52	1,652
Average	60,7			6,02	1,210
e-learning system quality:					
I am satisfied with e-learning functions	62	3	7	6,13	,983
I am satisfied the Internet speed	61	3	7	6,07	1,138
I am satisfied with e-learning content	61	2	7	5,90	1,207
I am satisfied with e-learning interaction	61	2	7	5,52	1,299
Average	61,3			5,91	1,157
Interactive learning activities:					
I would like to share my e-learning experience	62	4	7	6,03	1,130
I believe e-learning can assist teacher-learner interaction	61	3	7	6,02	1,147
I believe e-learning can assist learner-learner interaction	61	2	7	6,08	1,173
Average	61,3			6,04	1,150
E-learning effectiveness:					
I believe e-learning can assist learning efficiency	62	3	7	6,11	,907
I believe e-learning can assist learning performance	62	3	7	6,02	1,032
I believe e-learning can assist learning motivation	62	3	7	5,98	1,048
Average	62,0			6,04	0,996
Multimedia instruction:					
I like to use voice media instruction	62	1	7	5,29	1,663
I like to use video media instruction	62	3	7	5,84	1,176
I like to use multimedia instruction	62	4	7	6,05	1,108
Average	62,0			5,73	1,316

The results of the thirteenth statement "**I provide my feedbacks with a sole intention to help others to improve**" are: before 5,73; after 6,37. Improvement of behavior amounts to 11%.

The results of the fourteenth statement "**I provide positive feedbacks and encouragement to my colleagues**" are: before 5,61; after 5,27. Improvement of behavior amounts to 12%.

4. Discussion

4. *Rasprava*

The survey results show that students report positive behavioral change in presenting their seminar works online. The greatest progress was shown in "Check all technical equipment before the presentation", "I provide my feedbacks with a sole intention to help others to improve", and in time management – finishing presentations in time. The challenges are still present in usage

Table 5   *Descriptive statistics learning by doing*
Tablica 5   *Deskriptivna statistika učenja kroz praksu*

	Before experience					After experience				
	N	Min.	Max.	Mean	Std. Dev.	N	Min.	Max.	Mean	Std. Dev.
I create good power point presentation (concise, comprehensive, without too much text, visually attractive, with animations).	57	1	7	5,12	1,626	50	4	7	5,96	,925
I use key elements of a good presentation (sound and clear speech, self-confidence, concise expression, no stutter or buzzwords, body language).	57	1	7	5,05	1,608	50	1	7	5,86	1,088
I easily use Blackboard Collaborate tool to present tasks, projects and idea.	56	1	7	4,55	1,925	49	1	7	5,90	1,517
I use camera in presentations via Blackboard Collaborate.	57	1	7	3,44	2,244	50	1	7	4,74	2,440
I finish presentation in time.	56	1	7	5,16	1,724	49	3	7	6,14	1,021
I encourage discussion after my presentation.	56	1	7	4,25	1,812	49	1	7	5,00	1,744
I am confident presenting via Blackboard Collaborate.	57	1	7	4,25	1,776	49	1	7	5,59	1,457
Blackboard Collaborate enables me effective presentation of my idea and successful communication with my colleagues and a teacher.	57	1	7	4,49	1,733	50	2	7	5,64	1,352
I identified possible questions from the professor and colleagues and prepared answers.	55	1	7	4,51	2,026	50	1	7	5,14	1,796
I checked all technical equipment before the presentation and they were functional.	55	1	7	5,78	1,863	50	1	7	6,50	1,035
I received negative feedback as encouragement for improvement.	56	1	7	5,23	1,829	48	1	7	5,79	1,398
I enrolled in the discussions.	56	1	7	4,50	1,991	49	1	7	5,63	1,439
I provide my feedbacks with a sole intention to help others to improve.	56	1	7	5,73	1,483	49	4	7	6,37	,809
I provide positive feedbacks and encouragement to my colleagues.	56	1	7	5,61	1,510	49	1	7	6,27	1,114
Average	**56,2**			**4,83**	**1,80**	**49,4**			**5,75**	**1,37**

of camera/video presence. Students also need to work on encouragement of discussions after their presentations. Preparing the answers on possible questions from the professor and colleagues before presentation remains a relatively rare behavior. Actually, looking at the data more closely, there is a notion that students had first such experience ever. Students would benefit greatly from active engagements in the learning process.

Hypothesis H1: "Students improved their online competence through "learning by doing" is confirmed. An average of fourteen statement "Learning by doing" before experience are 4,83, after experience are. 5,75.

Hypothesis H2: "Students experiencing "learning by doing" are much more confident" is also confirmed. The results of the seventh statement "**I am confident presenting via Blackboard Collaborate**" are: before 4,25; after 5,59. Improvement of behavior amounts to 32%.

5. Limitations and Weaknesses

5. *Ograničenja i slabosti*

This study has limitations.
The first, the behavioral competence of online presentation used in the study is a proposition based on teachers' observations of students' behaviors. Those observations need to be better focused and more objective. Porter provided a good example how to integrating generic skills into a progam [3]. "Tuning project" provides inspirative list of competences in the managerial field in order to map and integrate core generic competences in the curriculum.

Second, the sample represents the whole population of students who performed online presentations in the courses. Repeating the study with different courses and observers, and a large sample size, would help to validate, generalize, and expend our findings.

Third, the longitudinal study, one which would follow the same sample during the program from the very beginning, and map a competence grid from basic presenter to proficient one would help a lot in design of further courses, development of evaluation matric, and definition of final learning outcomes of the master program. In the Evaluating multimedia presentation, Walbert provides a

rubric for evaluation multimedia presentations. It evaluates six features of effective presentation: focus, organization, support and elaboration, style, conventions, and presentation skills. [10]

A weakness of these case study involves the research question which is perhaps not well enough supported by theory.

A second weakness that may continue to plague the measurement approach involves interpreter reliability in self-assessment, because respondents may give socially expected answers.

6. Conclusion and recommendations

6. *Zaključak i preporuke*

Online presentation competence is only one of many generic competences that should be acquired during master program. For the sake of collective focus and harmonization in the process of curriculum planning and design, student learning and competency objectives of every course should be directly linked to the missions of the program and the school. As Kerby and Romine wrote for oral presentation skills embedded in an accounting program: "This linkage would bring clarity of purpose. Furthermore, specific learning outcomes and goals should be defined explicitly to provide focus and guidance for developing specific teaching and learning strategies. If goals are not clearly stated, it becomes difficult to create projects to develop oral presentation competencies, and it is impossible to identify performance levels."[11]

Online presentation competence is necessary ingredients for being successful in international business. Observing generations of students presenting online their seminar works to teachers and fellow students, it become clear that there is a need for more than having presentation assignment in the curriculum. There is a need to model right behavior, provide a checklist of necessary actions before, during the presentations, and elaborate evaluation of a performance more carefully. In the future, authors will adjust the instructions and assessment according to the presented findings. Students will be informed in advance on what to pay attention to in preparations and deliveries of presentations. A check list of tasks could help students to independently carry out

all the stages. The list will follow the same evaluation criteria as represented in the survey, as indicated in Table 5. The students be monitored them through each phase. To enhance active engagement of all students and provide more objective feedbacks [12], students will be assessed according to the same criteria by tutors and other students. Together with the self-assessment they will be assessed by peers and a teacher, according criteria in (table 6).

The process of assessment, which takes place in three phases, is shown in the (figure 1).

There is no question whether or not business professionals must possess strong communication competences. The question is how to facilitate competence development in student centered

manner. Although learning by doing methods and extensive assessment process might be time consuming, the authors agree that these are important educational tasks.

In the conclusion of "The role of self-determination theory in explaining teachers' motivation to continue to use e-learning technology", Sørebø states: "The present study also illustrates for practitioners how complex and resource demanding it is to strengthening teachers' willingness to continue their use of e-learning." [13] The meaning of our work, creating learning environment in which students acquire and prove useful competences in engaging ways, is certainly the strongest motivation for the authors.

Table 6 *Checklist of activities*
Table 6 *Popis aktivnosti za provjeru*

|	Self	Teacher	Students
Preparation for presentation			
Instructions for the preparation and execution of presentation were consulted.	Yes/No	x	x
All technical equipment before the presentation were checked.	Yes/No	x	x
Possible questions from the professor and colleagues were identified and answers were prepared.	Yes/No	x	x
Presentation's rehearsal was done.	Yes/No	x	x
Implementation of presentation			
Power point presentation was concise, comprehensive, without too much text, visually attractive, with animations.	Scale (1-7)	Scale (1-7)	Scale (1-7)
Key elements of a good presentation were exhibited: sound and clear speech, self-confidence, concise expression, no stutter nor buzzwords, body language.	Scale (1-7)	Scale (1-7)	Scale (1-7)
Web based tool to present tasks, projects and idea very used with ease.	Scale (1-7)	Scale (1-7)	Scale (1-7)
Camera in presentations was adequately used.	Scale (1-7)	Scale (1-7)	Scale (1-7)
Communication with colleagues and a teacher were effective.	Scale (1-7)	Scale (1-7)	Scale (1-7)
The presentation was finished in time.	Scale (1-7)	Scale (1-7)	Scale (1-7)
Discussion			
Presenter encouraged discussion after the presentation.	Scale (1-7)	Scale (1-7)	Scale (1-7)
Student was enrolled in the discussions after other people's presentations.	Scale (1-7)	Scale (1-7)	Scale (1-7)
Student provided feedback with a sole intention to help others to improve.	Scale (1-7)	Scale (1-7)	Scale (1-7)
Student provide positive feedback and encouragement to colleagues.	Scale (1-7)	Scale (1-7)	Scale (1-7)
Further development of the ability of presenting			
Accepted negative feedback as encouragement for improvement.	Yes/No	x	x
Reviewed the recording and analysis of deviations.	Yes/No	x	x
A plan for improvement was prepared.	Yes/No	x	x
The tools have been used in everyday business and life.	Yes/No	x	x
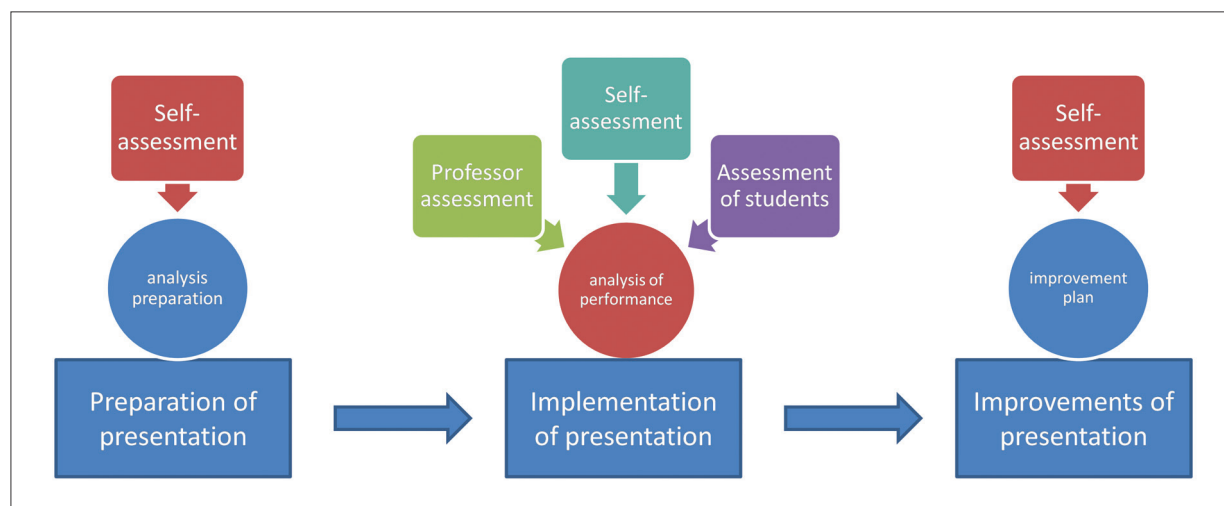
Figure 1   *Assessment process*

Slika 1   *Proces procjene*

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LECTURERS' REACTIONS TO AUTOMATED LECTURE CAPTURE INTRODUCTION

STAVOVI PREDAVAČA PREMA UVOĐENJU AUTOMATSKOG SNIMANJA PREDAVANJA

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Sažetak

Snimke predavanja postaju sve popularnije u visokoškolskom obrazovanju i očekuje se da će postati standard za većinu predavanja u budućnosti. Međutim, još uvijek postoje brojne prepreke, uglavnom vezane uz financijske, ljudske i tehničke probleme, koje utječu na brzinu procesa usvajanja tehnologija za snimanje predavanja i kvalitetu dobivenih snimki. Ovaj članak opisuje pilot projekt vezan uz uvođenje automatskog snimanja predavanja na Sveučilištu u Zagrebu u akademskoj godini 2015./2016. Sustav za automatizirano snimanje i objavu predavanja je dizajniran, implementiran, testiran i konačno podešen za rad u jednoj od predavaonica. Ostvareni sustav ne zahtijeva apsolutno nikakvu intervenciju predavača kako bi predavanja bila snimljena. Kao rezultat uvođenja ovog sustava snimljeno je više od 100 predavanja u izvedbi 11 predavača na 13 kolegija. Među predavačima je na kraju semestra provedeno istraživanje vezano uz njihove stavove prema snimanju predavanja, njihova očekivanja, strahove i iskustva. Rezultati istraživanja mogu se koristiti kao smjernice za izradu i implementaciju sličnih sustava u budućnosti.

Ključne riječi: *snimke predavanja, automatsko snimanje predavanja, stavovi predavača*

Abstract

Lecture captures or video recordings of lectures are becoming increasingly popular in higher education and can be expected to become a standard for majority of lectures in the future. However, there are still a number of obstacles mostly related to financial, human, and technical issues, that are influencing the pace of the adoption process and the quality of resulting lecture captures. This article describes an automated lecture capture pilot project implemented at the University of Zagreb in the academic year of 2015/2016. The Automated Lecture Capture and Publication System has been designed, implemented, tested and installed in one of the lecture halls. The implemented system requires absolutely no intervention from the lecturer to capture a lecture. As the result, more than 100 lectures, delivered by 11 lecturers in 13 courses have been captured. An on-line survey has been conducted among the lecturers at the end of the semester investigating their attitudes towards lecture captures, as well as their expectations, fears and experiences. The results of the survey can be used for designing and deploying similar systems in the future.

Keywords: *lecture capture, automated lecture capture, lecture recording, lecturers' attitudes*

1. Introduction

1. *Uvod*

Ex-cathedra lecturing is today one of the most represented, if not the most represented way of knowledge transmission in higher education. Although it is well known that live lectures suffer from a number of inherent disadvantages that hinder their learning potential [1], it seems that there are still certain properties of live lectures that make them appealing to students even when there is a wide range of other learning materials available [2]. Lecture capturing is a method through which live lectures can be turned into an everlasting learning material. While live lectures are usually a one-time events, their captures can

help students to make up for a missed lecture, but that can also be supplemented and synchronized with additional materials, thereby compensating for live lectures' intrinsic deficiencies [3]. A vast body of research by far has suggested that the learning potential of live lectures is mostly similar to the learning potential of lecture captures [4].

The facts that lecture captures are based on lecturing, which is a commonly used method of knowledge transmission, and that they can help students in knowledge acquisition, are today not the only reasons why lectures can and should be captured in higher education. Lecture captures also provide an insight into a university's teaching practices (for example using audience response systems) and lecturers' skills (for example interacting with the audience during a lecture and guiding the lecture in accordance with the audience reactions). This can be used to attract future students and thereby be beneficial for the university. And finally, universities can also use lecture captures for their remote or online programs, which are today more and more common, and charge for their usage.

These potential uses of lecture captures are not a novelty. University of Geneva in Switzerland, for example, has been engaged in lecture capturing practices since the 1970s [5]. But recent technological advances have played a significant role in increasing the popularity of lecture captures. Lecture capturing equipment, including video cameras, microphones, frame grabbers, is getting ever cheaper and more available, the disk space price for storing the captures is lower than ever, and there are a number of free software tools for capture support available. It is not surprising therefore, that lecture captures are today abundant online and can be found on universities' YouTube channels, websites, or available in context of massive open online courses.

However, there are still some issues related to lecture capture adoption in higher education institutions. These issues are mostly related to technical competences, manual work needed to capture a lecture, and lecturers' anxiety towards the capturing process. In this paper, some experiences regarding those issues are described through the description of the implementation of a fully automated lecture capturing system,

and through the opinions and experiences of the lecturers whose lectures have been captured in the pilot phase of the project. The rest of this paper is organized as follows: section two contains the description of reasons that led to the decision to implement a new software solution for lecture capture and publishing automation and the properties of that implementation. In section three the outcomes of the project and lecturers' opinions and experiences with automated lecture capturing and publishing obtained through an anonymous survey are presented. Final conclusions of the project are presented in section four.

2. Automated Lecture Capture and Publication System

2. *Sustav za automatsko snimanje i objavu predavanja*

The main functions of systems supporting lecture capturing and publishing are capturing one or several video sources (video of the lecturer and/or video of his slideshow/computer desktop/smartboard) and one or several audio sources (desktop and/or wireless microphone), post-processing of the capture files (re-encoding to target quality and codec, multiplexing video and audio, and optimizing video for web delivery), and finally publishing processed capture files on a server. Although there are readily available free tools like Opencast/Matterhorn [6] or Glalicaster [7] to support these processes, multiple issues in the attempts to set them up have forced us to consider developing our own implementation. These issues were a result of complex interactions between the operating system, capture hardware properties and drivers, and imperfections of the tools themselves. The requirements on the target system to be developed were:

- to be compatible with Linux based OS
- to be as simple as possible, but supporting a fully automated lecture capture and publishing process based on an lecture schedule available online
- to impose no limitations on the number of audio and video sources that can be captured (depending only on the processing power of the capture computer)

- to support simultaneous capturing and automated livestream of all capture sources.

The target system was finally implemented as a set of three main software applications, written as BASH scripts:

- The scheduler script, which runs upon every computer boot or when capture ends and, in case the next capture should begin within the next three hours, schedules the next capture using standard Linux *at* command. The lecture schedule is downloaded from the university website. If there is no capture to perform within the next three hours, the script sets auto turn-on and shuts the computer down for that time using the *rtcwake* command.
- The capture script, invoked by the at command, performs the entire capture process. It uses *FFmpeg* software (http://www.ffmpeg.org) to capture any combination of any number of audio and video sources. Each *FFmpeg* process stores its encoded output in a file, but also duplicates the output to a predefined localhost port, from where a *VLC media player* instance (http://www.videolan.org) will broadcast it to a livestream with or without re-encoding.
- The post-process script is invoked every day at 19 o'clock or after the last scheduled lecture in the evening, and performs media re-encoding to target quality and finally transfers the media files to the streaming server where they are available for on-demand consumption.

Although the described system is minimalistic, it fully supports the tasks it should support. Besides standard Linux commands, it requires only two external applications (FFmpeg and VLC), both of which are open source applications available in repositories of most Linux distributions.

The system was initially deployed in one of the department's lecturing rooms at the beginning of the winter semester of the academic year of 2015/2016. Following the deployment, lecturers have been informed at the department meeting that capturing is taking place. Printed notifications have been placed on the walls in the lecturing room where the system was installed. It was agreed that captured lectures would be available only to lecturers who held them and would definitely not be published without their full agreement.

3. Lecturers' opinions and experiences with automated lecture capturing

3. *Stavovi i iskustva predavača vezani uz automatsko snimanje predavanja*

By the end of the semester more than 100 lectures, delivered by 11 lecturers in 13 courses have been captured. Lecturers were then asked to participate in an anonymous survey about their attitudes, opinions and experiences with lecture capture in general, and the specific automated lecture capturing implementation at the department. The survey consisted of about 15 items (some questions were displayed depending on the answer on a previous question) and was completed by 9 of 11 lecturers.

The first group of survey items consisted of several questions about lecturers' own prior experience with lecture captures. Five out of nine lecturers (55.5%) claimed never before to have wanted to capture their own lectures with reported reasons being lack of personal benefit from capturing lectures or lack of their usefulness for students. Three lecturers (33.3%) reported to have already captured their lectures to provide students with an additional learning material, while one lecturer reported not having captured his lectures because of lack of technical support. When asked if they have ever consumed lecture captures, seven out of nine lectures answered affirmatively, with main reasons for that being acquiring some new knowledge (85.7%), and gaining insight into other lecturers' teaching practices (57.1%). The two lecturers who never consumed lecture captures explained that they prefer other types of learning materials. The same two lecturers reported never to have wanted to capture their own lectures, which could be explained by projecting their own preferences on the students.

In the second part of the survey, all of the lecturers reported having been aware that their lectures were being captured over the last semester, as well that they haven't introduced any kind of change in their lectures because of that. Four lecturers, however, noted that they would have changed their lectures if they were planning to later publish their lectures. None of the lecturers had reported any issues with the technical implementation of the system, which

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was not surprising, as there is absolutely no need for any intervention of the lecturer before, during, nor after the capture has taken place. The only missing feature one of the lecturers has reported was video editing in the post-processing phase.

In the third part of the survey, lecturers were asked about their general opinions for or against publishing their lectures. Three out of nine lecturers reported having nothing against publishing their lectures online in order to help students. Three other lecturers reported that they would agree to publish their lectures if certain conditions would be met. The conditions reported were that the recordings would be available to students only, that they would receive a financial or other kind of compensation, or that they could choose which lectures to publish and which not. Three lecturers who reported they would not agree to any kind of publishing of their lectures reported their reasons are that someone else could be using their knowledge or recordings to earn money, that lectures are about personal contact between the lecturer and his students, or because of their environment at the university.

In the fourth, final part of the survey, lecturers were asked if they requested access to their lecture captures, which six out of the nine of them didn't. Only one of the three lecturers who did request access to their lecture captures reported to have watched them. Three of nine lecturers reported that they would be more prone to capturing their own lectures now than before the automated lecture capturing was introduced. Only one of those three lecturers reported not having captured any of his lectures before.

4. Discussion and conclusions

4. *Rasprava i zaključci*

Although the sample size for this survey was very small (nine out of eleven lecturers completed the survey), it is the opinion of the authors that the described results provide valuable insights and are still worth reporting. The participants' opinions can be used as a starting point for identifying obstacles to automatic lecture capturing introduction on a higher education institution and their potential solutions.

The first interesting point supported by the obtained data is that it seems that a majority of lecturers is familiar with lecture captures and that lecturers use them for knowledge acquisition and gaining insight into other lecturers' teaching practice. On the other hand, it also seems that a lecturer's personal opinion on the usefulness of lecture captures for learning could correlate well with his readiness to provide students with his lecture captures, even if there is absolutely no work on the lecturer's side required in the capturing or publishing process. The only two lecturers who reported never to have consumed lecture captures, also reported not wanting to publish their lecture captures under any conditions, as well as that they personally prefer other kinds of learning materials.

The second point supported by the obtained data is not surprising at all. It seems that introducing a financial compensation or maybe another way of recognizing lecturers work could motivate lecturers to make their lectures available at least to their students. The fear of someone else making a profit by using someone else's captured lectures, or an explicit expectation of some kind of compensation for that was mentioned by two survey participants.

Finally, it seems that even though the support for lecture capturing was fully automated and required no intervention by a lecturer at any time, it still seems that the interest of lecturers for their captures was and remained low, at least based on how many lecturers requested access to their captures. Still, as lecture captures are mainly intended for students, which most lecturers are aware of, this is not necessarily an alarming result. If some of the lectures would be published, it remains to be seen how well they would be accepted by students.

It seems overall, that many lecturers don't consider lecture captures as a valuable learning resource, although the research has shown that students do consider having lecture captures available to be helpful for their learning [8], [9]. Raising lecturer's awareness about this, as well as raising their awareness about the different purposes lecture captures can be used for could perhaps influence their opinions. With automated capturing process and the identified benefits, it would be a pity if the lecture captures' potential would remain unutilized.

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VIDEO CONFERENCE AS A TOOL FOR ENHANCING STUDENT COLLABORATION

KORIŠTENJE VIDEO KONFERENCIJE ZA POBOLJŠANJE STUDENTSKE KOLABORACIJE

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Abstract

Video conferencing has been present on software markets for decades. Yet, due to various technical and pedagogical restrictions, it has been relatively rarely used in online education. Following the advent of reliable and high-bandwidth internet protocol connectivity, as well as development of new videoconferencing system, potentials of synchronous computer supported collaborative learning through video conferencing have increased [1] [2].

In ancient Greece, those who weren't interested to participate in public affairs were called "idiot", so it may be said that there are a lot of idiots in a world today and the only one who can change things are educational institutions. By supporting synchronous collaborative learning, contemporary education has better chance to develop public citizen and not private individual or "idiot". To facilitate such synchronous communication between students and teachers, not as a tool for teacher domination but as a tool for authentic education [3], this study looks into recent applications of the BigBlueButton (BBB) videoconferencing system integrated in open-source virtual learning environment, Moodle.

In the capacity of learning technologist, author of this paper has been involved in various aspects of this application from software development, through support to teachers and students, to pedagogy. The paper analyse the main motivators for the implementing synchronous computer supported collaborative learning at the University of Applied Sciences. It briefly introduces the main technical issues in the application of Moodle/ BigBlueButton, and explores its pedagogical applications in providing a suitable online environment for democratic education and encouragement of students to become "critical agents who actively question and negotiate the relationships between theory and practice, critical analysis and common sense and learning and social change" [4].

Sažetak

Videokonferencijski sustavi već su desetljećima prisutni na tržištu. Međutim, zbog različitih tehničkih i pedagoških ograničenja, relativno su se rijetko koristili u online obrazovanju. Pojavom pouzdanog i širokopojasnog pristupa internetu, kao i razvojem novih videokonferencijskih sustava, potencijali sinkronog računalno potpomognutog kolaborativnog učenja (eng. Computer Supported Collaboratice Learning - CSCL) su značajno porasli [1] [2].

U staroj Grčkoj, one koji su imali pravo, a nisu bili zainteresirani za sudjelovanje u javnim poslovima, nazivali su "idiotima", tako da se može reći da danas na svijetu ima puno "idiota", a obrazovne institucije su jedine koje mogu promjeniti stvari. Podržavajući sinkrono kolaborativno učenje, suvremeno obrazovanje ima veće šanse da razvije javne građane, a ne privatne osobe ili "idiote". Da bi se olakšala takva vrsta komunikacije između učenika i nastavnika, ne kao sredstvo za dominaciju nastavnika, već kao alat za autentično obrazovanje [3], u radu se gleda na primjenu BigBlueButton (BBB) videokonferencijskog sustava integriranog u open-source virtualno okruženje Moodle.

U radu se analiziraju glavni poticatelji za provedbom sinkronog CSCL, te se ukratko uvodi u tehničke probleme u primjeni Moodle/ BigBlueButton i istražuje njegove pedagoške primjene za pružanje odgovarajućeg mrežnog okruženja za demokratsko obrazovanje i poticanje studenata da promiču dijalog, raspravu i argumente potkrijepljene dokazima, te aktivno pregovaraju odnose između teorije i prakse [4].

Ključne riječi: Videokonferencija, Moodle, BigBlueButton, računalom podržano kolaborativno učenje, demokratsko obrazovanje

1. Introduction

1. *Uvod*

Education, not only plays an important role in student learning, but also in fostering the ability to research and gather information, their understanding and application of collected information to prepare students for the upcoming challenges [5]. However, education also plays an important role in the democratization of society because only people who respect each other and their diversity [4], who realize that everything is built through collaboration can create a society with genuine democratic values.

To create conditions, for students to develop in such way, there is a need to shift the educational approach by changing the focus from the teacher to the students. There was always the idea of students learning together in small groups and that idea was mostly accepted as a positive learning shift from lectures in large auditoriums overcrowded with students [6]. The collaboration that takes place in such groups is a continuum and it happens at every step, from content research, discussion, creation of shared knowledge and co-editing content. Unlike competitive and individualistic learning, students can work together in collaboration to achieve common goals of learning [7].

Advances in technology that occurred over the past few decades allow this theory to be finally put into practice. However, the ability to combine these two ideas (ICT and collaborative learning, or technology and education) and

to effectively enhance learning remains a challenge for teachers.

2. Theoretical Background

2. *Teoretska pozadina*

2.1 Computer supported collaborative learning (CSCL)

2.1 *Računalom podržano kolaborativno učenje (CSCL)*

CSCL is a diverse field in which teachers work in different ways, but the main focus is on collaborative groups of students. Unlike previous educational and pedagogical theory that looks almost exclusively at individual students, CSCL uses networked computers to move focus away from individual student and focus it on a small group of students (4-5 students) [8]. Therefore, it rejects the foundations of traditional educational and places learning in meaningful negotiations to be carried out in the social world, rather than in the minds of individuals [6]. Learning begins to take place as group discourse, where communication is not random, secondary factor, but the primary interaction through which everything else happens. Such an environment allows students to take ownership of the learning process, to engage in social interaction and dialogue, to develop more ways of presenting and become more self aware [9].

Small groups are the most suitable places for observing intersubjective learning as they release a wide range of social interactions and still they are small enough to keep track of what is going on [8]. The very nature of collaborative learning is such that a group that works together, will probably develop a solution that is more complex and sophisticated than it would be if each member has worked by himself. Through participation in group process, students do not only learn the theory developed by the group, but can also learn to think about the theory from multiple perspectives, and learn how to work together with others. CSCL gives hope that networked computer technology can bring together students in new ways to take advantage of the power of collaborative learning [10].

CSCL has been deeply influenced by the theories of Lev Vygotsky [8][10], and it emphasizes the importance of dialogue and social mediation in the development of guidelines of the learning process [11]. In particular, it can be said that the CSCL is inspired by his visionary understanding that learning takes place originally on a social level, and later, on the individual level of learning [8][10][12]. For Vygotsky, educators serve as facilitator who teach and are encouraging students to form their own level of understanding. Social interaction between students and students with teacher boosts the growth of knowledge [13]. In the process of completion of collaborative process, students are exposed to new ideas and information from a variety of perspectives and approaches through discussions and questioning, which at the end makes easy for students to understand and internalize critical concepts [9].

CSCL provides a convenient online environment for democratic education in which students are encouraged to become "critical agents who actively question and negotiate the relationships between theory and practice, critical analysis and common sense and learning and social change" [4]. This is an area which will the most challenge traditional pedagogy, concepts of teaching and learning, and institutional policies and practices [13].

2.2 Virtual learning environments (Moodle)

2.2 *Virtualno edukacijsko okruženje (Moodle)*

While there are many platforms that are appropriate for creating VLE, Moodle is one of the most popular. One of the reasons Moodle is so popular among teachers is that it is designed in open dialogue between teachers and developers, where they met various models for learning design and pedagogy [14]. Moodle platform satisfy most of the necessary conditions for the provision of high-quality virtual environment for student collaboration. Some of the tools that are available in Moodle, and are easily applicable in each class are wiki, database, forum, glossary... What is important to note that, since the Moodle

is an open source platform, there is a wide community of teachers and developers, who are constantly working to create new tools and improve existing ones.

In terms of collaboration and creating dialog between students, the biggest drawback of the Moodle platform is that it is mainly based on asynchronous communication, however, that can be compensated with a large plugin database that is available for teachers, and one of such plugin is BBB.

2.3 Extending Moodle with synchronous bbb platform

2.3 *Proširenje Moodle platforme sa sinkronom BBB platformom*

Moodle includes a number of tools that enable high-quality support for asynchronous collaboration, but it lacks quality synchronous component. In addition, Moodle can be enriched with a web conference tool, BigBlueButton.

BigBlueButton is an open source web conferencing system that enables educational institutions to deliver a high-quality learning experience to remote students. BBB supports sharing of slides (PDF and office documents), video, chat, voice, whiteboard and desktops, and it runs on Mac, Unix, and PC computers. Also, it allows recording of web conference sessions and presentations for later playback by students, complete with full audio and video.

The reason why BBB is chosen, instead of some similar platform, is beacouse it can be fully integratet with moodle (simply adds a new activity), no software to dawnload, single sign on (authenticated via Moodle), and ease of use. Same as Moodle, BBB is open source, and as such no manufacturer support is available, although it is available through the online community.

The combination of Moodle and BBB in education is extremely useful, especially when it comes to collaboration within small groups of students. In Moodle, BBB is displayed as activity and therefore as well as any other activity can give acces only to specific group. In this way, each group of students has its own virtual classroom in which they can have both synchronous and asynchronous collaboration. As already mentioned BBB has several tools that can

be used in synchronous collaboration ,but this paper is focused on the importance of just one of them and that is the role of video conferencing in the student collaboration.

3. Improved potential for video communications

3. *Poboljšanje potencijala za video komunikacijom*

Video conferencing has great potential for use for teaching in higher education. The potential lies in the possibility of creating a dialogue in student collaboration, which contributes to the quality of education instead of learning in isolation. The dialogue can be between teachers and students are only between students. However, the success of a video conference may depend on factors that are not necessarily related to the technology, but with an institutional support, student and teacher access to the technology, and their methods [2].

Although the technology has been available for several decades, there was always some reason that restricted its wider introduction to student education. Some of these reasons were the availability of broadband Internet, the high cost of technology, lack of flexibility and widespread use of information technology among the students themselves. However, due to the rapid development of the technology itself, as well as the availability of broadband internet, video communications are more accessible, more mobile and have greater impact on student education.

Synchronous video communication technology shows a high potential for education, it is suitable for small and large groups, offers a variety of tools for meaningful interaction and has applications in a wide range of values. They allow a combination of several technologies that enable simultaneous communication and interaction, and the possibility of using multiple media in different ways. Video communication provides an opportunity for authentic online collaborative learning (formal and informal), which is also its greatest potential because the way that affects the online learning environment is that it moves it closer to face-to-face communication [13]. New video communication technologies have the potential to give students

the freedom to interact with each other and their teacher in accordance with their learning needs and agreed plans for achieving the learning objectives and outcomes. Video media can empower successful learning because mutual face-to-face communication encourages the development of trust within the learning community, allowing students to support each other in various ways on their way.

The intention of the videoconference is not only to create space for new communication, but also encourage critical dialogue instead of a regular discussion, dialogue that supports thinking and reflection in real-time which promote deeper more powerful learning in a more positive and relaxed environment. Acceptance of new technologies and their potential for the development of critical education, does not mean at the same time diminishing the importance of teachers in the educational process, but on the contrary, teacher role is even more important and more active than ever before [10] [15] [16].

4. Importance of dialog in synchronous video communication

4. *Važnost dialoga u sinkronoj video komunikaciji*

The asynchronous component, that Moodle has to offer, has great value in the collaboration (wiki, sharing documents, forums, databases ...) and it is to a certain extent irreplaceable, but what tools for synchronous collaboration has to offer, asynchronous cannot match. This primarily refers to the dialogue that takes place among students or between students and the teacher in real time. Although synchronous communication includes chat rooms and discussion boards, when it comes to the dialogue, video conferencing is much natural because it uses both verbal and non-verbal signs, so there is less chance for misunderstandings [17].

The use of video communication in CSCL, encourage students to create knowledge through dialogue and sharing of different perspectives. Conditions for such dialogue should be based on ethical and moral values, and thus fosters thoughtfulness and holistic thinking [13]. All this leads to the creation of new opportunities that

students can explore. Unlike traditional forms of teaching that represent a one-way transfer of knowledge from teacher to student, „dialogue represents a give and take, a creation and re-creation, a process of risk and reward" [18]. This approach moves towards the ideals of Paulo Freire, whose philosophy encourages emancipatory learning. In his ideals, teachers should leave behind the traditional learning process of memorizing facts and start encouraging students to engage, dialoging and problem solving with other students [3] [19], as opposed to banking concept, where knowledge is owned by the teacher and its transfer to students is direct and one-sided. By shifting teaching practice to his ideals, students are being treated as responsible human beings who are ready to enter the world with the ability to think, and not manipulable objects .

Simply said, dialogue implies a sincere exchange of words and ideas, between students who enjoy the same role in the process. Dialog "is the encounter between men, mediated by the world, in order to name the world. Hence, dialogue cannot occur between those who want to name the world and those who do not want this naming—between those who deny other men the right to speak their word and those whose right to speak has been denied them." [3].

True dialogue is possible only in conditions in which no one imposes their ideas to others, in which one person does not act on another, but work together with each other. The dialogue allows the exchange of opinions, spreading the difference, consensus building and reflective practice. And such dynamic conditions that occur through dialogue, can lead to the creation of new knowledge.

5. Teacher's Role

5. *Uloga nastavnika*

A shift from the traditional teacher-oriented education, to teaching that focuses on student and interaction among students, also changes the role of teacher. The teacher dismisses traditional role, and assumes the role of facilitator. Although the more control over learning is given to the students, learning still needs to be planned in order to achieve planned outcomes. However, there are several

different ways, in which students can come to outcomes, than it was in traditional learning where the emphasis was on teaching instead of learning [13].

The teacher's role is even more important than in traditional teaching because the teacher must create a environment in which students will become aware of their possibilities as critically engaged citizens. The teacher has to design and organize all the cultural elements that are involved in the educational context, and same as the architect, he needs to organize the content in which student experience will take place [19].

Such a dialogue that takes place between the students must not be empty, must not be reduced to mere talk, but it must be constructive and concentrate around the real problem. This means that it must be the problem for which they care, and must include the problems which make sense to them. In terms of Vygotsky, in the zone of proximal development, it should be a problem that challenges their current understanding, but is in the reach of their understanding if they have the support of students who are working with them. In other words, if they work collaboratively on the problem which each member individually would not know to solve [8] [10]. Students should know and understand that their interactions in the group are connected with others in such a way that success can only be achieved if they all contribute and work together. The teacher must create such positive interdependence among students, because knowing that someones participation is essential for the entire group, can be a powerful motivating factor.By this means students, by themselves, are gathering the knowledge and solutions to problems that was set up by a teacher, and so they are able to pass on their knowledge in another context [20].

The work of students is also affected by their perception, so the negative perception leads to a negative effect, while positive perception leads to positive results [21]. Based on that, it is of great importance that teacher prepares students for video collaboration through the technical and educational aspects. In other words, they need to receive training before taking a course, so they can understand what the technology can achieve, and what its limitation are, and also they must know what is expected of them. Pedagogy

itself should not be a method or technique that is imposing to students, but a political and moral practice that provides knowledge, skills and social relations, which enable students to expand their opportunities and become more aware of the critical importance of being a citizen in a democratic society [3] [4]. Such an approach, which shifts the learning focus to students and their interactions, creates uncertainty that did not exist before. The teacher is no longer the safe zone in which he has complete control, but is faced with a variety of unpredictable obstacles. The teacher, as a facilitator, especially should pay attention to potential obstacles (student in the group can not or does not want to participate in the work, technical problems ...), and in such cases to make alternative plans.

6. Conclusion

6. Zaključak

This paper showed some of the potential of videoconferencing as a rich media that is able to enhance CSCL using Moodle upgraded with BBB. In order to fulfill the purpose of higher education institutions for critical education of citizens, including the revitalization of democracy itself [4], it is extremely important to provide students with the opportunity to develop a dialogue. Since most institutions have limited physical space in which students are able to find and keep a dialogue, VLE (virtual learning environment) is the appropriate solution. Because

of the open source and interoperability Moodle and BBB proved to be more than suitable for the creation of a virtual environment in which student collaboration can take place.

Model of using video conferencing, presented in this paper, puts the difference between content oriented learning and learning with a focus on student interaction through videoconferencing collaboration. While it is proposed that the control of the learning process is placed fully into the hands of the student, it does not mean that learning is unplanned, but that the role of the teacher is to create conditions for such collaboration and student motivation [13]. The emphasis is on empowerment of mutual student interaction as the foundation of learning. Enabling students to participate in the construction of the learning process, encourages them to embrace education as its own project, something they themselves can create. In other words, they no longer have to wait passively to be told what to do [19].

Educational institutions that plan to use video conferencing in teaching, must be aware that such courses require more time for organizing and structuring then the traditional one. Teachers need to be familiar with the technology, must be aware of different teaching conditions and make changes in the organization and management of the course. But also they must keep in mind that education should help us fight the ideological delusion, and that the main goal of education is not only preparing for the "career", but preparing for self-managees life [22].

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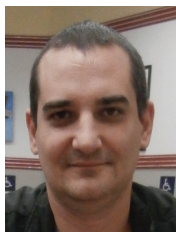
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VIDEO MEDIA OF NEAR INFRARED AND VISUAL SPECTRUM IN CREATION OF SCIENTIFIC AND EDUCATIONAL CONTENT

VIDEO MEDIJ BLISKO INFRACRVENOG I VIZUALNOG SPEKTRA U KREIRANJU ZNANSTVENO OBRAZOVNIH SADRŽAJA

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Sažetak

U radu je predstavljeno dizajniranje paralelne video produkcije u vizualnom i blisko infracrvenom spektru. Konstruiran je sustav dvije kamere koje bilježe okolinu istog vidnog polja zapisom kroz dva različita filtera. Na jednoj kameri postavljan je filter koji omogućuje snimanje vizualnog područja, a na drugoj kameri je filter koji bilježi samo blisko infracrveno područje. Promatranje dvostrukog spektralnog područja predstavlja novi način gledanja na okolinu i kretanje ljudi. Uvodi se aktivno bojanje odjeće za blisko infracrveni spektar za postizanje InfrareDesign (IRD) scenskih efekata. Za uspješno integriranje budućeg snimanja u dvostrukom spektru i bilježenja informacija u svakodnevnom životu ili za eksperimentalne potrebe pridaje se važnost edukaciji mladih za stvaranje kompetencija oblikovanja sadržaja u dvostrukom spektru. Dosadašnje publikacije u svojem pisanom obliku i uz korištenje slika imaju ograničenja prilikom prikaza video medija kao sastavnog dijela obrazovnog sadržaja. Obrazovni materijali i istraživanja paralelnih video materijala moraju se prilagoditi formatom i načinom objavljivanja. U radu se predlaže uvođenje online sjedišta jednostavnih adresa kao platforma za znanstveno obrazovanje putem digitalnih medija. Korištenjem predloženog načina objavljivanja znanstveno stručnih istraživanja koristi se puni potencijal dostupnih medija za objavljivanje integriranog multimedijskog sadržaja kojim je jedino moguće komunicirati ovakve poruke bez uskraćivanja specifičnosti određenih sastavnica.

Ključne riječi: *blisko infracrveni video, obrazovna literatura, znanstvene publikacije, edukacija*

Abstract

This paper presents the design of parallel video production in the visual and near infrared spectrum. Two cameras system is designed to record the environment of the same visual field through two different filters. Integrated in one camera is a filter that allows us to record the visual areas, while the other camera includes a filter that captures only the near-infrared area. Observation of double spectral areas represents a new way of environment and movement observation. In order to achieve InfrareDesign (IRD) scenic effects, active coloring of clothes for close infrared spectrum was introduced. In order to successfully integrate future dual range recording as well as recording information in everyday life or for experimental purposes, a significant importance is placed on educating young people to achieve competence for designing content in dual spectrum. Previous publications in writing material and with images have limitations when it comes to viewing video media as an integral part of the educational content. Educational materials and parallel video material research must be adapted to the format and method of publication. The paper proposes the introduction of online center as a platform for science education through digital media. Using proposed method for publication of scientific and technical research the full potential of available media is used to publish an integrated multimedia content that is only possible to communicate these messages without denying the specificity of certain components.

Keywords: *near infrared video, educational literature, scientific publications, education*

1. Uvod

1. *Introduction*

Razvitak digitalne tehnologije i dostupnost multimedijske opreme otvorile su mogućnosti prezentacije kompliciranih tehničkih i društvenih znanstvenih radova koristeći razne multimedijske elemente. Uporabom slike, zvuka, videa i animacija obogaćujemo prezentiranu tematiku informacijama koristeći multimedijske elemente gdje su autori u mogućnosti detaljnije i jasnije iskomunicirati svoja istraživanja. [1] Video radovi definirani su kao «video prezentacije koje opisuju određeno znanstveno istraživanje, odnosno komuniciraju istraživačku pozadinu, metode i rezultate kroz upotrebu slika, zvuka, videa i teksta.» [2]. Journal of Visualized Experiments (JoVE) krenuo je sa radom 2006. godine kao pionir u izradi online video apstrakta kao sastavih dijelova znanstvenih radova.[3] Postavljanje video apstrakta u online okruženje radovi postaju marketinški vidljiviji i pristupačniji za širu publiku, a samim time podiže se vrijednost kako znanstvenog rada tako i časopisa koji izdaje radove. [4,5]

Video medij u istraživanju vizualnog i infracrvenog spektra potreban je kako bi se uspješno prikazali dijelovi istraživanih materijala u dva spektra. Dosadašnje nadzorne kamere snimaju video zapise isključivo u jednom spektru. Kamera ima jedan objektiv koji uz dnevno svjetlo snima sliku vizualnog spektra ili u boji ili crno bijelo, zavisno o vrsti kamere. U nedostatku sunčeve svjetlosti kamera snima blisko infracrvenu refeksiju materije u rasponu od 850 do 1000 nm. Odvojeno snimanje vizualnog ili infracrvenog spektra istom kamerom moguće je zbog tehničkih karakteristika CCD čipa unutar kamere. Kamera bilježi sliku na CCD čip osjetljivom na područje svjetlosti do 1400 nm.[6] Snimljeni infracrveni video zapis snimljen prikazan je kao crno-bijela (siva) slika. [7] Konstuirana je dualna kamera (ZRGB kamera) složena od dvije zasebne kamere gdje objektivi jedne kamere snimaju vizualni spektar (RGB: 400 do 700 nm), dok druga kamera promatra apsorpciju blisko infracrvenog spektra materije kroz jedan kanal Z na 1000 nm. [7,8] ZRGB kamera paralelno bilježi RGB i Z pokretnu sliku snimane okoline. Kamera koristi dnevno svjetlo

bez zasebno ugrađenog infracrvenog izvora što omogućuje snimanje objekata u neposrednoj blizini i na velikoj udaljenosti. [6,7,8] Eksperimentalni dvostruki snimak prikazan u objavljenim radovima pokazao je zanimljivosti promatranja bojila odjevnih predmeta snimanih ljudi. ZRGB kamera korištena je kao alat za pasivno promatranje skupine studenata prilikom posjete jedne zagrebačke tvrtke. [7] U infracrvenom spektru uočene su razlike u odjeći studenata ovisne o korištenim bojilima za tekstil. Upravljanje bojama do sada se bavila perfekcionizmom obojenja za vizualno doživljavanje boja [8]. Iz razloga preglednosti snimljenog sadržaja predlaže se paralelni prikaz video materijala. Korištenjem novog načina dizajna komunikacije u vizualnom i infracrvenom spektru materije nužna je daljnja edukacija i istraživanje ovoga područja. Za pravilni prikaz ekperimentalnih rezultata tiskani medij i znanstvene publikacija nisu dovoljne već autori kreiraju online sjedišta jednostavnih web adresa za objavljivanje svih snimljenih video materijala.[9]

2. Utjecaj online video sjedišta

2. *Impact of online video web pages*

Video materijali u znanstvenim i obrazovnom procesu kratke su video prezentacije u trajanju od 3 do 5 minuta koje objašnjavaju sažetak rada i istraživanog područja. Video rad u nekoliko minuta objašnjava osnovne postavke provedenih istraživanja. U online video okruženju autorima je omogućeno opisati stvari koje ne mogu u tiskanim izdanjima napraviti – pokazati eksperimentalne metode, laboratorijske radove i istaživačke procese te objasniti motivaciju za određenim istraživanjem. Autori također koriste video materijale za prikazivanjem sebe i svojih znanstvenih istraživanja u «opuštenijem» elementu, pokušavajući približiti tematiku široj ciljanoj publici. Veliki broj video radova izrađen je kao pregled istraživanja, odnosno opisuju kako će nešto biti objašnjeno, te na taj način privlači čitatelje da kupe ili pregledaju cijeli članak. Video članci mogu podići online vidljivost, navoditi veći broj ljudi tehničkim člancima te također informirati veći broj ljudi o istraživanoj tematici. Video članci se mogu naći na nekoliko online sjedišta i razlikuju se u svojoj duljini,

tehničkim formatima, kompozicijama kadrova, intelektualnim pravima. Internet video sjedišta i multimedijski video članci svojim mogućnostima umrežavanja i veće vidljivosti služe izdavačima i časopisima za povećanje vidljivosti i citiranost te privlačenje sve većeg broja čitatelja. Iako video materijali mogu biti spor mehanizam za pretraživanje velikog broja radova, kod mlađih autora ovakav način pregledavanja velikog broja video članaka u kratkom vremenu brzi je način istraživanja referentne literature. Video članci su korisni za znanstvenike kako bi prilikom objašnjavanja proučavane tematike povećali svoje komunikacijske sposobnosti i unaprijedili ono što tekstualni zapis plošno prezentira. Strukturiranost i jasno definiranje eksperimentalnog procesa vrlo je važno prilikom kreiranja scenarija za najbolji način kako da se nešto objasni i napiše. Na autorima je zadatak da osmisle jednostavno objašnjenje kompliciranih pojmova uz pomoć slike, zvuka i ostalih medijskih elemenata.

3. Integracija multimedijskih elemenata u istraživanju spektralnih video blizanaca

3. *Integration of multimedia elements in research of spectral video twins*

U istraživanju teme video reprodukcije vizualnog i infracrvenog spektra izrađeni su spektarni video blizanci. Snimljeni su na odvojene kartice za snimanje video materijala. Uz pomoć aplikacija za obradu videa snimke se obrađuju i kreirao se paralelni usporedni prikaz dvostrukog spektra. Pripremljeni video materijali postavljeni su na standardnu video online platformu – Youtube i vimeo – sa mogućnošću ugrađivanja videa na sve daljnje web odredišta. Kreirana je web stranica jednostavne adrese (http://zrgbfilm.svemir.hr) kao početnog mjesta za objavljivanje svih daljnih radova, snimljenih materijala i istraživanja iz ovoga područja. Svaki objavljani rad ima svoj naslov i svoju naslovnu ilustraciju. Pregledavajući svaki rad zasebno on se sastoji od tekstualnog dijela apstrakta, dok se preostali dio rada ovisno o pravima može u potpunosti preuzeti na vlastito računalo. Uz sažetak, grafički su poredani svi vizualni multimedijski elementi grafika, slika, videa i animacija kako bi prezentirana tema video blizanaca vizualnog i infracrvenog spektra bila

kvalitetno i detaljno obrazložena. Predavajući studentima, kao korisnicima ove tematike, primijećuju se sljedeći koraci njihovog ponašanja – prvo pregledavanje cijele stranice (scroolanje), nakon toga pregledavanje statičkih medija (slika i grafika) uz paralelno brzo iščitavanje tekstualnog dijela sažetka rada. Nakon toga detaljno se pristupa pregledavanju video materijala koji je u velikom broju ispitanika pogledan do zadnjeg snimljenog kadra. Nakon daljnjeg razgovora sa studenima oni vrlo uvjereno obrazlažu pregledani rad izdvajajući važne informacije koje su bile prezentirane integracijom različitih medija. Tek ulaskom u detalje i znanstvenu nadogradnju tematike pojavila se potreba za pristupu cjelovitog teksta na daljnu analizu.

4. Zaključak

4. *Conclusion*

Ljudi percipiraju okolinu i uče na različite načine. Korištenjem multimedije otvara se mogućnost individualiziranog pristupa predstavljanja i razumijevanja informaciju. Integracijom medijskih elemenata prikazujemo veliki broj informacija koje tiskani medij nije u mogućnosti kvalitetno prenostiti. Na autorima je zadatak ocijeniti koje informacije znati postaviti u koji medij.

Kreiranje online video sjedišta za eksperimentalne radove i daljnju edukaciju nužan je u današnjem multimedijskom svijetu komunikacije. Kroz medijski prikaz znanstvenih radova omogućeno je širenje informacija na veću publiku te jednostavniju i sigurniju nadogradnju daljnih istraživanja. Vrlo je važno kreirati jednostavne i «user friendly» okruženja za znanstvenike i autore koji nisu skloni korištenju i obradi različitih medijskih elemenata. Bitno je educirati ljude kako raditi kvalitetne video materijale da video ne bi ispao presmiješan ili se previše ne bi izdvojio iz tematike. Tada se gubi zanimanjnje i cilj određenih istraživanja.

Osnovna ideja korištenja medijskih elemenata u znanstvenim radovima nije negiranje postojećeg načina već njegova nadopuna i korištenje prednosti interneta, njegovo umrežavanja i mrežno granjanje informacija. Predlaže se nadogradnja i razvijanje aplikacija za online čitanje i pregledavanje video i tekstualnih

članaka na internetu. Ističe se važnost arhiviranja i pravilnog indeksiranja svih audiovizualnih podataka te "iskorištavanje" arhiviranih podataka u obliku dokumentarnih filmova.

Predlaže se cjeloživotno obrazovanje u znanstvenom izdavaštu za edukaciju osnovnih načina obrade multimedijskih elemenata kako bi se u online okruženju pojavili kreativni video zapisi znanstvenih istraživanja svih područja.

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Ivan Rajković rođen je u Zagrebu 1978. godine. Diplomirao je 1997. na Akademiji Dramske Umjetnosti na smjeru Filmska i TV montaža. 2002. završava Tehničko Veleučilište u Zagrebu smjer elektroničko poslovanje. Executive Master of Business Administration (Cotrugli MBA) uspješno završava 2012. godine, te zatim nastavlja obrazovanje na Carnetovoj E-learning akademiji na smjeru E-learning management. Predavač je na TVZ-u na kolegijima u području medija i multimedije. U toku mu je obrana doktorskog rada na smjeru grafičke tehnologije na Grafičkom Fakultetu u Zagrebu.

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USING VIDEO JOURNALS IN ACADEMIC SERVICE-LEARNING

VIDEO DNEVNICI U AKADEMSKOM DRUŠTVENO KORISNOM UČENJU

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Abstract

This paper chronicles experience of one of its authors (Nives Mikelić Preradović) with video journals in the service-learning course with year-5 students of Information Sciences at the University in Zagreb (Croatia) specialized in the following fields: Archival Science, Library Science, Museology, and Informatics Teacher Education. The first part of the paper introduces academic service-learning and outlines previous experiences with video journals in service-learning. The second part of the paper describes service-learning at the University of Zagreb, and briefly introduces research methodology. The third part of the paper presents two case studies of using video journals in academic service-learning: TiM: Ti i Muzej (Team: You and Museum) and Readers' Club Knjigotron. The last, fourth part of the paper, analyses case studies and describes advantages and obstacles to introduce video journaling in service-learning. The paper confirms earlier research in conclusion that the main obstacles to such implementation are technical skills related to video production. However, it also shows that widely available equipment, such as phones and computers, satisfies the needs of service-learning. Therefore, in contrast to earlier research, it seems that equipment has ceased to be an obstacle. In spite of differences in technical proficiency and quality of final videos, students in both groups have met learning outcomes and acquired appropriate critical skills. Instead of speaking of video proficiency, therefore, the paper suggests that future research should turn into the direction of video literacy.

Keywords: service-learning, video journal, case study, video production, video literacy

Sažetak

Rad opisuje iskustva jedne od autorica (Nives Mikelić Preradović) sa video dnevnicima u kolegiju na temu društveno korisng učenja sa studentima pete godine studija informacijskih znanosti na Filozofskom fakultetu Sveučilišta u Zagrebu koji se specijaliziraju u sljedećim smjerovima: arhivistika, bibliotekarstvo, muzeologija, i nastava informatike. Prvi dio rada uvodi akademsko društveno korisno učenje i opisuje ranija iskustva s video dnevnicima u društveno korisnom učenju. Drugi dio rada opisuje društveno korisno učenje na Sveučilištu u Zagrebu i kratko opisuje istraživačku metodologiju. Treći dio rada prezentira dvije studije slučaja: TiM: Ti i Muzej i Čitateljski klub Knjigotron. Zadnji, četvrti dio rada analizira studije slučajeva te opisuje prednosti i mane uvođenja video dnevnika u društveno korisnom učenju. Rad potvrđuje rezultate ranijih istraživanja u zaključku da se glavne prepreke nalaze u području tehničkih vještina povezanih s video produkcijom. Međutim, on također prikazuje da široko dostupna oprema, poput telefona i računala, zadovoljava zahtjeve društveno korisnog učenja. Dakle, u suprotnosti sa ranijim istraživanjima, rad zaključuje da je oprema prestala biti preprekom za uspješno društveno korisno učenje. Usprkos razlikama u tehničkim vještinama i kvaliteti završnih video radova, studenti u obje grupe postigli su ishode učenja i stekli odgovarajuće kritičke vještine. Umjesto daljih istraživanja u području tehničke spremnosti, dakle, rad sugerira da buduća istraživanja treba usmjeriti ka video pismenosti.

Ključne riječi: društveno korisno učenje, video dnevnik, studija slučaja, video produkcija video pismenost

1. Introduction

1. *Uvod*

Service-learning is widely defined as a form of experiential education that integrates meaningful community service into the curriculum [1]. Academic service-learning connects the goals of higher education with the needs of society through student active participation in structured cooperative activities that address community needs [2]. Students are encouraged to utilize classroom knowledge for improvement of local communities. During the process, they develop critical thinking, interpersonal, and professional skills [3]. Service-learning consists of two main elements: (1) engagement within the community (service), and (2) critical reflection on that engagement (learning). According to Bringle and Hatcher, these elements should be balanced by engaging students to "participate in an organized service activity that meets identified community needs", and "reflect on the service activity in such a way as to gain further understanding of course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility" [2: 112]. Critical reflection takes place before, during and after the service, and allows students to perceive influence of their service on the community and on own learning.

This paper explores opportunities for development of critical reflection in service-learning using video journals. It introduces critical reflection and describes a service-learning course in information and communication sciences tutored by one of the co-authors. Using the methodology of case study, it analyses two video journals produced during the course in collaboration with different partner institutions: a museum and a public library. Based on previous experiences [4], it conducts the analysis from the position of four main stakeholders: students, teachers, community partners, and the local community. Outcomes are measured in relation to five generally accepted criteria in the field of service-learning: video completion, community partner satisfaction, teacher satisfaction, student satisfaction and skill development [5] [6]. Video completion is defined as student ability to complete the video journal; community partner

satisfaction is assessed through verbal feedback; teacher satisfaction is perceived as student achievement in regards to critical thinking; student satisfaction is assessed through the online course evaluation at the end of the semester; skill development is carried out by a teacher who evaluates video journals and decides whether it enabled students to develop new skills.

2. Critical Reflection and Journaling in Service-Learning

2. *Kritička refleksija i dnevnici u društveno korisnom učenju*

Critical reflection in service-learning is commonly fostered by reflective journaling and discussion [7: 26]. Reflective journaling enables students to provide some structure to often unpredictable and unstructured service-learning experiences [8] [9]. Student journals facilitate the process of reflection as "a medium through which students can record their actions and observations, as well their emotional and intellectual reactions to community experiences" [10: 44]. Reflection journals are also found to enhance critical thinking [11] and facilitate learning [12]. Additionally, reflective journals provide students with the opportunity to articulate their learning process and develop fresh perspectives.

There are many different techniques for reflective journaling. Usually, students are requested to write journals where they identify a social issue, research the identified issue on-site and in literature, analyze their on-site experiences, and write recommendations for future projects. Stevens and Cooper [9] list a number of ideas for journal-writing activities, many of which might be transformed to video journaling. For example, students might write or record imaginary dialogues with community partners in order to understand their perspectives. Or, they might create concept maps, list key elements in their project, cluster related elements, and building relationships between them. Teachers may provide students with a list of guiding questions, or key terms. The resulting journal may contain different types of entries: daily logs, summary logs, reflections, and milestones. It can also be developed as a list of words that describe student feelings, actions, thoughts and contradictions.

Depending on learning context and learning outcomes, teachers can employ any of these techniques or combinations thereof.

During the past decades, cameras, video editing software, and hosting space have become more and more available. Consequently, an increasing number of service-learning courses foster critical reflection through weblogs and online journals [13] [14]. The positive effects of video media on student achievement and attitudes were already documented almost two decades ago [15]. Video is a powerful tool for learning, teaching and presentation, and provides many advantages over traditional writing-based classroom activities such as richer learning content, and visual documentation of student psychological, social and emotional intellectual development.

However, video blogging and video journals still have not been used much [16] [17]. A single search for "service-learning (video) journal" on YouTube results in 32 videos in English, 28 of which are individual short student video blogs, while the rest are service-learning orientation videos. A slightly modified search with the phrase "service-learning reflection" on YouTube results in 333 videos in English, most of which are (again) individual student video blogs of about 2-3 minutes. These videos typically indicate the lack of appropriate equipment and basic video editing skills (e.g., a loud background noise, poor quality of the footage, low-quality microphone, etc.). A single search for "service-learning (video) journal" on Vimeo returns no results, but a search for "service-learning video" retrieves 22 videos in English, most of which are group video journals of elementary and secondary school children. In comparison to individual video journals, group video journals are of much better quality. These results relate to early findings of Malvey, Hamby and Fottler [18], who report the lack of hardware/software reliability as the basic limitation for online video journaling in service-learning.

In order to deliver an effective video, students need to write a storyboard and prepare an engaging script. Then, they need to engage in various processes related to video production: use a camera, compose clear and aesthetically pleasing shots, streamline the video, do basic video editing, cut the video that looks professional, and provide broad technical compatibility for the final product (i.e. desktop computers, smart phones, tablets, etc.). In this study, students of information and communication sciences have obviously arrived with a lot of previous knowledge. Looking at a general population, however, it is perhaps too much to expect that students will come with a working knowledge of multimedia learning theories, media psychology, and technical production.

3. Service-learning graduate course in University of Zagreb

3. *Predmet na temu društveno korisnog učenja na Sveučilištu u Zagrebu*

Service-learning was introduced to the University of Zagreb in 2006-2007 through the series of workshops and seminars aimed at its faculty. In 2009-2010, the Department of Information and Communication Sciences offered the first stand-alone elective course on service learning in Croatia which soon received remarkable student enrolment. This researched course is aimed at exposing graduate students to the theory and practice of service-learning, to encourage civic engagement, and to meet the demands of global and diverse educational marketplace. Participants in this study are year-5 students of information sciences specialized in the following fields: Archival Science, Library Science, Museology, and Informatics Teacher Education. During the course, students are expected to complete a minimum of 45 hours of community service (3 hours per week during 15 weeks) and academic requirements of the course. Community service is conducted in conjunction with weekly class meetings.

Participating in different critical reflection course activities, students need to demonstrate what they have learned during their service experience. Therefore, they are offered both individual and collaborative assessment tools. Individual assessment consists of student journals, which can be presented in a written or video format. Journals needs to bring about personal experience, knowledge and skills acquired during the semester, relevant literature resources used in the project, specific contributions to the community, and clear connections between

students' service-learning experience and their future qualification. Learning outcomes for this reflection activity are: (1) Student needs to understand and analyze literature about different types of service-learning activities. (2) Student needs to understand the difference between service-learning volunteering and student practicum (3) Student needs to critically think about own project, forming arguments and counter-arguments. (4) Student needs to participate in group projects aimed at developing information technology solutions that follow the thematic content of the study. (5) Student needs to acquire transversal competencies: critical thinking and active citizenship.

The collaborative assessment tools are: project application, final project report, in-class oral presentation of the project application and the final report, critical project e-portfolio on Mahara, and showcase e-portfolio on Google site, Prezi or YouTube. Assessment of project application includes evaluation of the project goals according to SMART criteria (specific, measurable, achievable, realistic/relevant, time-oriented) and the selection of the community partner. Assessment of the final project report includes evaluation of completed project goals (SMART criteria), team members' skills, explanation of the community need, project structure and backup plan, project activities, outputs, milestones and deliverables, Gantt chart, etc. Learning outcomes of these two activities are: (1) Students need to learn how to write a group project applications, project plans, evaluation forms and final project reports. (2) Students need to understand project management procedures. Within in-class oral presentations, assessment includes evaluation of presentation skills, time frames of the presentation, and contact with the audience. Learning outcomes of these activities are: Students need to develop presentation skills (verbal: voice, vocal variety), non-verbal skills (gestures, facial expressions, pauses) and their transversal competencies (inter-personal skills and intra-personal skills).

The next collaborative assessment tool is an e-portfolio that needs to be developed on Mahara ePortfolio system. This tool enables formative assessment of learning, since each group portfolio needs to represent the critical reflection of the project team and other teams in the service-learning course. In the e-portfolio, students are expected to use multimedia (video, pictures, attachments) that represent their learning curve over the course of semester. Also, they are expected to post comments on other projects in the Mahara system. The last assessment tool is a showcase e-portfolio on Google site, Prezi or YouTube. This tool enables summative assessment of learning, which includes evaluation of presentation structure, use of keywords, different media and content. The created video or website need to be informative, relevant, aesthetically pleasing, engaging and well-designed. Learning outcomes of this activity are: (1) Students learn to use the appropriate tools to create the showcase e-portfolio. (2) Students need to develop presentations (the ability to make effective, high-level presentations that are needed for effective communication of complex ideas). Students need to develop transversal competencies: multi-literacy, inter-personal skills, ICT skills and intra-personal skills.

4. Case Study I: TiM project

4. *Studija slučaja I: TiM projekt*

4.1 Community Need

4.1 *Potrebe zajednice*

In the contemporary society, roles and functions of museums have significantly changed. Contemporary museums turn visitors from mere observers into active participants. However, there is still a fundamental lack of awareness of the importance of a museum among the elementary school students - 1st to 8th grade. Many students find museum visits uninteresting, tiresome and even useless. Also, Croatian elementary school curriculum does not include student visits to institutions of cultural heritage [19]. On the other hand, if students receive high quality educational guidance in museums during their formative years, they are given a chance to fully understand the importance of cultural inheritance and social context of museum exhibits. Therefore, the aim of the project, titled TiM: Ti i Muzej (Team: You

and Museum) is to highlight the importance of systematically organized age- appropriate school visits to museums.

4.2 Student - Community Partnership

4.2 *Partnerstvo između studenata i zajednice*

The project was established through a collaboration between students of Information and Communication Sciences from the Faculty of Humanities and Social Sciences, University of Zagreb (who needed to obtain the field experience), the elementary school Cvjetno Naselje (which needed to expand its involvement with the local community), and the Museum of Arts and Crafts in Zagreb (which needed to increase the number of elementary school students visiting museum and recognizing museum educational activities).

4.3 Project Design

4.3 *Dizajn projekta*

Elementary school students (seventh and eighth graders) have visited Museum of Arts and Crafts with their school teachers under the professional guidance of the museum pedagogue. After the tour of the permanent exhibition, they took part in creative workshops prepared according to their age. Students of Information and Communication Sciences have documented all the activities in a video journal. They created a website with the information about the Museum, which contains a gallery of pictures showing the recent visit to the Museum, and an interactive quiz about the Museum of Arts and Crafts and its artifacts.

4.4 Video Journal

4.4 *Video dnevnik*

In the 18 minutes long video journal, university students managed to document the most interesting parts of their project. They introduced themselves, explained the background of their service-learning project, and presented project-related observations of the Head of the Educational Department of the Museum of Arts and Crafts. The video also documents the visit

of elementary school students to the permanent exhibition of the Museum of Arts and Crafts, and their participation in the workshops. Finally, the video contains recorded interview responses of boys and girls visiting the museum.

In the journal, girls from the 7th grade expressed their appreciation of the contemporary artist Boris Badurina. They also found it interesting to see all the artistic periods in one place, and to be able to notice the differences in styles from furniture to clothing styles. At the end of the interview, female pupils have concluded that they never expected to acquire so much knowledge in the museum. Boys admitted that they (and their peers) rarely or never visit museums. For some of these thirteen year old boys, this was their first visit to the museum in their lives.

Eighth-grade pupils emphasized that this visit enabled them to connect the lessons learned in school with real museum artifacts. During school classes, they do not have an opportunity to link historical facts to material artifacts, so they lack actual perception of life in a specific historical period. They abandoned the prejudice of museums as places with dusty antiquities, boring remains and scraps.

4.5 Outcomes

4.5 *Ishodi*

Measure 1: Video realization
In spite of compressed time format, lack of appropriate equipment, and lack of advanced video editing skills, university students managed to create the video, insert background music and summarize the whole project experience in 18 minutes of the video journal. This provided them with an experience of making video journals for a service-learning course, as well as with better understanding of the benefits and issues associated with such projects, including time constraints and effectiveness.

Measure 2: Community partner satisfaction
After watching the video, the Head of the Educational Department of the Museum of Arts and Crafts expressed very positive comments on the student project and the video, and students found these comments encouraging. Also, the

Head expressed satisfaction with the collaboration with university students and the high level of their technical preparedness, as well as with their willingness to understand the needs and demands of the Museum.

Measure 3: Teacher satisfaction
The group video journal was used by university students to document their service-learning project experience, and by their teachers as a tool for evaluation. During the semester, university students were introduced to critical reflection activities (journals and portfolios) that were assessed at the end of the course. Students could have used either e-learning tools available through Moodle and Mahara (ePortfolio system), or they could have created group video journals that represent their learning curve over the course of semester. Teacher's analysis of this video journal confirmed that students' service-learning project enabled meaningful teaching and learning experiences.

Measure 4: Student satisfaction
All four participating university students stated that they gained a valuable teaching experience through designing the interview questions for elementary school pupils and explaining them the concepts related to the museum (such as "curator" or "depot"). Working in a group setting allowed students to exchange ideas with their peers and to learn from each other. This was especially important because students had different backgrounds in information technology and video editing. All students have recognized the emerging role of information technologies in shaping their participation in the community, and have discovered ways in which video journals can be used to address challenges of developing and facilitating service-learning experiences.

Measure 5: Skill development
In the group video journal, university students have documented the actual project that was implemented in a real world setting. Apart from the development of their leadership, communication and teamwork skills, they have also contributed to the quality of the Museum's educational program in an informal learning environment. Students were able to apply their

classroom learning in the video editing process, organize raw footage from the video shoot, cut, paste and retime the material. Students applied color correction and other editing effects, and aligned the video to the earlier developed storyboard. They made the graphic and text overlay (inserting names and roles of participants in the video during their interview) and added the background music. Moreover, they rendered their video journal in order to publish it in one of the popular streaming video websites and, finally, uploaded it to YouTube channel.

Limitations and Challenges
The first video journal performed well on all five measures of feasibility, suggesting that group video journals are feasible in service-learning courses. Students conducted their interviews with own equipment (built-in mobile phone cameras), so poor quality of the footage represents the main limitation of their video journal. The recorded content was at some points very difficult to listen to, view and examine for the evaluation purposes. However, students have put forth enough effort to acquire necessary video editing skills and to extract the material that represents the most valuable reflections of elementary school students and their community partners. In spite of poor quality of the raw footage, students were able to develop critical thinking about their project, which resulted in careful decision making in the selection of the video material to be used in the journal.

5. Case study II: Readers' Club Knjigotron

5. *Studija slučaja II: Čitateljski klub Knjigotron*

5.1 Community Need

5.1 *Potrebe zajednice*

Children learn about the world and other cultures through the social messages found in stories. Stories help children understand how society perceives their culture as well as the cultures of their classmates, teachers, caregivers, and others, thereby influencing their social and identity development....... One place that children can interact with stories on a regular basis is the library. [20: 2]

In the library, children spend time looking for a new and interesting content, and they are surrounded with children with similar interests. Unfortunately, interviewing school children from the local neighborhood, students of Information and Communication Sciences from the Faculty of Humanities and Social Sciences, University of Zagreb found out that elementary school children rarely visit the local public library. Guided by parents and teachers, children of a younger age (7 to 10 years old) like to visit the local library. But, as they grow older, they cease to perceive the library as a place to play, learn and make friends. Some children never pay a visit to the library, and expect their parents to borrow the required readings for them. The project named "Readers' club for children Knjigotron" was conceived as a meeting point for children, university students and professional librarians. The aim was to offer creative workshops for children of 11 to 13 years old, which is a critical age at which worldwide children stop coming to the library (EU Directorate General Education and Culture, 2013).

5.2 Student - Community Partnership

5.2 *Partnerstvo između studenata i zajednice*

The project was established through a collaboration between students of Information and Communication Sciences from the Faculty of Humanities and Social Sciences, University of Zagreb (who needed to obtain the field experience), Children's Library "Marin Držić" in Zagreb (which needed to increase the number of elementary school students visiting library and recognizing it as a place for informal learning) and the elementary school Rapska (which needed to expand its involvement with the local community and increase the awareness about the importance of reading among children).

5.3 Project Design

5.3 *Dizajn projekta*

In "Readers' club for children Knjigotron", children aged 11 to 13 were encouraged to express themselves in writing, drawing and acting. University students aimed to provide children who love books with quality content. They also aimed to gather children who were not fans of books to

encourage them to socialize, play and participate in informal learning within the library setting. University students held several workshops in Children's Library "Marin Držić", designed a poster and a video journal, conducted surveys about reading habits of school children, and conducted evaluation of workshops. The spin-off of this project is Bibliocycling (Bibliocikliranje), a new project where the idea of the Reader's club was connected to bicycles, which involved the Faculty of Humanities and Social Sciences in Zagreb, Reader's Club of the Children's Library "Marin Držić", 7 other libraries between Zagreb and Split, and Maestral orphanage in Split.

5.4 Video Journal

5.4 *Video dnevnik*

In the 10 minutes long video journal, university students have documented the idea of the Readers' club, the workflow for the project, and children's experiences with the project. The video gives the summary of children's creative expression, participation in motivational games, design of creative posters, and interviews between project team members and children. In the footage, children bring evidence of their reaction to issues encountered in everyday life and in the literature through their creative expressions, talk and play.

Readers' club for children Knjigotron was primarily designed for elementary school children aged 11 to 13, but today it is opened to all children who want to come and participate in the workshops. The video aimed to develop the positive children's attitude towards the library and to arouse their desire to spend their free time in the library. The video connects with the audience on an emotional level, inspiring a call to action from the viewer. It shows that by taking part in the Readers' club, children can socialize, play and learn.

5.5 Outcomes

5.5 *Ishodi*

Measure 1: Video realization
In spite of lack of advanced video editing skills, university students managed to create a video that will contribute to attracting children to join the Readers' club Knjigotron. At the outset of the project, student attention was focused on learning

a new set of skills over a short period of time. They have clearly defined the aim of their video journal and their target group. In the phase of recording, students aimed to document all they have done in the workshops. They wanted for their video journal to be interesting and child friendly, and also to include interviews with children. Having carefully reviewed an hour and a half of material, they selected the best frames, eliminated bad or useless frames, found suitable background music, came up with the alternation of scenes that follows the rhythm of the music, and made a brief 10 minute video journal which represents a meaningful contribution to their service-learning project.

Measure 2: Community partner satisfaction

After watching the video, the librarian from the Children's Library "Marin Držić", who closely collaborated with university students in all project activities, said the following:

This video clearly shows that the establishment of the Reader's club was a wonderful experience. I enjoyed the collaboration with such a responsible and enthusiastic project team. I was pleasantly surprised every time that students did more than they were required to (as is the case with this video). In creating the video, they harnessed all their knowledge and different skills, and this is what made it richer and better. The video is an evidence that, along with reading, workshops were also filled with a lot of entertainment and laughter. I am glad that the children who love to read had a chance to share their experiences in the video, to feel supported and to enjoy the company of their own kind. For all of us who participated in the workshops, meeting in the library was a multidimensional experience: it had a social and educational component (reading, learning and creative expression). The video managed to capture both of them. Reader's Club proved to be a good addition to the program in the Children's Library Marin Držić, which means that, as such, is necessary in the community. Workshops are continuing, and we become volunteers.

Measure 3: Teacher satisfaction

According to the teacher, this video journal is an excellent indicator of students' creativity and ability to engage intellectually, emotionally and socially. The video was used during evaluation of the project. Furthermore, it also served as a promotional video of service-learning activities in Croatia in the Europe Engage KA2 project entitled "Developing a culture of civic engagement through service-learning within higher education in Europe" [21]. The video was subtitled in English and rated Excellent by project partners from 12 European countries who work on service-learning promotion and networking. Their analysis of this video journal confirmed that students' service-learning project enabled meaningful teaching and learning experiences.

Measure 4: Student satisfaction

All six members of the project team were students of librarianship. In addition, four students had teaching competences, and one student had video editing skills. Working in a group setting, at the end of the semester, all six students gained important skills in video creation, stating that the experience of creating a video journal was more educational than a traditional written journal. They agreed that this experience enriched the knowledge gained in the study and the ability to work in teams. It also increased their self-confidence and skills such as communication, problem solving and persistence and provided them the insight to deal with their personal weaknesses and abilities. After watching the video, students claimed that the video increased their feelings of personal achievement, fostered their desire to help others, and developed a sense of social responsibility. In the process of writing the storyboard and prepare the script for the video, they learned about the purpose of their study and the needs in their local community. This whole process helped them to understand how they can involve in community activities. These experiences served as backgournd for the aforementioned spin-off project Bibliocycling.

Measure 5: Skill development

In the beginning of the project, students aimed to take advantage of the knowledge they acquired during their studies and the specific skills of each individual member. But, as the project went on,

they realized that they will need to gain more skills to complete the project, such as journalistic skills and video creation and editing skills. One team member who had experience in video creation taught the other members the basics in working with Canopus Edius 5 software. He also taught them how to record the workshop, directed and mounted the video journal that was recorded by the other members of the team. The quality of the sound captured by the camera was not as good as the quality of the sound recorded by the audio recorder, so team members had to learn how to separate the sound captured by the camera and instead use the sound recorded by the audio recorder. Although it sounded as a simple work, it was not an easy task for five beginners. However, they have very quickly mastered it, although it took them a while to place the sound in multiple frames of the video. Additionally, they learned the basic actions in the Canopus Edius 5 program, such as cutting, deleting, bonding and separation of sound and images. Finally, all students consider the most important aspects of this activity to be: teamwork, interaction with the clients (elementary school students and librarians), references for their CV, communication skills, knowledge application and being able to give of themselves.

Limitations and Challenges
This video journal performed excellent on all five measures of feasibility, suggesting once more that group video journals are feasible in service-learning courses. In order to make a high-quality video journal, however, university students had to find the professional equipment, since the built-in mobile phone cameras did not serve the purpose. Preparation of recording equipment (camera stand, cassette and camera), was a challenge because every Friday students had to borrow the expensive equipment and return it to its owner on Sunday evening. Therefore, one of the team members had to skip lectures on Fridays, four times in a row. They failed to provide a sound recorder and a microphone for the first workshop and therefore did not record interviews with children in that workshop. Also, although the scenario was created just before the first workshop, they could not follow it because they realized that they cannot expect the same

children to be present at all workshops and could not assume how children will react to their workshops. Since the five of them were total beginners in working with video, the transfer of footage to a computer represented a challenge for them, as well as browsing through the material, storage of the material, the design of the whole scenario and providing the sound recorder for the interviews.

At the end, all students were able to develop necessary video creation and editing skills, which resulted in an excellent video journal that was internationally recognized. The additional reward for students is that project Knjigotron has been recognized by the Zagreb City Libraries (ZGL) as the first Readers' club (within the ZGL) which was carried out exclusively for children [22: 15] and which became a regular activity of the Marin Držić library.

6. Discussion

6. *Diskusija*

Using qualitative research methodology based on first-hand tutoring experience by one of its authors, this paper analyses usage of video journals service-learning at the University of Zagreb, Department of Information and Communication Sciences, with year-5 students of Information Sciences specialized in the following fields: Archival Science, Library Science, Museology, and Informatics Teacher Education. Video journals created by these students have achieved remarkable results on various measures of feasibility, thus suggesting that video journals are not just feasible but actually desirable for service-learning courses at their study level. However, students of information sciences arrive with above-average previous digital skills. And, even amongst these students, warnings voiced by earlier research still achieve a lot of resonance. As Malvey, Hamby and Fottler [18] indicated almost a decade ago, the main obstacles to smooth implementation of video journals in service-learning are of technical character: availability of equipment, (lack of) specific digital skills such as video editing… These pertinent challenges cannot be attributed to mere lack of appropriate training – more importantly, they also indicate the lack of a wider video literacy.

The presented case studies provide two different student responses on video journals in service-learning. Students in Case study II: Readers' Club Knjigotron have managed to achieve high levels of proficiency in the field of video production, which was awarded by wider recognition of their project nationally and internationally. Remarkably, the majority of these students arrived to the course without previous expertise in video production. This indicates that service-learning, in smaller groups, can help students create a small community that can foster significant development of digital skills. At the same time, students engaged in the Readers' Club Knjigotron have also achieved high levels of achievement in terms of course learning outcomes. This example is somewhat extraordinary, as such levels of success cannot be expected to repeat in every team or even in every generation of students. However, Case study II: Readers' Club Knjigotron indicates that video journals, in an appropriate setting and with an appropriate student population, can be an excellent pedagogical vehicle for service-learning.

Case Study I: Team: You and Museum, is probably much more indicative for creating reasonable future expectations from video journals in service-learning. Students struggled with video production and editing, and the produced video cannot be used outside of classroom setting. Yet, within these limitations, students have nevertheless met learning outcomes for their course and developed appropriate critical skills. This indicates that high levels of technical proficiency are not necessary for successful use of video journals in service learning, i.e. that content is much more important than form. In future research, it would be interesting to explore the threshold of video proficiency for successful service learning, and determine a minimum level of technical skills that allows successful use of video journals in service learning.

7. Conclusion

7. Zaključak

Service-learning takes place in a contested space between learning and community service. Using video journals provides service-learning

with an additional layer of complexity, visibility, and learning for all participants. Nowadays, just like a decade ago [18], the main obstacles to implementation of video journals in service-learning are technical skills related to video production. In the age of ubiquitous computing, however, equipment is no longer an obstacle. Even widely available equipment, such as phones and standard computers, provides enough computing power for creating video journals adequate for service-learning. In the age of video cultures [23] [24], therefore, the notion of technical proficiency and availability of equipment has converged into a wider notion of video literacy.

This case study is conducted with a somewhat untypical population of year-5 students of Information Sciences. It is to be expected that students in other fields, as well as younger students, will face more obstacles to making video journals. However, video production seems to be a very useful vehicle for student learning. In spite of differences in technical skills and quality of final videos, students in both groups have successfully met learning outcomes and developed critical skills. After crossing a certain threshold (i.e. being able to produce a video), it seems that meeting learning outcomes and development of critical skills does not depend much on the level of video proficiency. Therefore, video literacy is inevitably a mesh-up of technical and conceptual skills related to video production, analysis and interpretation. Year-5 students of Information Sciences inevitably arrive with a lot of baggage, so in this research it is impossible to explore this mesh-up further.

With its background in critical theory and community service, service-learning is an excellent starting point for inquiry into issues pertaining to video and learning. Unsurprisingly, however, these questions quickly grow beyond the context of service-learning, and transform into more general questions characteristic of the role of video in modernity. In future research, therefore, it would be interesting to look more closely into the question: What makes a video literate person? It is from this position, then, that we might return to service-learning and develop appropriate pedagogies for learners in the age of the digital video.

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EMPOWERING STUDENTS FOR VIOLENCE PREVENTION WITH HELP OF MULTIMEDIA LEARNING RESOURCES

OSNAŽIVANJE UČENIKA U PREVENCIJI NASILJA UZ POMOĆ MULTIMEDIJSKIH OBRAZOVNIH SADRŽAJA

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Abstract

In order to answer the needs for empowering students, teachers and parents in the area of e-safety, NGO "Suradnici u učenju" helped five primary schools in European Union-funded project " Children's safety on the Internet " developing new school curriculum area for children's safety on the Internet for students aged 7 -14, their parents, teachers and local community. Curriculum consist of pedagogical-didactical model, acceptable use policies, multimedia resources, textbooks and guides. The project aims were improving students' digital competences and encourage children to assume responsibility for their own safety with a focus on empowerment, emphasizing responsible behaviour and digital citizenship and to raise e-safety awareness. In this paper we discuss the content and evaluation of school curriculum developed in that project. The curriculum was tested with students aged 7 to 14, their parents and teachers. Results show that the curriculum and learning resources fully satisfied students' expectations and that the team of authors successfully implemented modern strategies in the curriculum and resources creation. That school curriculum is now used as base for new national curriculum of subject Informatics and cross-curricular topic Use of ICT. Resources created for school curriculum are freely available for further use on project web site http://petzanet.hr

Keywords: e-safety, electronic violence prevention, school curriculum, digital skills, children's safety online

Sažetak

Kako bi osnažili učenike, učitelje i roditelje u području e-sigurnosti, udruga „Suradnici u učenju" surađivala je s pet osnovnih škola na provođenju EU projekta „Sigurnost djece na internetu" razvoj novog školskog kurikuluma za sigurnost djece na internetu za učenike starosti 7 do 14 godina, njihove roditelje, učitelje i lokalnu zajednicu. Kurikulum se sastoji od pedagoško-didaktičkog modela, politika prihvatljivog korištenja, multimedijskih sadržaja, udžbenika i priručnika. Cilj projekta bio je poboljšanje digitalnih kompetencija učenika, poticanje učenika u preuzimanju odgovornosti za svoju sigurnost s fokusom na osnaživanje uz odgovorno ponašanje, digitalno građanstvo te podizanje razine osviještenosti o sigurnosti na internetu. U ovom radu govorimo o sadržaju i evaluaciji školskog kurikuluma koji je napravljen u tom projektu. Kurikulum je testiran s učenicima 7 – 14 godina, njihovim roditeljima i učiteljima. Rezultati pokazuju da kurikulum i obrazovni sadržaji zadovoljavaju učenička očekivanja te da je autorski tim uspješno primijenio moderne strategije pri razvoju kurikukuluma i sadržaja. Spomenuti školski kurikulum upotrijebljen je kao osnova pri stvaranju novih kurikuluma za Informatiku i međupredmetnu temu Uporaba IKU. Svi sadržaji su javno dostupni na mrežnoj stranici projekta http://petzanet.hr

Ključne riječi: e-Sigurnost, prevencija elektroničkog nasilja, školski kurikulum, digitalne vještine, sigurnost djece na internetu

1. Introduction

1. *Uvod*

European Parliament and the Council of the European Union included digital competence in

key competencies which each person needs to possess in order to adapt to the rapidly changing world. Their definition of digital competence, along with knowledge and skills, include critical attitude toward the responsible use of ICT. In this digital age children are focused on computers and mobile devices from early childhood. It is of utmost importance to teach them how to use those devices properly and appropriately [1].

At the moment, students in compulsory schools in Croatia have a chance to obtain ICT related skills and knowledge only if they choose an elective subject - Informatics in grades 5 to 8, or if similar extra-curricular activity is enabled for grades 1 to 4 [2]. However, the topic of e-safety is not part of actual Informatics curriculum at all. Therefore not even the minimum of children's knowledge about appropriate and safe use of internet is obligatory at the time. Education Sector Development Plan 2005-2010 [3] considers equipping people with the skills to use information and communication technology in everyday life as one of the prerequisites for active involvement in an information-based society.

According to the UNICEF's survey in Croatia [4], 85% of children have Internet access at home, their favourite activities on the Internet are seeking entertainment, communication with friends, and use of social networking sites while using the internet for research and learning are less frequent. The same survey showed that 34% of children experienced some form of electronic violence, comparing to 12 % of European children, who say that they have been bothered or upset by something on the internet [5]. Findings from EU Kids Online research "Risks and safety on the internet" suggest that digital skills training needs continued emphasis and updating in terms of training, safety features and applications operation to ensure that all children reach a minimum basic standard and to prevent digitally isolated and unskilled children [5].

In order to answer the needs for empowering students, teachers and parents in the area of e-safety, NGO "Suradnici u učenju" helped five primary schools in European Union-funded project " Children's safety on the Internet " developing new school curriculum area for

children's safety on the Internet for students aged 7 -14, their parents, teachers and local community. The curriculum is designed in a way which gives schools, teachers and students certain autonomy in choosing the content, methods and forms of work. It provides the educational and learning outcomes and standards of their acquisition whilst addressing all key competences of the European Union following violence prevention strategies and guidelines [6] & [7].

2. Project development and implementation

2. *Razvoj i implementacija projekta*

Project "Children's safety on the Internet" was a European Union-funded project (October 2013 - December 2014) which NGO "Suradnici u učenju" and Veliki Bukovec primary school developed together with partners, primary schools Popovača, "Mladost", "Gripe" and "Mato Lovrak", financed from a grant scheme "Further development and implementation of the Croatian Qualifications Framework" (Europeaid/131254/M/ACT/HR).
The project objectives were:

- to develop learning outcome-based school curriculum area for children's safety on the Internet which will enable holistic approach involving students, parents and teachers on the same goal;
- to develop and implement appropriate pedagogical and didactical model for student centred learning which will make the most of teachers' potentials and new technology strength;
- to improve primary school teachers' educational skills and expertise so they could apply the new methodologies for student centred learning;
- to improve students' digital competences and encourage children to assume responsibility for their own safety as much as possible with focus on empowerment, emphasizing responsible behaviour and digital citizenship;
- to raise students, teachers, parents and general public awareness and understanding of issues relating to the children's safety online in synergy with the EU policies [8].

Project facilitated cooperation and experience exchange as well as sharing best practice between

Croatian and EU schools on issues relating to children's safety online and gives equal opportunities to all students to reach standard learning outcomes in area of safe, legal and ethical behaviour on the Internet and to prevent digitally isolated and unskilled children.

Project Pedagogical team worked on development and publishing of school curriculum area which consist of four courses addressing one of four age groups in primary schools (students aged 7-8, 9-10, 11-12 and 13-14). School curriculum is vertically adjusted in five units: information, communication, content creation, safety and problem solving as recommended in EU Framework for Developing and Understanding Digital Competence in Europe [9]. Some of the topics covered in curriculum are: personal data protection, e-mail phishing and scams, netiquette, online communication and collaboration, risks on social networks, responsible use of mobile devices, sharing and authoring rights, identity theft, digital footprints, e-portfolios and online presence, evaluation of information on the Internet, how to protect computer and family, prevention of cyberbullying [8].

3. Learning resources

3. *Obrazovni sadržaji*

Each set of teaching/learning materials include textbooks for students, multimedia resources, teachers' guides and guides for parents. Learning objects within teaching/learning materials were created in form of text, hypertext, pictures, animated stories, videos, audios, computer games, social games, colouring pages, photos, interactive quizzes, learning quests. Along with the classic printed textbooks, students, teachers and their parents can use digital versions in PDF formats, as well as digital e-books. Moreover, virtual classroom provide students with a personalized learning platform. Students are allowed to choose a content themselves – texts, examples, presentations, posters, comics, exercises and quizzes to study, as well as the pace at which they will go through the content individually and learn.

Teachers' guides provide lesson plans with summary and learning outcomes enriched with suggestions for technology and resources so that every teacher can easily see which equipment and resources are needed and how to broaden their knowledge. Guides for parents accompany each lesson from the student's textbook with short explanations, additional family activities which parents and children can do together at home.

The characters which illustrate various topics are created specifically for this curriculum. Special attention was paid to gender equality, therefore there is an equal number of male and female characters and it is easy for children to put themselves in the shoes of any of the characters. Multimedia and digital resources were created for all lessons, special attention was payed to creation of 22 computer games and interactive quizzes and 56 animated stories, audio and video clips which give students an opportunity to learn individually, through games and problem-solving activities. Digital materials have a specific design, the content is automatically adjusted to the device display and its resolution which enables students with special educational needs to use them more easily. More than 800 learning resources are organized in a database and freely available on the project website petzanet.HR [10].

4. Curriculum piloting

4. *Pilot-testiranje kurikuluma*

School curriculum was tested and evaluated by two sides - schools which take part in project and external advisors. Pilot testing was performed with 201 students (aged 7 - 14) - 2 classes from each participating schools. The testing was organized in September and October 2014 in all schools. In every class ten lessons were delivered in the weekly schedule, two lessons each week. Testing of the curriculum was monitored by using the pre-test and post-test questionnaires created especially for this project with age appropriate language and design accompanied with teachers diaries and focus groups with students and parents after the curriculum was delivered. The questionnaire consisted of three groups of questions: general, e-safety and digital skills, and satisfaction with learning resources.

In the pre-testing there were 25 students of the 1st grade; 44 students of the 2nd; 18 students of the 3rd; 18 students of the 4th; 15 students of the

5th; 34 students of the 6th; 22 students of the 7th and 25 students of the 8th grade. In the post-testing there were 22 students of the 1st grade; 43 students of the 2nd; 18 students of the 3rd and 19 students of the 4th; 12 students of the 5th; 36 students of the 6th; 18 students of the 7th and 20 students of the 8th grade. In the pre-test 49,7 % were male and 50,3 % female pupils and in the post-test 46,6 % were male and 53,3 % female pupils.

The average age of first internet use is 5,6 which means that students start to use Internet before they start 1st grade, and that age is lower than findings in EU Kids Online research [5] which showed that the average age of first internet use is seven.

Research The International Computer and Information Literacy Study (ICILS), conducted by IEA - International Association for the Evaluation of Educational Achievement, 2013 in 21 countries showed that only 1 % of Croatian teenagers are on the highest level of computer and information literacy that includes critical evaluation [11]. Although results from ICILS cannot be compared with results of this question it shows us that young students tend to believe everything they find on the Internet. Considering the fact that 77 % of them started to use Internet before entering 1st grade emphasise the importance of lessons developing critical evaluation of information in the curriculum.

*Table 1*   *Critical thinking and evaluation*
Tablica 1   *Kritičko promišljanje i vrednovanje*

Can you believe everything you read on the Internet? (in %)				
Grade		Yes	No	I don't know
1st & 2nd	Before	20,9	79,1	0
	After	4,7	87,5	7,8
3rd & 4th	Before	0	100	0
	After	0	100	0
5th & 6th	Before	0	93,9	6,1
	After	0	100	0
7th & 8th	Before	2,1	89,4	8,5
	After	0	94,7	5,3

In Table 2 you may find some comparison of students answer prior and after pilot project implementation.

The question regarding competences of friends who did not take part in this research also addresses one of the important digital competences - helping others, sharing knowledge and bridging the digital gap [12].

The Last part of the questionnaire contained questions regarding students' satisfaction with learning resources. In general students were very satisfied with lessons delivered in project (92 - 100 %). Comparing students' satisfaction with different kinds of learning resources, students mostly liked animated stories and videos than games and worksheets and in the last places e-book and textbooks.
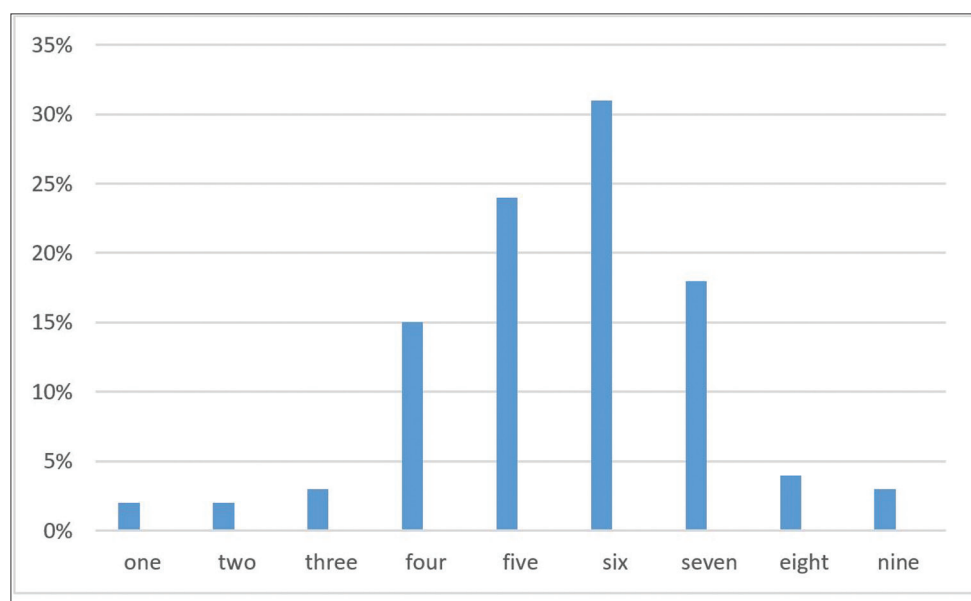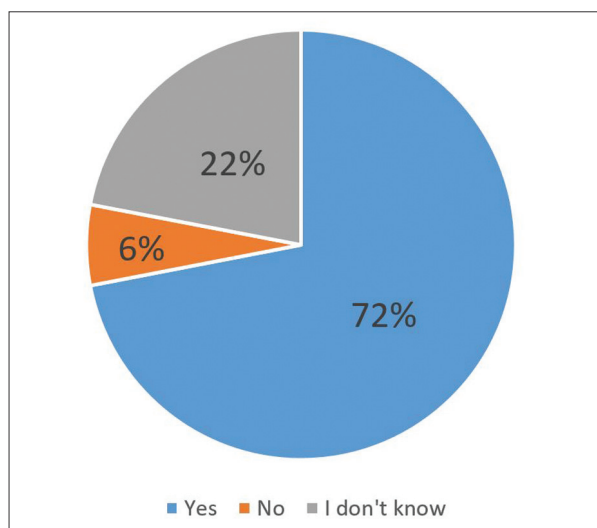

Graph 1
How old were you when started using the Internet?

Graf 1
S koliko godina ste se počeli koristiti Internetom

Before	After
63 % of students knew that they are leaving digital footprint every time they use the Internet	83 % knew that
71 % of the students agreed with the statement that the content that you post on the Internet someone else can seize and represent themselves as their author.	90 % agreed with that statement
65 % of students disagreed with the statement that the information you find on the Internet may be used without mentioning the source.	83 % disagreed
79 % of the students thought that the victims of electronic violence should not hide that they are victims and wait for abusers to stop	81 % thought that
50 % of students agreed or strongly agreed that creation of hate group on social network and posting in it is bad as hitting someone in real life.	71 % agreed
56 % of students disagreed with the statement that "if I find out that some-one is a victim of cyber bullying it is best not to interfere, and only watch from the side."	73 % disagreed
66 % of students think that different rules of behavior apply on the Internet than in real life	40 % think that
13 % of the students agreed with the statement that they may disclose their personal data on the Internet	3 % agreed

Table 2
Pre and post comparison

Tablica 2
Usporedba podataka prije i poslije implementacije projekta

Graph 2   *Do you think that your friends need additional knowledge about the use of the Internet, its good and bad sides?*

Graf 2   *Mislite li da vašim prijateljima treba dodatno znanje o uporabi Interneta, njegovim dobrim i lošim stranama*

Students in grades 1st & 2nd just answered question with Yes/No and senior grades gave marks 1 - 5. Such high grades show that learning resources fully satisfied students' expectations and that the team of authors successfully implemented modern strategies in the curriculum and resources creation. Results also show tendency toward multimedia resources in all grades and could be used as recommendation for future creation of curriculum resources. (Table 3).

When asked "Would you like to have lessons about children's safety on the Internet next year too?" 82,2 % of students from all grades answered yes, which is also a significant sign that the curriculum content, learning resources and the way of teaching was set up in the way that suits needs of today's learners.

Table 3   *Average marks for different learning resources*

Tablica 3   *Prosječne ocjene za različite obrazovne sadržaje*

	1st & 2nd	3rd & 4th	5th & 6th	7th & 8th
Textbook	95 % yes	4,8	3,9	3,7
e-book	95 % yes	4,9	3,7	4,2
Worksheets	100 % yes	4,9	3,8	4,3
Computer games	100 % yes	4,9	4,3	4,3
Animated stories and videos	100 % yes	4,9	4,2	4,7

5. Conclusion

5. *Zaključak*

The limitations of this research were the strict timeframe of project implementation, and a small number of students, teachers, parents and schools.

The project timeframe dictated a narrow time slot for the implementation of the curriculum and its testing, so we found out that the implementation was more intense than originally planned. The results of the research were immediately used for improving the quality of the created curriculum and learning resources and after that, all updated resources were published online for free, unlimited use. For measuring influence of this curriculum in prevention of electronic violence, long term research is needed which was not possible in this project.

What is promising is that in 2014/15 school year alongside with the originally planned five schools, around 20 schools started to use the learning resources and in the 2015/16 school year the number of schools raised to over 50. Also, the learning resources and the school curriculum "Children's safety on the Internet" under its short name "Pet za net" have found their place in the new national curriculum for the cross-curricular subject called Use of ICT as well as in the curriculum for Informatics (Computer Science) subject for all primary and secondary schools in Croatia.

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DIGITAL EDUCATIONAL RESOURCES IN SERVICE OF INTERACTIVE TEACHING METHODS

DIGITALIZIRANA NASTAVNA SREDSTVA U FUNKCIJI INTERAKTIVNIH NASTAVNIH METODA

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Abstract

New teaching strategies include significant use of computers but the effectiveness of those methods based on the use of computers is low if the inclusion of interactive teaching methods and students' intellectual engagement is ignored. Digital resources are not the ones that affect the learning outcomes but teaching methods that are accompanied by the implementation of various educational technologies. If we just change the media which presents teaching content and thereby keep the same teaching methods as before, the effectiveness of teaching remains the same. Digital resources differ with respect to the potential of creating learning situations. Some digital resources facilitate the implementation of interactive teaching to a greater extent from others. A survey was conducted in Croatia in order to test the effectiveness of one of the strategies involving digital resources. The results indicate that application of appropriate digital resources has a positive effect on learning and acquiring the concepts in physics. The results are an indicator for the research that follows which will examine the teaching method that involves interaction at all stages of teaching process and highlights the use of digital resources as one of the tools for the realization of interactivity and student's intellectual activity enlargement.

Keywords: interactive teaching methods, student's intellectual engagement, digital resources, effectiveness of digital resources

Sažetak

Mnoge od novih nastavnih strategija uključuju značajnu uporabu računala no treba naglasiti da je učinkovitost samih metoda baziranih na uporabi računala niska ukoliko se zanemari uključivanje interaktivnih nastavnih metoda kao i intelektualna angažiranost učenika. Nisu digitalni materijali ti koji utječu na krajnje ishode učenja, nego su to nastavne metode koje prate primjenu različitih nastavnih tehnologija. Drugim riječima, promijenimo li samo medije putem kojih prezentiramo nastavne sadržaje, a zadržimo pri tome iste nastavne metode kao i ranije, efikasnost nastave ostaje ista. Digitalni materijali se međusobno razlikuju obzirom na potencijal stvaranja nastavnih situacija. Neki digitalni materijali u većoj mjeri olakšavaju realizaciju interaktivne nastave od drugih. U svrhu ispitivanja učinkovitosti jedne od strategija koja uključuje računalo i digitalne materijale provedeno je testno ispitivanje u Republici Hrvatskoj. Rezultati ispitivanja upućuju na zaključak kako primjena odgovarajućih digitalnih materijala ima pozitivan učinak na učenje i savladavanje koncepata iz fizike. Također, rezultati istraživanja indikator su za istraživanje koje slijedi, a kojim će se ispitati nastavna metoda koja uključuje interaktivnost u svim fazama nastavnog procesa i ističe korištenje digitalnih materijala kao jednog od alata za ostvarivanje interaktivnosti i povećanja učenikove intelektualne aktivnosti.

Ključne riječi: interaktivne nastavne metode, intelektualna angažiranost učenika, digitalni materijali, učinkovitost digitalnih materijala

1. Introduction

1. *Uvod*

Contemporary state od science has changed throughout history within three phases [1]: institutionalization, professionalization and socialization. During these phases there has been the introduction of new terms such as natural science and natural scientist instead of philosophy of nature and philosopher of nature as well as redefining the role of teaching science to be a function not only of cultural transmission but also social reconstruction.[2]

Following the above changes in recent decades, a number of studies in the filed of educational contructivism is carried out. Constructivistic ideas about learning and teaching have their starting point in the ideas of Swiss psychologist J. Piaget while the constructivistic view of science is based on the ideas of philosophers of science like Popper, Kuhn, Laktos, Feyerabend. The fundamental is the assumption of Piaget's genetic epistemology that there is an analogy between the development of the logical organization of the corpus of knowledge within a discipline (Physics) and the corresponding development of psychological processes in the development of person. By including the history and philosophy of Physics, the epistemological aspects of Physics can naturally get closer to students.[3] Bigger introduction of history and philosophy of Physics in the classroom contributes to the humanization of teaching science by encouraging social perspective and enhanced interaction between the natural sciences, social changes and technology.

The starting point for the individualization of teaching is based on the fact that students in the class do not make a set of equivalent observer. The modern pedagogy provided the answer to the theoretical settings of the famous educators and psychologists (Jean Piaget, Leo Vygotski, and Roger Schank) who emphasized the individualization of teaching, thus creating the framework for self-regulated learning. Self-regulated learning is self-guiding process by which learners transform their mental abilities into learning skills.[4] In the self-regulated learning the student's task is to become an active participant [5] prepared for the revolutionary conceptual change based on the analogy of a paradigm shift in the philosophy of science [6] i.e. the process of accommodation in the epistemology of Piaget. Conceptual change is a cognitive process in which the emphasis is on the transformation of concepts in the learning process.[7] Famous constructivist Rosalind Driver points out that the learning cycle must necessarily be interactive in every stage.[8] Considering the fact that science in the world science community works on the principle of consensus, that could be an argument for the introduction of more interactive constructivist approach to the teaching process.

Today, on the traces of constructivism, there is a new culture of learning that has an impact on new forms of teaching that are achieved by using the technology through various aspects of pedagogical arrangements. The teaching material of solid textbooks is converted into educational software tailored to the student. In accordance with constructivist philosophy of learning, in the application of new media, didactic arrangement is more important than the learning content. Digital resources are effective only so far as teachers are able to take advantage of their didactic potential. Digital resources are not the ones that affect the final outcomes of learning, but teaching methods that are accompanied by the implementation of various educational technologies. In other words, if we just change the media through which we present teaching content and thereby keep the same teaching methods as before, the effectiveness of teaching remains the same. Also, if we use teaching methods efficiently, learning will be effective regardless of the educational technologies used in teaching.

In this paper there will presented the results of testing the effectiveness of digital resources in introduction, learning and mastering the physical concepts in the domain of mechanics. The aim of the survey was not a comparative relationship of teaching methods but formatting the teaching method as didactic innovation which allows interactivity in all phases of the teaching process with the use of digital resources and the maximum intellectual engagement of students that affects the self-regulation of students' learning.

2. Integration of digital resources in teaching Physics

2. *Integracija digitalnih materijala u nastavu fizike*

Well designed multimedia resources could significantly affect the increase of motivation for learning and attractiveness of learning content.[9] Modern media and digital resources have extremely high potential when it comes to contribution to the improvement of teaching. . If the basic didactic principles of cognitive learning theory are not taken into account, the use of digital resources in the classroom does not necessarily mean achieving better results. The future of education lies in an interactive teaching approach and therefore in the application of digital resources that encourage interactivity. In addition to creating content for learning based on various types of coding and relate to different sensory modalities, there are: an interactive contact with the learning objects, ability to adapt certain prerequisites for learning, feedback to specific learning activities, research and simulation or online based making sites distributed sections for learning in virtual spaces.[10]

In accordance with constructivist perspective, the learning process is recorded as active, individually controlled, constructive, situationally conditioned social process and its outcome and the flow is affected by many subjective and objective factors.[11] Wondering about the ways of integrating digital resources in teaching Physics and by taking into account the guidelines of modern pedagogy, it came into existence the idea of designing and developing a teaching method that puts emphasis on learning outside the classroom using the interactive digital resources that enable:

- active self-regulated learning in students and achieving conceptual changes
- the role of the teacher as a mentor who assigns content and has access to the student's work through LMS1
- preparation and implementation of lesson in one of the didactic arrangements (e.g. research teaching, project teaching, Physics Suite method or any form that positively affects

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1   Learning Management System (LMS)

the development of students' interests and allows active learning, social interaction and allows students to perceive the possibility and importance of applying the theoretical knowledge acquired through digital resources)

Digital resources differ with respect to the potential of creating learning situations that allow us to use teaching methods efficiently. Some digital resources facilitate the implementation of interactive teaching to a greater extent from others. As a starting point for the development and design of this teaching method, it was necessary to examine and determine the effectiveness of various forms of digital resources in compliance with the requirements of interactive constructivist teaching. For this purpose, a web page called "Virtual Classroom"2 is created which contains interactive digital resources (video animation, video presentations, interactive simulations) as well as a description of the integration of these resources into the learning process through didactic framework that shapes the teaching process as a system of three components: learning outside the classroom, classroom learning and teaching.

3. Survey description

3. *Provedba ispitivanja*

The survey was conducted in the school year 2014/2015. in 5 Croatian elementary schools on 168 respondents (students). Schools were equally represented in regional, rural and urban sense. The experimental group and control group were defined in each school. Experimental group includes class in whom a "Virtual Classroom" was implemented while the control group is a class in which there was nothing new regarding the teaching of Physics i.e. processing of teaching unit "Movement and force". The experimental group included a total of 79 students while the control group included 89 students. In order to inspect the effectiveness of "Virtual Classroom", a test for comprehension of the kinematics graphs was developed. The test is created according to the test of Robert J. Beichner3 which is then

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2   http://virtualnaucionica.weebly.com/

3   Testing student interpretation of kinematics graphs, Robert J. Beichner, Physics Department, North Carolina State University

adapted to the elementary school according to the Croatian National Curriculum Framework.

Students within experimental and control groups wrote the same test before the start of the teaching (pretest) of the unit "Movement and force" and after the teaching the same unit (posttest). The survey results are shown in Figure 1.

According to the results it can be concluded that for the experimental group the percentage of solvability for posttest compared to pretest increased for 23.25% while for the control group the increase was 17.30%. Thus, the increment for the experimental group is bigger by 5.95% compared to the control group from which it could be established that the implementation of the "Virtual Classroom" and the application of appropriate digital resources had a positive effect on learning and mastering the concepts in kinematics.

It is important to point out that the implementation of "Virtual Classrooms" encountered several obstacles. It was noted that in the very beginning of the application not all students actively involved in its implementation. In continuation of the implementation it has been observed that more and more students are using digital resources and preparing for the upcoming teaching unit. Also, at the beginning of the implementation, greater activity in class was shown only by excellent students and later on by others. The students pointed out that they like "Virtual Classroom" mostly because of the fact that everything done in class is available in one place (web page). Most students stated that

they like Physics less than other subjects but they would like to continue with this type of work in the following teaching units (Waves, Light).

Therefore, we can conclude that the application of digital media does not lead to an increase in the quality of learning and teaching. New media only open space for the development of a new culture of learning and the new organization of learning and teaching. [11]

4. Conclusion

4. Zaključak

There are many different interactive teaching methods but their common denominator is exactly intellectual engagement of students. Many of the new teaching strategies include significant use of computers but it should be noted that the effectiveness of those methods based on the use of computers is very low if the inclusion of interactive teaching methods and intellectual engagement of students is ignored. In addition, it is very important to distinguish different types of digital resources. Some digital resources facilitate the implementation of interactive teaching to a greater extent from others. The visualization together with teaching assistance should allow students to observe objects and phenomena in order to reach a clear and accurate knowledge. Well-worked visualization should affect not only the process of acquiring knowledge but also to develop the students' intellectual, sensory and practical skills as well as the ability to express
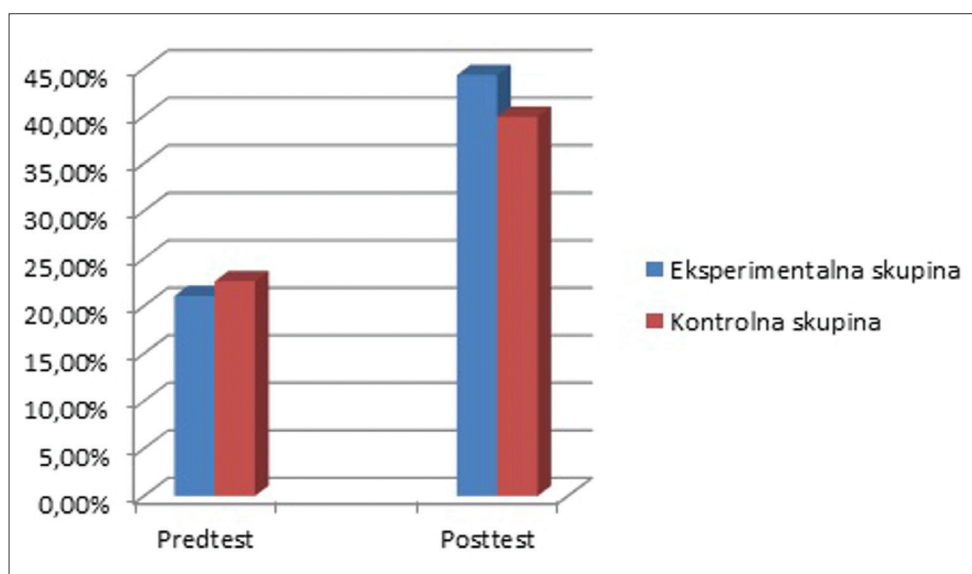

Figure 1
Results of pretest and posttest for comprehension of the kinematics graphs

Slika 1
Prikaz rezultata predtesta i postesta razumijevanja grafički prikaza iz kinematike

themselves. Without visualization of particular problem it is difficult to present a demanding scientific models and systems especially in teaching natural sciences. Furthermore, interactive computer simulation can greatly facilitate the acquisition of knowledge in teaching science but only if its implementation is accompanied by the proper elaboration of models and quality methodology concept. Therefore, during the integration of digital resources in teaching it must be taken into consideration the proper selection of such form of digital resource that will in the certain stage of learning process have the highest efficiency in achieving interactivity and increasing the student's intellectual activities. However, it must be pointed out the importance of developing competencies of teachers for new processes in learning to be supplemented by some other personal, methodical and communicative competencies.[11]

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PROPOSAL OF A MODEL FOR CREATING INTERACTIVE MULTIMEDIA WEB EDUCATION

PRIJEDLOG MODELA ZA IZRADU INTERAKTIVNE MULTIMEDIJSKE WEB NASTAVE

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Abstract

The increased use of multimedia web education (MWE) in distance learning, brings up questions related to the selection of suitable methods of designing this kind of learning. The paper suggests a possible model of creating interactive multimedia web education (IMWE) and compares this model with the classical teaching face to face (F2F).

The proposed model (IMWE) is based on: the experiences of Croatian teaching practice based on the cognitivistic and constructivistic approach, Merrill's basic principles of instructional design, Gagne's recommendation to activate the internal learning process, Meyer's principles of design of multimedia, and Horton's models for structuring educational web content.

The conclusion of this paper is that the IMWE teaching provides the same or even better results in learning compared to traditional F2F teaching, which is confirmed by experimental research performed with hundreds of students on the Polytechnic of Zagreb.

Keywords: *model, web, learning, multimedia, design*

Sažetak

Sve veća primjena multimedijalne web edukacije (MWE) kod učenja na daljinu, stavlja u prvi plan pitanja koja se odnose na odabir prikladnih metoda za oblikovanje ovakve vrste učenja. U radu se predlaže jedan mogući model oblikovanja interaktivne multimedijske web edukacije (IMWE), koji se komparira s klasičnim oblikom poučavanja metodom licem u lice (F2F).

Predloženi model (IMWE) utemeljen je na: iskustvima hrvatske nastavne prakse zasnovane na kognitivističkom i konstruktivističkom pristupu, Merrillovim osnovnim principima instrukcijskog dizajna, Gagneovim preporukama za aktiviranja internih procesa učenja, Meyerovim načelima oblikovanja multimedije te Hortonovim modelima strukturiranja web obrazovnog sadržaja.

U zaključku rada pokazano je da IMWE nastava daje iste ili bolje rezultate u učenju u odnosu na tradicionalne F2F nastave, što je potvrđeno i eksperimentalno kroz istraživanje provedeno sa stotinjak studenata Tehničkog veleučilišta u Zagrebu.

Ključne riječi: *model, web, učenje, multimedija, dizajn*

1. Introduction

1. *Uvod*

The development of information and communication technology enhances the traditional methods of teaching and learning by computer, including new paradigm of learning based on Internet technologies. These technologies enable sending and receiving of learning content via the WWW (World Wide Web), which has enabled distance learning over the Internet.

Content for learning provided over the web integrated picture, sound, animation and video, enabling better use of computers in education. This way of displaying multimedia information over a computer increases the level of attention, understanding and remembering the message at recipients. This paper is a resultant between research methods and tools for the development of educational multimedia content and the author's experience in this field.
The focus of this work is the model for designing educational multimedia contents that is distributed over the web. This model is called interactive multimedia web education (IMWE). The paper

presents a theoretical paradigms and practical recommendations for creating interactive multimedia web education (IMWE) in accordance with modern theoretical models of learning and Croatian educational practice. The starting point of this work is based on elements of psychological and pedagogical paradigms of learning and instructional design models that have an impact on the model for design of multimedia educational web content that is suggested in this paper.

The idea for the experimental part of this paper was created and based on the work of Chen & Shaw, named Online Synchronous vs. Asynchronous Software Training Through the Behavioral Modeling Approach: A Longitudinal Field Experiment, which can be found in the proceedings under the editorship of Mahbubur Rahman Syed [1]. Their paper describes a model approach to teaching and shaping the e-learning content of the online course for Microsoft SQL Server 2000 that was conducted in the Taiwan College. In their experiment conducted with 96 students, they found that there was no significant difference in learning outcomes achieved between lectures conducted face-to-face and online asynchronously and synchronously. Their model was based on the Behavioral Modeling Approach.

This work has had different starting points, based on psychological - pedagogical paradigms like [2]:

- Merrill's model of instructional design based on cognitivistic-constructivist approach and Gagne's recommendation to activate the internal learning process
- Mayer's principles of design of multimedia messages
- Horton models structuring web content.

Hypothesis (H) of this work was [2]: "The use of interactive multimedia web instruction (IMWE) statistically gives equal or better learning outcomes compared to traditional frontal classroom teaching face-to-face (F2F)".

2. The Basics Theories of Learning and Instruction Design

2. *Osnovne teorije učenja i instrukcijskog dizajna*

Learning theories provide instructional experts strategies and techniques for facilitating learning. There are many theories of learning, some of

which are significant Behaviorism, cognitivism, constructivism [2] [3] [4].

Behaviorism is a learning theory that focuses on objectively observable behaviors and outsides mental activities. Behavioral theorists define learning as acquisition of new behavior, or a change / modification of existing [2] [3].

The behavioral approach to learning is based on an objective study and measurement of external visible changes in behavior. According to this theory of learning are important external visible changes in behavior, while internal processes are irrelevant to the study of learning, because they cannot be observed or measured directly [2] [3].

Cognitivism is opposite of behavioral theory which focuses on internal mental processes, which involves how people perceive, think, remember, learn and solve problems. Cognitivism is related on intelligence, according to contemporary research works often links cognitivism to the view that people process information as computers do. Cognitivism influenced the education system at its most effective [2] [3].

Constructivism is a meta-concept about how somebody thinks, it is a theory of communication which suggests that each recipient will use own learning contents and communication process on different ways. From the perspective of constructivists, learning is an active process, unique to the individual, and consists of constructing conceptual relationships and meaning from information and experiences already in the learner's repertoire [2] [3].

2.1 First Principles of Instruction Design by David Merrill

2.1 *Merrillova osnovna načela instrukcijskog dizajna*

David Merrill gives a model called First Principles of Instruction Design. According to Merrill most effective learning environments are those which are based on the real problem and active participation of students through four different stages of learning (Figure 1) [5]:

1. Activation of prior experience
2. Demonstration of skills
3. Application of skills
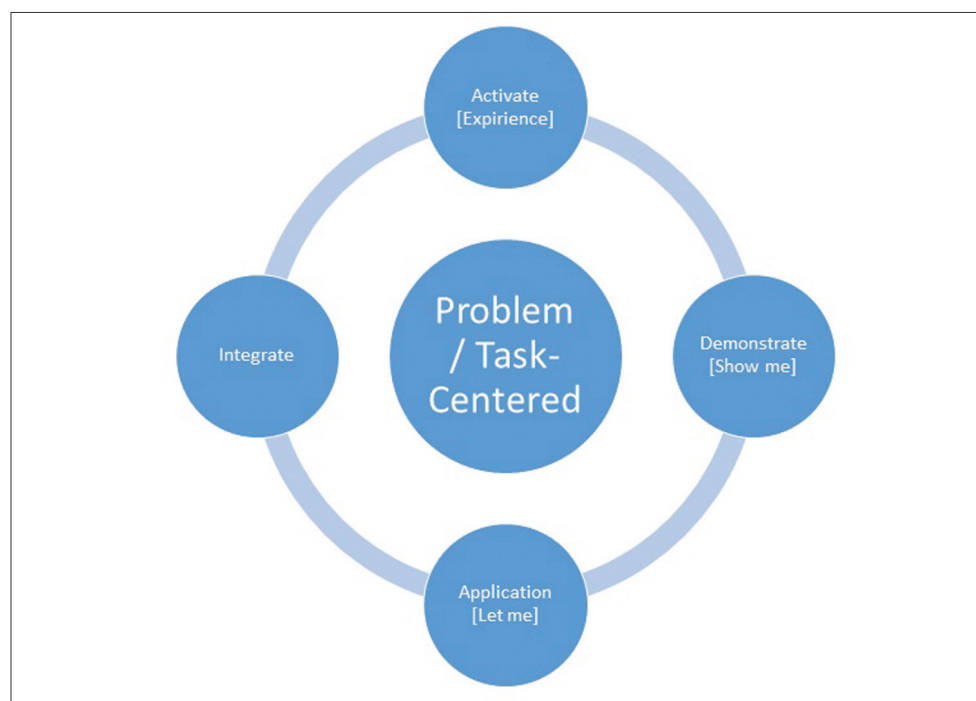4. Integration or activation of these skills in the real world.

These five first principles stated in their most concise form are as follows [5]:

1. Learning is promoted when learners are engaged in solving real-world problems
2. Learning is promoted when relevant existing knowledge is activated as a foundation for new knowledge
3. Learning is promoted when new knowledge is demonstrated to the learner
4. Learning is promoted when new knowledge is applied by the learner
5. Learning is promoted when new knowledge is integrated into the learner's real world.

2.2 The principles of instructional events by Gagne

2.2 *Gagneova načela poučavanja*

Instructional design as a process is the systematic development of instructional specifications using learning and instructional theory to ensure the quality of instruction. It is the entire process of analysis of learning needs and goals and the development of a delivery system to meet those needs. It includes development of instructional materials and activities; and tryout and evaluation of all instruction and learner activities.

Gagne's nine events of instruction became the standard for instructional design model. These nine instructional events are [2] [6]:

1. **Gaining attention (G1)**: This step provide stimulus to engage the learners and motivate them. It starts with a problem, new situation, uses a multimedia advertisements, and asks questions.
2. **Inform learners about goals and objectives (G2):** The step explains what learners will be able to do and how they will be able to use the new knowledge as a result of the learning.
3. **Stimulating recall of prior learning (G3)**: This step reminds the learners of the prior knowledge, in fact asking the learner what they already know (facts, rules, procedures or skills). Show how knowledge is connected, provide the learners with a framework that helps learning and remembering. The entry tests can be included here.
4. **Present the material to be learned (G4)**: The step provides and displays the new learning content (text, graphics, simulations, figures, pictures, sound, etc.). Chunk information (avoid memory overload, recall information).
5. **Providing learning guidance (G5)**: This step organizes the learning and putting it into context. E.g. presentation of content is different from instructions on how to learn.

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6. **Eliciting performance – practice (G6)**: This step needs to allow the learners to demonstrate and use the newly acquired knowledge, skills or behavior.

7. **Providing feedback (G7)**: This step needs to tell the learners how they have performed and show them the correctness of the trainee's response, analyze learner's behavior, or possibly present a good (step-by-step) solution of the problem.

8. **Assessing performance (G8)**: This step is important to test the learners, and also give them general progress information about their performance.

9. **Enhancing retention and transfer (G9)**: This last step needs to allow the learners to consolidate their learning. It needs to inform them about similar problem situations, provides additional practice, and puts the learners in a transfer situation and possibly lets them review the lesson.

2.3 Cognitive Theory of Multimedia Learning and Mayer's Principles of Multimedia Learning

2.3 *Kognitivne teorije multimedijskog učenja i Mayerova načela multimedijskog učenja*

The cognitive theory model of multimedia learning is based on three primary assumptions [6] [7]:

1. Visual and auditory experience/information comes to recipients from two different ways. This information is processed through separate and distinct information processing "channels."

2. Each information processing channel is limited in its ability to process experience/information.

3. Processing experience/information in these channels is an active cognitive process designed to construct coherent mental representations.

This model is activated through five steps [6] [7]:

1. Selection of relevant words for processing in verbal working memory

2. Selection of relevant images for processing in visual working memory

3. Organization of selected words into a verbal mental model

4. Organization of selected images into a visual mental model

5. Integration of verbal and visual representations as well as prior knowledge.

According to the cognitive theory of multimedia learning and practical research, Mayer defined basic and advanced principles of multimedia learning. Multimedia principles can be integrated in the design of multimedia content and can be covered by all nine Gagne events

Mayer described seven basic principles of multimedia learning (BPM) these are [2] [6] [7]:

1. **Multimedia principle (BPM1)**: People learn better from words and pictures than from words alone. On screen animation, slide shows, and narratives should involve both written and oral text and still or moving pictures. Simple blocks of text or auditory only links are less effective than when this text or narration is coupled with visual images.

2. **Split-attention principle (BPM2)**: People learn better when words and pictures are physically and temporally integrated on the screen. When presenting coupled text and images, the text should be close to or embedded within the images. Placing text under an image (i.e., a caption) is sufficient, but placing the text within the image is more effective. The text and images should also be presented simultaneously. When animation and narration are both used, the animation and narration should coincide meaningfully.

3. **Modality principle (BPM3)**: People learn better from graphics and narration than from graphics and onscreen text. Multimedia presentations involving both words and pictures should be created using auditory or spoken words, rather than written text to accompany the pictures.

4. **Redundancy principle (BPM4)**: People learn better when the same information is not presented in more then one format. Multimedia presentations involving both words and pictures should present text either in written form, or in auditory form, but not in both.

5. **Segmenting, pre training and modality principles (BPM5)**: People learn better when multimedia messages are presented in learned-paced segments rather then as continuous unit, people learn better from multimedia messages when they know the names and characteristics of the main concepts and people learn better

from multimedia message when the words are spoken rather then written.

6. **Coherence, signalling, spatial contiguity, temporal contiguity and redundancy principles (BPM6)**: People learn better when extraneous material (words, pictures, and sounds) are excluded rather than included, when cues are added that highlight the organization of the essential material, when corresponding words and pictures are presented near rather then far from each other on the screen or in time, and people learn better from graphics and narration than from graphics and narration and onscreen text.

7. **Personalization, voice and image principles (BPM7)**: People learn better when the words of multimedia presentation are in conversational style rather then formal style and when the words are spoken in standard-accented human voice rather then a machine voice or foreign-accented human voice; but people do not necessarily learn better when the speaker's image is on the screen.

Mayer also gives nine Advanced Principles of multimedia learning (APM) [2] [6] [8]:

1. **Guided-discovery principle (APM1)**: People learn better when guidance is incorporated into discovery-based multimedia environment.

2. **Worked-out example principle (APM2)**: People learn better when receive worked-out examples in initial skill learning.

3. **Collaboration principle (APM3)**: People can learn better with collaborative online learning activity.

4. **Self-explanation principle (APM4)**: People learn better when they encouraged to generate self-explanation during learning.

5. **Animation and interactivity principles (APM5)**: People don't necessarily learn better from animation than from static diagrams.

6. **Navigation principles (APM6)**: People learn better in hypertext environments when appropriate navigation aids are provided.

7. **Site map principle (APM7)**: People learn better in an online environment when the interface includes a map showing where the learner is in the lesson.

8. **Prior knowledge principle (APM8)**: Instructional design principles that enhance multimedia learning for novice may hinder multimedia learning for more expert learners. Design effects are stronger for low-knowledge learners than for high knowledge learners and for high spatial learners rather than from low spatial learners. The aforementioned strategies are most effective for novices (e.g., low-knowledge learners) and visual learners (e.g., high-spatial learners). Well-structured multimedia presentations should be created for they are most likely to help.

9. **Cognitive aging principle (APM9)**: Instructional design principles that effectively expand working memory capacity are especially helpful for older learners.

2.4 The models of structure Web content and learning activity by Horton

2.4 *Hortonovi modeli strukturiranja Web sadržaja i aktivnosti*

Web lesson is a collect of activities and presentations that accomplish one of the sub-goal of the course. A lesson is a miniature course requiring its own objectives, introductions, assessments and feedback. The structure of multimedia web lessons is a series of small web sequences [9].

Progress through the lesson, or through small web sequences is usually determined in advance. Horton models generally suggest the idea how create a sequence of instruction (Table 1). If use them we have starting point for our own solutions, and each model can be customized and formatted as required [10] [11].

The originality of this paper is reflected in by introducing Gagne nine events of instruction in these models [6].

This paper describes structure of the classic tutorial (the basic model). It is familiar to learners and teachers. The model for creating interactive multimedia web education that is proposed in this paper has a simple structure and familiar to traditional F2F teaching and Croatian educational practice according to Poljak articulation of teaching [12] [13]. It is also easy and flexible and can be used and customized for many purposes including Web-based training. In this model we can easily incorporate Gagne's nine events of instruction (Figure 2).

On the other side in this model multimedia sequences have to be designed according to Mayer's basic and advanced principles of design of multimedia. Designing of multimedia sequences Mayer's basic principles is mandatory, while the advanced Mayer principles optional (Figure 3).

Table 1   *Horton's models structuring web content* [9] [10] [11]

Tablica 1   *Hortonovi modeli strukturiranje web sadržaja* [9] [10] [11]

| Structure	Description	Using
Classic tutorial	After an introduction, learners proceed through a series of topics, each teaching a more difficult concept or skill. At the end of the sequence are a summary and a test. Within the topics, teaching skills and concepts are examples and practice activities.	To teach basic knowledge and skills in a safe, reliable, and unexciting way.
Book-like structure	The lesson is organized as a hierarchy of general and specific areas. Learners can navigate the lesson sequentially as if turning pages, drill down to a specific topic, or consult an index or table of contents (main menu).	For subjects with a clear, accepted structure, especially if the lessons will be used for refresher learning or just-in-time learning.
Scenario centered lessons	The lesson centers on a major scenario about a problem or project. After an introduction and preparation, the learner engages in a variety of activities all relating to accomplishing the goals of the central scenario.	To teach complex concepts, emotional subjects, or subtle knowledge that requires rich interaction with the computer or other learners
Essential learning tutorials	After an introduction, learners proceed through a series of tests until they reach the limits of their current knowledge. Then they are transferred into the main flow of a conventional tutorial, which ends with a summary and test.	To let impatient learners skip over topics on which they are already knowledgeable.
Exploratory tutorials	Learners find knowledge on their own. Learners navigate an electronic document, database, or Web site in which they accomplish specific learning goals. To aid in this task, they may use a special index and navigation mechanisms. Once learners have accomplished their goals, they view a summary and take a test.	To teach learners to learn on their own by developing their skills of navigating complex electronic information sources.
Subject specific structure	A free-form structure where each topic, activity, or page can potentially lead to any other. In practice the structure is organized by the logical organization of the subject or the flow of a scenario.	For subjects that have a distinct organization you want to teach. And for simulations when other structures would interfere with learning.
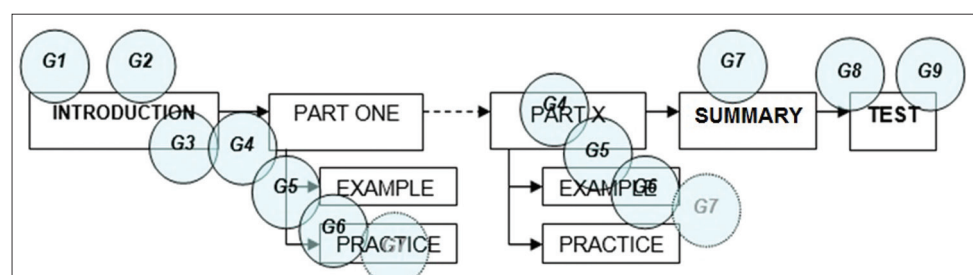
Figure 2 *Horton's basic model of the training tutorial (the lesson blocks) with Gagne's instructional events* [2] [6]

Slika 2 *Hortonov osnovni model tutorijala (blokovi lekcije) s Gagneovim načelima poučavanja* [2] [6]
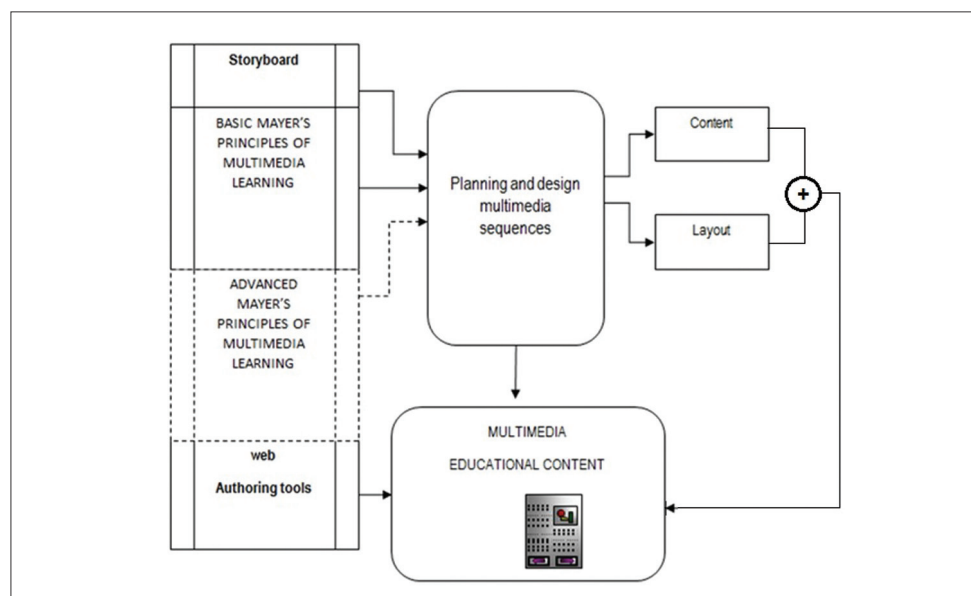
Figure 3
Model for the planning and design of multimedia sequences [2]

Slika 3
Model planiranja i oblikovanja multimedijskih sekvenci [2]

3. The Statistical Analysis of Results and Verification of the Model

3. *Statistička analiza rezultata i verifikacija modela*

Conducted research within of this work is motivated by the desire for practical verification of the proposed model compared to traditional classroom teaching face-to-face (F2F). The proposed model for the design of educational multimedia content presented in this paper is based on a synthesis:

  a. Pedagogical-psychological paradigms based on the cognitivist and constructivist way of learning
  b. Structuring of web content and defining a sequence in accordance with the proposed Horton models structuring web content
  c. Introducing Gagne's nine teaching events in Hortons' models like outside influences for affected and triggered activation internal cognitive processes of learning
  d. Merrill's First Principles of Instruction Design based on active resolving practical problem tasks
  e. Design of multimedia elements according to Mayer's principles of multimedia learning.

The proposed model represents an interactive way of learning within the defined structure of web space for accommodating the multimedia educational content, which means the maximum active relationship between student and course content.

Verification of the model that proposes to create multimedia web educational content verified by experimentally comparing results of knowledge tests, after the completion of course performed by IMWE and F2F method. The tests measured the amount of memorized material and the success of solving practical tasks. The research had been done with students of the Polytechnic of Zagreb.

Through the teaching from three different modules (three experiments), students were divided into three groups. In each experiment, was treated one unit (lesson) that has been designed in two ways, as a classic F2F teaching and as IMWE.

Three groups (the control groups: A, B, C) have had classic F2F teaching with instructor and ppt presentation. Other groups have had teaching through online IMWE (B-s, C-s; A-s, C-s; A-s, Bs) (Figure 4). At the end of each teaching unit all the students have handled the test. At the end all of this tests of all groups was examined and assessed by the instructor.

The success of the groups that participated in all experiments (all observed statistically events) are expressed on the basis of the mean [14]:
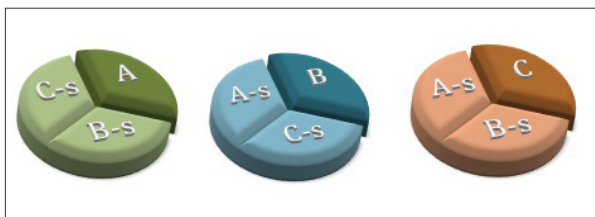
$$\overline{X} = \frac{\sum X_i}{N}$$

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Figure 4   *Three sequences of experiments* [2]
Slika 4   *Tri sekvence eksperimenata* [2]

$\overline{X}$ – The average value of tests in the group (arithmetic mean)

N – the number of assessed tests

$\sum X_i$ – the total of assessed tests in group.

In checking hypotheses were used methods [14]:

   a.   checking the variance using the F-test

   b.   checking the arithmetic means using Student's t-test.

The obtained results by the groups are presented in table (Table 2) and chart (Figure 5) and as such are compared and discussed below.

Experimentally determined:

N_{IMWE}=94; $\overline{x}_{IMWE}$=78,85; S_{IMWE}=13,7; k_{IMWE} = 93
N_{F2F}=42; $\overline{x}_{F2F}$=62,4; S_{F2F}=18,04; k_{F2F}= 41

To confirm the hypothesis: $\overline{x}_{IMWE} > \overline{x}_{F2F}$ applied the statistical method of checking the hypothesis by comparing the experimental data with the theoretical values in two ways by checking [14]:

Table 2   *Spreadsheet view the results of learning [2]*
Tablica 2 *Tablični prikaz postignitih rezultata učenja [2]*

THE ACHIEVED RESULTS					
GROUPS AND STUDENTS					
GROUPS	NUMBER OF STU-DENTS IN A GROUP	N	$\overline{X}$	COM-MENT	Stand. Dev. σ
A	14				
B	14	42	62,40%	F2F	18,04
C	14				
A-s	17				
A-s	17				
B-s	15	94	78,85%	IMWE	13,69
B-s	12				
C-s	17				
C-s	16				

   a.   Variance for IMWE and F2F over the F-test

   b.   Arithmetic means for IMWE and F2F over the Student's t-test.

F-test

The assumption: $H'0: \sigma^2_{F2F} = \sigma^2_{IMWE}$

Then:

$$F_{exp} = \frac{\sigma^2_{F2F}}{\sigma^2_{IMWE}} = \frac{18,04^2}{13,7^2} = 1,7339$$

Theoretical values of the variables F for freedom degrees k_{IMWE}=93, k_{F2F}=41 are:

$F_{0.01}(k_{IMWE}, k_{F2F}) = 1,73$
$F_{0.05}(k_{IMWE}, k_{F2F}) = 1,47$

As the $F_{exp} < F_{0.05}$ (1,7339<1,47) and $F_{exp} \geq F_{0.01}$ (1,7339≥1,73), the hypothesis could be accepted, e.g. the variance in this case did not significantly different [14].

T-test

The assumption that the: $\mu_{IMWE} > \mu_{F2F}$ if the: $\overline{x}_{IMWE} > \overline{x}_{F2F}$ with the degree of freedom: $k_{IMWE} + k_{F2F}$=134, then:

$$t_{exp} = \frac{\overline{x}_{IMWE} - \overline{x}_{F2F}}{\sqrt{\frac{(N_{IMWE}-1)S^2_{IMWE} + (N_{F2F}-1)S^2_{F2F}}{N_{IMWE} + N_{F2F} - 2}}\sqrt{\frac{N_{IMWE} + N_{F2F}}{N_{IMWE}N_{F2F}}}} = \frac{78,85 - 62,4}{\sqrt{\frac{93*13,7^2 + 41*18,4^2}{134}}\sqrt{\frac{136}{94*42}}}$$

$$t_{exp} = \frac{16,45}{15,29+0,1856} = \frac{16,45}{15,4756} = 1,06296$$

The critical values of t_0 for the freedom degrees >120 are: $t_{.1}$=1,282; $t_{.05}$=1,645; $t_{.0025}$=1,96; $t_{.01}$=2,32.

How is the value of $t_{exp} < t_0$ (1,06296 < t_0), then the hypothesis $\overline{x}_{IMWE} > \overline{x}_{F2F}$ can be accepted [14].

On this way, statistic methods were confirmed that the IMWE teaching on average achieved better learning outcomes in relation to the F2F teaching. This also confirmed the practical applicability of the proposed model and recommendations for the designing of multimedia educational web content.
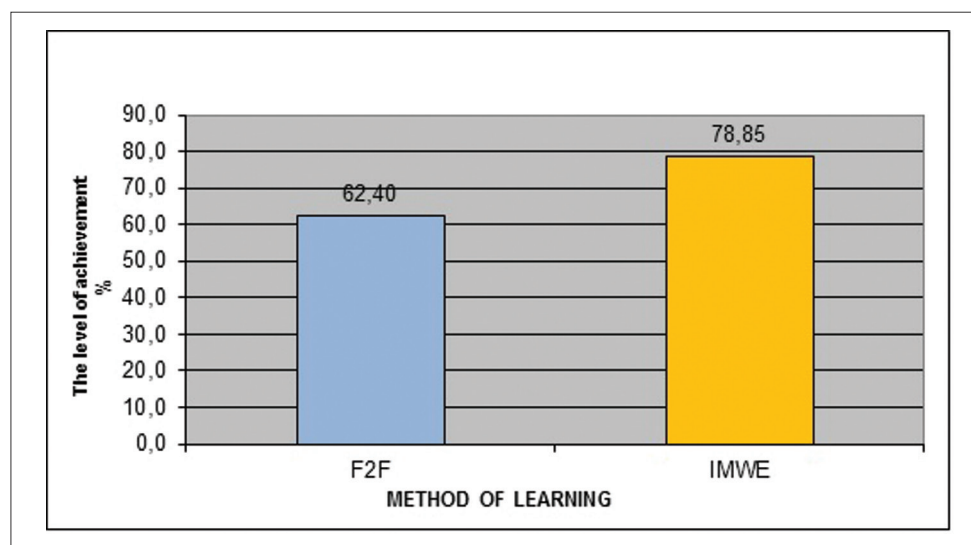
Figure 5
Graphic view of the average values of the results achieved learning [2]

Slika 5
Grafički prikaz prosječnih vrijednosti postignutih rezultata učenja [2]

4. Conclusion

4. *Zaključak*

The model for the design of educational multimedia content presented in this paper is based on cognitivist and constructivist way of learning supported by Gagne's nine teaching events in Hortons' models like outside influences for affected and triggered activation internal cognitive processes of learning. From the other side introduction of Merrill's First Principles of Instruction Design based on active resolving practical problem tasks and designing of multimedia elements according to Mayer's principles of multimedia learning, additionally and stronger are activated cognitive processes which contribute better e-learning.

The experimentally and statistically has been proven that in this case the interactive multimedia web education (IMWE) provides better results in learning compared to traditional face-to-face (F2F) teaching, which is confirmed by experimental research performed with hundreds of students on the Polytechnic of Zagreb.

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DESIGN AND VISUAL CULTURE EDUCATION AT TECHNICAL UNIVERSITIES

DIZAJN I VIZUALNA KULTURA NA TEHNIČKIM UČILIŠTIMA

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Abstract

Creating and producing physical and virtual objects is more than applying technical aspects of innovation and creation. Objects should be designed having in mind both technical knowledge and design principles (a combination of technical skills, expertise from social research, insights from the humanities plus the affiliation of creativity techniques).

The final results of technical process are not merely things with functional properties but objects that bring added value, "speak" to the user and create an emotional bond as "interface" [1]. The communication chain would be impossible without this dimension.

Most technical universities in Croatia seem to be neglecting the relationship between the two fields, and the importance of having design focused syllabi, not yet taking on "design as a cognitive theory" [2]. In this respect, the introduction and development of educational content covering basic design principles to a technical university is crucial. This interdisciplinary approach has proven to be successful in most innovative learning places, such as MIT Media Lab and Aalto University.

Following this concept, two new subjects were introduced at Zagreb University of Applied Sciences and both are based on social sciences and humanities in relation to design.

Keywords: visual culture, design, interdisciplinary education, technical sciences

Sažetak

Stvaranje fizičkih i virtualnih predmeta puno je više od primjene tehničkih aspekata inovacije i kreacije. Predmeti bi trebali biti projektirani imajući na umu kako tehnička znanja tako i principe dizajna (kombinaciju tehničkih vještina, ekspertize iz društvenih istraživanja, saznanja iz humanističkih znanosti i kreativnih tehnika).

Rezultat tehničkih procesa nisu samo stvari koje imaju obilježje funkcionalnosti, već predmeti koji donose dodanu vrijednost, „obraćaju se" korisniku i stvaraju emocionalnu vezu kao „interface" (sučelje) [1]. Komunikacijski lanac bio bi upravo nemoguć bez te dimenzije.

Čini se da većina tehničkih učilišta u Hrvatskoj zanemaruje povezanost ovih dvaju polja, kao i važnost uvođenja silabusa s naglaskom na dizajn, još uvijek ne poučavajući „dizajn kao kognitivnu teoriju" [2]. Iz tog je razloga uvođenje i razvoj obrazovnog sadržaja koji obuhvaća osnovne principe dizajna na tehnička učilišta od iznimne važnosti. Takav interdisciplinarni pristup pokazao se vrlo uspješnim na većini inovativnih obrazovnih institucija, poput MIT Media Lab-a i Sveučilišta Aalto.

Slijedeći taj koncept, na Tehničko veleučilište u Zagrebu uvedena su dva nova kolegija i oba se temelje na odnosu društvenih i humanističkih znanosti prema dizajnu.

Ključne riječi: vizualna kultura, dizajn, interdisciplinarno obrazovanje, tehničke znanosti

1. Introduction

1. *Uvod*

Every object that is produced has at least two functions, and one is often more obvious than the other. The first lies in the core purpose of the produced object while the other is more subtle and refers to – communication. What makes an object more desirable than another is embedded in its meaning, or better yet, its multiple layers of meanings, that correspond

and communicate with the user on an immaterial, or spiritual level. To integrate this kind of meaning and communication into a design it is important to be aware of human psychology and the socio-cultural factors. Implementing values into a design is therefore crucial for its success. Furthermore this aspect is relevant to users in process of understanding the function of objects produced.

2. The Concept Of Design

2. *Koncept dizajna*

The term design is often used in variety of contexts and is therefore sometimes difficult to define. The nature of the term and the process is implemented in everyday life since the beginning of human culture and it is inseparable from any kind of human action, whether in architecture, product design, web design or hair design. The term and the definition of design is related to the person using the term. In this respect, and considering the subject discussed in this paper, it is important to define design/a designer/the design process – from two aspects: within engineering and within humanities/social sciences.

Firstly it is important to glance at another occurring problem that lies in the multiple or fluid nature of the concept of *design* (especially in English). It can be used as a *noun* (signifying a general field, a concept and a finished product) and as a *verb* (denoting a process or action). John Heskett argued this in one sentence: "*Design is to design a design to produce a design.*" [3, p. 5].

Within the general public and sometimes even within the academic sphere, design is often (even today!) described merely as the *form* and the *aesthetic* value of an object. But a *designed object* should be: functional, usable, creative, innovative, sensible to humanistic and environmental concerns, meaningful, long lasting and user friendly. It should be able to connect with both our physical and psychological being. This in particular applies to visual communication design, product design, architecture, and it is making its way to engineering and technical sciences as well.

2.1 Design and Engineering

2.1 *Dizajn i tehničke znanosti*

To define a designer as a person, with a high level of responsibility because of his/her ideas,

knowledge, and skills, means to determine several aspects of the product – the technical, economic and ecological [4]. Furthermore, design is acknowledged as an engineering activity that: "*affects all areas of human life, uses laws and insights of science, provides the prerequisites for the physical realization of solution ideas, and requires professional integrity and responsibility.*" [4, p. 1]. Other authors in the field define design as the "*process of conceiving, developing, and realizing products, artifacts, processes, systems, services, and experiences with the aim of fulfilling identified or perceived needs or desires typically working within defined or negotiated constraints*", but also as a process of "*conception, invention, visualization, calculation, refinement, and specification of details that determine the form of the product*" [5, p. 2]. Cross argues that the design process "has to provide a description of the artefact that is to be made" [6, p. 4]. This description should bear all the details of the product such as dimensions, surface finishes, materials and colors.

According to ABET (Accreditation Board for Engineering and Technology) engineering design is "*the process of devising a system, component, or process to meet desired needs, specifications, codes, and standards within constraints such as health and safety, cost, ethics, policy, sustainability, constructability, and manufacturability. It is an iterative, creative, decision-making process in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally into solutions*" [7, p. 27]. While this definition of engineering design still stands, ABET proposes changes in student outcomes in engineering studies that must include, among other things: "*a broad education component that includes humanities and social sciences...*" [7, p. 29]. This connection with humanities and social sciences was described by Dixon and Penny, who state that engineering design is somewhere in the middle of two overlapping streams, one beginning with science and ending in production, and the other ranging from politics to art [8]. Penny also points out that engineering design is "*concerned with the art of using science in achieving a useful end-product*" [8, p. 344].
In 2001 Faste pointed out that education in engineering should take a new course arguing that

until the end of 1980's it was a universal practice for the engineer to focus on *utility*, the industrial designer to deal with *form*, and the manufacturing engineer to manage *production*. But since the beginning of 1990's, due to changes in technology, economics, geopolitics, philosophy etc. the nature of products had also changed, which means that the nature, or the universal practice of the engineer must change as well, becoming more involved with the form-giving aspect of the product, something that was traditionally assigned to the industrial designer [9].

2.2 Design within Humanities

2.2 *Dizajn u humanističkim znanostima*

Zaccai states that a designer "*must successfully integrate all of the requirements that balance the rational, sensory and emotional expectations of the individual user and of society as a hole*" [10, p. 5]. He argues that the division of labor and specialization resulted in experts with deep knowledge in one field but a strictly superficial knowledge in all other. When dealing with "problem solving" of any kind of nature, the solution should fulfill all the desired needs we have as human beings. This means that a person with specialized knowledge in one field has to work with other experts to try and overlap the gaps (leaving no blank areas) in this narrowly focused knowledge of an individual to create a product that is satisfactory to our humanistic values.[1] The real focus, therefore, should not be on the designed object, but on the person using the object [10].

ICSID (International Council of Societies of Industrial Designers) offers a quite extensive definition of industrial design. The newest changes to the definition say that industrial design is a trans-disciplinary profession, a creative and strategic problem-solving process whose aim is to produce innovative products that provide a better quality of life. Like Zaccai, ICSID puts the user at the center of the design process [11].

From 2011 to 2013 the ico-D (International Council of Design) went through a review that

made the way for a new definition of design, which is said to be the most significant outcome of the review. Design is defined as a "*constantly evolving and dynamic discipline*", while the designer as a professional who "*applies intent to create the visual, material, spatial and digital environment, cognizant to the experiential, employing interdisciplinary and hybrid approaches to the theory and practice of design. They (designers) understand the cultural, ethical, social, economic and ecological impact of their endeavors and their ultimate responsibility towards people and the planet across both commercial and non-commercial spheres.*" [12]

According to Croatian Designers Association (HDD) "*design is an interdisciplinary activity that combines social, humanistic and technical sciences with a creative and artistic component*". [13]

3. Design Education within Technical Universities in Croatia

3. *Dizajn na tehničkim učilištima u Hrvatskoj*

Since design is an interdisciplinary activity encompassing both art and technology, humanistic and technical sciences, one would assume that it is only natural for it to be, at least in some way, incorporated in the curricula of technical studies. But this is more an exception than it is a common rule. Only a few Croatian technical universities offer courses covering design – the Faculty of Forestry (Wood Technology Study Program), Faculty of Electrical Engineering and Computing, and the Faculty of Mechanical Engineering and Naval Architecture.

The Faculty of Forestry offers several courses covering design principles and methods, semiotic theory, theory of form, visual communications, aesthetics, psychological, cultural and social factors such as: *Furniture Design, Methodology of Industrial Furniture Design, Upholstered Furniture*. The aim of the courses is mastering and understanding the theoretical, practical and methodological basics of design as s complex interdisciplinary process. At the end of the course the students should be able to critically review design solutions and be independent in creating their own designs [14].

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1   Including aesthetics, intellect, soul, and all of the senses.

The Faculty of Electrical Engineering and Computing introduced a new course named *Creative Laboratory* which is in essence an *interdisciplinary* course. The lecturers come from different fields which gives students the opportunity to learn how to approach a problem or a project from different perspectives and to make solutions that are innovative and truly answer the desires and needs of the population. It's a joint course that includes experts from six universities: the School of Design, Faculty of Economy, Faculty of Electrical Engineering and Computing, The Academy of Fine Arts, The Music Academy and The Faculty of Natural Sciences. The key aspect of this course is the multidisciplinary approach – artistic, designer, engineering, scientific, managerial and musical. Students are divided into groups based on two criteria – psychological tests and core faculty – making sure that the team members are diverse in respect to their character and expertise.

An example of an interdisciplinary approach to design is the International Design Conference organized by the Faculty of Mechanical Engineering and Naval Architecture in association with the Design Society. The conference was first held in 1981, and since then it gathers professionals across the fields of engineering and industrial design and covers a variety of design related topics from a cross-disciplinary perspective, ranging from engineering, industrial design, aesthetics, ergonomics, sociology and psychology.

4. Exapmles of Good Practice

4. *Primjeri dobre prakse*

"*Successful products require the presence of three things: utility, usability, and meaning.*" [9, p. 328]. Rolf Faste was an Associate Professor of Mechanical Engineering and Director of the Product Design Program at Stanford University. During his academic work and teaching period he tried to sensitize mechanical engineers to understand human needs and cultural meanings of products, teaching visual thinking and "need finding" courses. Today, the Stanford University offers a handful of

design courses related to humanistic sciences within engineering studies [15].[2]

In association with the d.school (Hasso Plattner Institute of Design) in Stanford, the HPI School of Design Thinking in Potsdam set a milestone in multidisciplinary teaching and product manufacturing by offering students the opportunity to engage in problem solving projects with students from other disciplines like engineering, business, creative industries, media, social sciences, humanities, life sciences and industry. The focus is on design thinking, development and dissemination of this teaching method which has proven to be very successful. After getting the basic theory of what design thinking is, students apply this knowledge to solve a real problem through a project in collaboration with external partners from industry and society [16].

MIT offers a course called *Engineering Innovation and Design* which is a core requirement in the Gordon-MIT Engineering Leadership Program. The course is project based and gives students an opportunity to learn and apply design thinking in problem solving. The course covers topics such as creativity, design principles, psychology, usability, banding, innovation and ethics etc. Students learn to communicate with high emotional impact and develop skills to lead, organize, evaluate and implement successful projects [17].

University of Technology Eindhoven (TU/e) is taking engineering and technology studies even further into humanities and social sciences introducing undergraduate and graduate programs like *Psychology and Technology and Human-Technology Interaction* with the aim of increasing the acceptance or enjoyment of using products. The programs focus on the relationship between humans and technologies, i.e. how people use and interact with technology, teaching students the way people think, perceive and behave through courses that cover psychology, cognitive sciences, perception, human factors, decision making and consumer behavior [18].

2   The curriculum includes courses like: Renaissance Machine Design, Think like a Designer, Visual Thinking, The Designer's Voice, Introduction to Human Values in Design, History and Philosophy of Design, The Designer in Society, d.science: Design for Science, Fundamentals of Design for Design Thinkers.

At the Faculty of Industrial Design Engineering in Delft the focus is on learning user-centered design and on integration of engineering, materials, manufacturing methods, design, ergonomics, business and environment. Student listen to courses like *Man and Product*, and *Design and Experience* [19].

5. Design and Visual Culture Courses at Zagreb University of Applied Sciences

5. *Dizajn i vizualna kultura na Tehničkom veleučilištu u Zagrebu*

Having in mind the importance of interdisciplinary approach to design, Zagreb University of Applied Sciences (UAS) decided to introduce two new subjects (*Design and Visual Meaning; Theory and Development of Design*) to its IT design Undergraduate Study Program positioning the design topics from the point of view of social sciences and humanities. Design and visual communications do not exist in a vacuum of technical sciences, rather, they are the core of everyday life. All products connect to users in two aspects: material and symbolic. It relates to human body, mind and soul. To communicate this twofold nature of design as practice, the newly introduced subjects cover theories and examples of visual culture and its effects on the design process. Students learn different approaches to design – anthropological, aesthetical, and semiotic; the way meanings are generated and associated with object of everyday life and changed through time and form. Topics related to design and design theory are presented as static images through presentations, but also with relevant video materials in both physical and virtual classrooms, which added dynamic to the teaching process. The students are encouraged to interact, critically observe and review existing design solutions, which should help them make their own design using critically applied principles.

The course *Design and Visual Meaning* is an introductory subject that focuses on basic terminology, theories, ideas and concepts on design and visual semantics that enables students to recognize relevant features of visual culture, especially the relation of design and visual perception to contemporary digital and multimedia environment. Topics are presented through relevant examples of visual culture, covering a broader social and cultural context. Students analyze design for logos and web sites, with regards to their socio-cultural aspects and basic design principles. Students are also encouraged to visit design exhibitions as an important way of bringing design closer to the general audience.
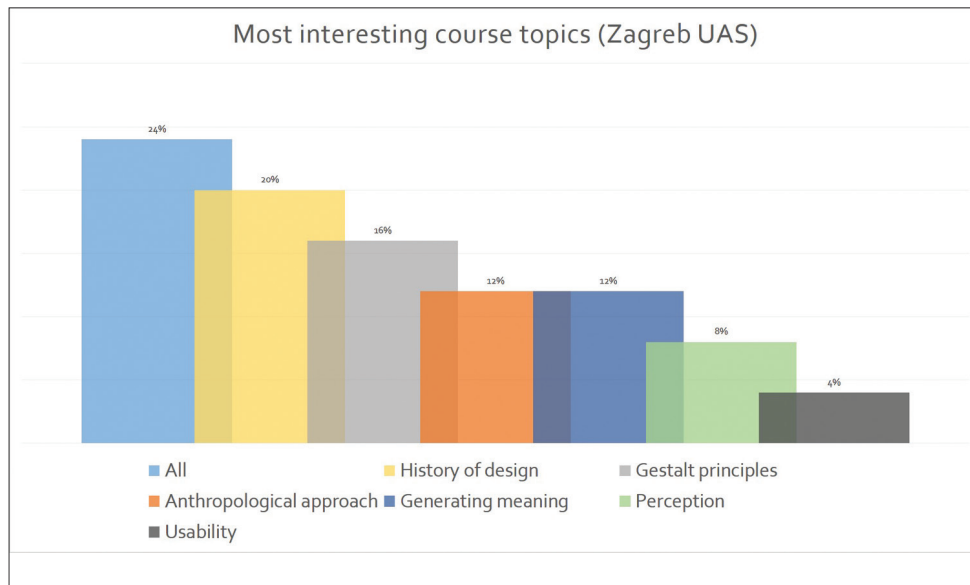
The second course, *Theory and Development of Design* deals with concepts, theories and practices related to design. Students analyze and integrate ideas and concepts on design in relation to their social and cultural context. This enables them to engage with a deeper analyses and evaluation of past design solutions. Both courses' learning outcomes try to upscale the competences of students within the field of integrated approach to science and technology as creative tools for sustaining the environment adapted to human needs.

5. 1 Questionnaire Results
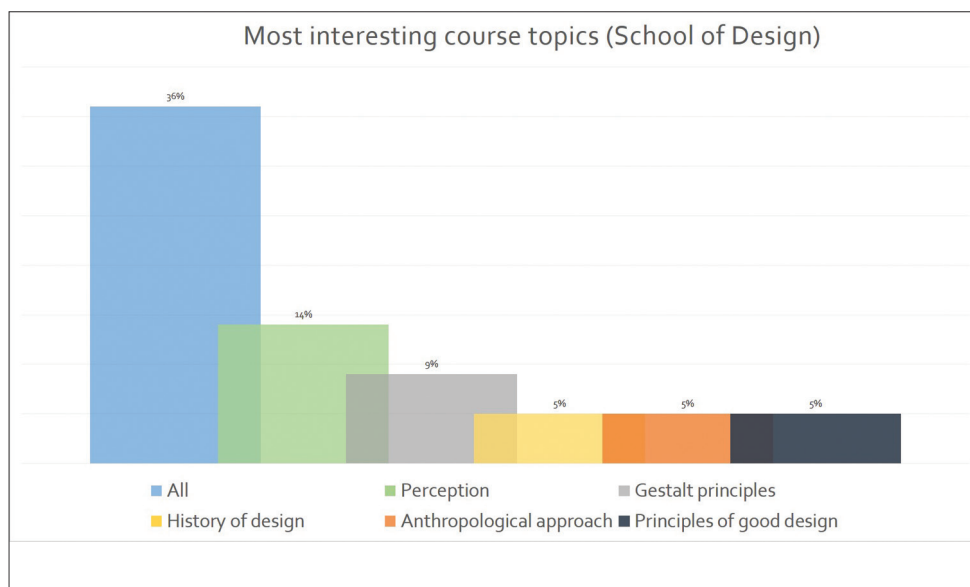
5. 1 *Rezultati ankete*

To evaluate the content and the methodology of both courses a student questionnaire was carried out during April and May 2016. The students had to grade the content and usefulness of the course on a scale from one to five (one being the lowest grade). The results (Graph 1) show they are generally satisfied with the course content (average grade: 4,52), and they found it mostly useful (average grade: 4,2). Six out of 25 feel the course content is complete, and needs no changes. Topics they found most interesting are: all (6/25); history of design (5/25); Gestalt principles (4/25); anthropological approach to design (3/25); generating meaning (3/25); perception (2/25); and usability (1/25).

The same questionnaire was carried out at the School of Design at the University of Zagreb. The students found the course content satisfying (average grade: 4,45) and useful (average grade: 4,36). Topics they found most interesting were: all (8/22); perception (3/22); Gestalt principles (2/22); history of design (1/22); anthropological approach to design (1/22); rules of good design (1/22). Even though the average grade of the course content is somewhat lower than with the students at UAS, more students from this group said they liked all topics (Graph 2).

Most interesting course topics (Zagreb UAS)

24%
20%
16%
12% 12%
8%
4%

- All
- History of design
- Gestalt principles
- Anthropological approach
- Generating meaning
- Perception
- Usability

Graph 1
Topics student at Zagreb UAS found most interesting.

Grafikon 1
Teme koje su studenti na Tehničkom veleučilištu u Zagrebu označili kao najzanimljivije.

Most interesting course topics (School of Design)

36%
14%
9%
5% 5% 5%

- All
- Perception
- Gestalt principles
- History of design
- Anthropological approach
- Principles of good design

Graph 2
Topics students at The School of Design found most interesting.

Grafikon 2
Teme koje su studenti na Studiju dizajna označili kao najzanimljivije

Furthermore, students from both universities were asked to suggest topics that could be covered within the course in the future. Students at Zagreb UAS proposed mobile app design, animation design, video and video games design, but also a topic referring to Croatian graphic and industrial design history. Most of the students at the School of Design suggested topics related to contemporary design, history of design and industrial design. Other topics they pointed out as important are: materials used in design, eco design and design for extreme conditions (such as submarines, or extremely cold climates).

6. Conclusion

6. Zaključak

Even though design is an interdisciplinary activity that has no clear borders and is an integral part of every single object produced, design education in Croatia (apart from a few exceptions) mostly focuses on one or two aspects of the field, depending on the study type. The focus of design within technical studies lies, in great part, on technical functionality and utility. This is a solid foundation for making objects that "do the job", but in today's creative and technologically

founded economy, where pretty much everything works well, mere functionality is not nearly enough. Comprehending design from the field of humanities and social sciences offers an opportunity to create objects and communication systems that have cultural "added value", which communicate and relate to users on a complex

functional level. Introducing courses that cover this kind of design understanding at Zagreb UAS is a step forward towards the new type of comprehensive technological and human centered approach to creative competence, through syllabi with learning outcomes which do complement the tech topics with social and humanistic ones.

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NEW TESTAMENT EPISTLES AS EARLY EXAMPLE OF FORMATIVE DISTANCE LEARNING DUE TO POSITIVE EMOTIONS

NOVOZAVJETNE POSLANICE KAO RANI PRIMJER OBLIKOVANJA OSOBE UČENJEM NA DALJINU KROZ POZITIVNE OSJEĆAJE

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Abstract

This paper will introduce and compare distance learning in the case of Paul's epistles (disciples of Christ) and Universities (students). Distance learning is not a new idea, it has been known since the first century. Christian teachers, e.g. Paul of Tarsus, taught their disciples through epistles, not only to exchange teaching and information, moreover, it was regarded as formative process of the whole person. Due to fostering positive emotions their teaching letters take on a formative level in the sense that disciples adopted the information (teaching) as active part of their lives and thus were (trans)formed by it. Psychology confirms, information related to emotions is stored permanently in the brain, and the learned material is better evoked. That way the information becomes available on demand and takes on formative characteristics (like with the disciples of Christ). Meaning, the student will be informed through distance learning and thereby the whole person can be formed. The formative aspect is vital, it ensures for the student not only information, furthermore, formation will enable the student to incorporate the learned material into their practical lives as well.

Keywords: New Testament, Epistles, distance learning, emotions, (trans)formation.

Sažetak

Ovaj rad će predstaviti i usporedite učenje na daljinu u slučaju Pavlovih poslanica (Kristovi učenici) i sveučilišta (studenti). Učenje na daljinu nije nova ideja, poznato je od prvog stoljeća. Kršćanski učitelji, npr. Pavao iz Taršiša, poučavao je svoje učenike kroz poslanice, nije to bila samo razmjena informacija, štoviše, to je bio proces oblikovanje cijele osobe. Obzirom da su poticane pozitivne emocije kroz poslanice, njihova poučna pisma poprimaju oblikovnu razinu u smislu da učenici usvajaju informacije (učenje) kao aktivni dio svog života, tako nastaje (pre)oblikovanje. Psihologija potvrđuje da se informacije povezane s emocijama trajno pohranjuju u mozgu, a naučena se materija lakše doziva u sjećanje. Tako informacija postaje dostupna na zahtjev i poprima formativne karakteristike (kao i s Kristovim učenicima). Dakle, student će biti informiran putem učenja na daljinu, i moguće je da cijela osoba bude (pre)oblikovana. Formativni aspekt je bitan, jer osigurava da student ne prima samo informacije, već biva preoblikovan. To omogućuje studentu da naučeno gradivo primjeni u svom praktičnom životu.

Ključne riječi: Novi Zavjet, poslanice, učenje na daljinu, emocije, oblikovanje.

1. New Testament Epistles, an ancient medium for distance learning

1. *Novozavjetne poslanice kao drevni medij za učenje na daljinu*

Epistles were the primary written correspondence form in the ancient Greco-Roman world, especially throughout the New Testament times. The word epistle comes from the Greek *epistole* which means "letter" or "message," but in the beginning it "referred to an *oral* communication sent by a massager." This kind of communication was used in diverges areas of life, formal (e.g. commercial, legal, military and governmental documents) and informal (e.g. personal letters). [1]

Paul of Tarsus, Apostle of Jesus Christ, employed this form of communication to spread and reinforce his teachings of Jesus Christ and Christian conduct in the church, secular society, and family settings with crucial information on religious practice and theology. Even though some of Paul's epistles were personal letters, they were more than private. Mostly his epistles were addressed to Christian communities, intended to be read publicly within the churches. He wrote from the position of a sent representative of Jesus Christ who is the head of the church on earth. This gave him the authority to act as teacher and mentor; furthermore, to instruct, give guidance, inspire and to rebuke. These epistles were

occasional, contextual writings addressing particular situations, and were the substitutes for Paul's personal presence. He was concerned with the life situations of his readers, but never in the impersonal way characteristic of many Hellenistic letters. Paul treated each situation as unique and important. At the same time his letters set forth significant theological teaching and express a Christian understanding of life which reaches beyond the particular historical situation. [1]

Noteworthy, Paul wrote to congregations he personally knew (e.g. 1 and 2 Epistle to the Thessalonians, Epistle to the Galatians or 1 and 2 Epistle to the Corinthians) and to churches he did not know personally (e.g. Epistle to the Romans). Also, he mentored a few leaders and wrote to them with the same purpose as the other letters (e.g. 1 and 2 Epistle to the Timothy or Titus). An epistle would be carried by a trusted massager, who was recommended by the author, first, to the addressed congregation, and afterwards it became a circular letter for the other churches. The messenger publicly read the epistle to the believers. Church members received the teaching-epistles in the same manner as if the Apostle himself were with them. As above stated, Paul was interested in the lives of the disciples. He treated them with care and devoted equal time to write about solving their problems as well as his teachings. Through maintaining personal relationships with the disciples, Paul mirrored Jesus Christ and his teachings, and thus was a role-model for the disciples to follow. Those epistles pictured to the disciples a new world

(i.e. a new mind set) of which they could be part of. Only those who took the teachings beyond the cognitive level and actually related it in their everyday life actions, were (trans)formed into a new person.

2. Formation Through the Learning Process

2. *Oblikovanje osobe kroz učenje*

The epistles would not only inform and correct or resolve conflicts, likewise they had (and still have today) a formative value. The disciples of Christ viewed an epistle not only as source of information or instructions. Moreover, believers considered the teachings in the context of their lives (i.e. the church) and adopted the given information (i.e. learned) so that this knowledge formed and changed their entire lives; their approach to life altogether. This kind of formation through distance teaching was only possible because believers were driven by their positive emotions, first, for their Lord Jesus Christ, and second, for their communities (sacred and secular). Gratitude, happiness, and hope are emotions (i.e. emotional experiences) which create the potential will to perform better with the goal of higher achievement. [3] Positive emotions and the divine intervention were the force that determined the New Testament believers to take on Paul's teachings even if he was not physically present. What Paul did through his teachings was to demonstrate and explain how certain teachings were of practical use in everyday life. Another aspect was his clear presentation of how those teachings, if rightly implemented in thought and action, could bring benefits to the individual believer and to the faith and secular community. Psychology confirms that a student (esp. graduate student) shows more interest (and is less bored) with the lessons if the instructor can clearly relate the learning material to practical or relevant use in the student's life or work place. [4]

[R]esearch operating within a self-determination paradigm posits that not all academic activities are intrinsically motivating, but through providing external supports, such as a rationale as to why an activity is useful or relevant to students' lives, students may internalize the

value of engaging in activities that may not be particularly compelling or intrinsically interesting. … Fostering relevance is one such external support, which refers to actions that help students understand the connection of the academic material to their own interests and goals. When students perceive instruction to be successful at fostering relevance, they are more likely to experience positive affect in learning situations and greater engagement. In graduate-level education courses, instructional strategies to foster relevance may include connecting course material to real-world or practice applications. [5]

Significant is that Paul was the external support in this whole (trans)formation process and was on disposal to the disciples. In fact, his maturity and help (i.e. professor's expertise) was critical for the disciples to accomplish acting out the teachings.

3. Emotions—Part of the Learning Process

3. *Osjećaji – Dio procesa učenja*

Similar to Paul, a professor has the role of a mentor and is the authority-figure in class. The instructor's way of interaction with students is crucial for their processing and how learned information will be stored in the brain. Today distance learning can have three forms. In many on-line programs students do not know their instructors personally and probably will never meet any of them. Another possibility is that the student has a one week in-class experience with the instructor, combined with on-line work for the rest of the semester. And the third option where one has a distance mentor-relationship with the instructor, for instance, when writing a thesis. In addition to teaching new material, professors should teach (or help) their students to manage their emotions "during challenging learning and evaluation activities." That way instructors have the chance to decidedly impact their students' accomplishment emotions. [5] If the instructor limits his interaction with the students only to communicate when something is wrong or assignments were poorly done, then the instructor will only evoke negative emotions. This kind of critique has its place only if the professor is also commenting on the

student's accomplishments, hence the critique becomes constructive and not destructive. Poor personal relationships between instructor and student will inevitably lead to a decline or even a complete loss of learning performance for the course. The results are poor learning outcomes. Where no positive emotions are involved there is no lasting formation of the student possible. Emotions come in when professor and students interact on a more intensive and personal basis. The professor is the fueling force in that kind of relationship and his engagement (or the lack for it), and constant communication with the students (communally or individually, via blackboard or e-mail), ensures that not only information is traded. In addition, the knowledge boosted by the professor's praise (or encouragement) will be emotionally experienced by the student. Experts confirm that "emotionally charged memories, both positive and negative, are remembered better. One reason for this phenomenon is that emotional stimuli involves the arousal of the amygdala, consequently affecting the cortex (the brain region responsible for focusing one's attention) and the hippocampus (the brain region responsible for consolidating memory)." Further, "Emotion may trigger the recall of memories stored in neocortical representations. Amygdala backprojections to the cortex could perform this for emotion in a way analogous to that in which the hippocampus could implement the retrieval in the neocortex of recent (episodic) memories." [7]

The student does not only receive information, but information, which is emotionally processed, transforms and the taught material becomes part of the student life (i.e. enables them to use in practice). [8] "Another function of emotion is that by enduring for minutes or longer after a reinforcing stimulus has occurred, it may help to produce persistent and continuing motivation and direction of behavior, to help achieve a goal or goals." [9]

4. Personal Testimony (Monika Bajic)

4. *Osobno svjedočanstvo (Monika Bajić)*

This hypothesis is a result of my own experience with distance learning. Over a year ago, I enrolled in an on-line Master's program (Masters of Theological studies) at a private university in

the United States of America. My motivation was personal development and higher academic requirements for my work place. At the beginning, I was skeptical towards distance learning methods and if such a way of learning can accomplish anything except of information transfer. After the first semester, I was assured, and had to admit that this method of education has nothing missing. In fact, there are many benefits for people like me (i.e. employed, family, volunteering, etc.). The learning outcomes do not lack compared to in-class (face-to-face) studies.

In my opinion the professor and how he handles his students determines the learning experience and thus learning outcomes. I had a few professors whose approach is obsolete. Their communication with students is very limited and if not initiate by the student themselves, the professor would not interact other than giving mass-instructions via e-mail or discussion board. Beyond their weekly instruction for the discussion board and assignments, their communication was mostly restricted to comments and correcting wrong behavior or poorly done assignments. A few instructors used a more personal approach in their on-line courses. I experienced and received through such a course knowledge that (trans)formed me. My brain stored the received information in a way that I can access it any time I want. Not only do I remember the lessons, I integrated them in my everyday life practice. One part of our assignment was to write a weekly journal on particular chapters of an Old Testament book. This exercises helped me to integrate some personal and cultural experience in specific areas of religious practice. The instructor read my journal every week and communicated through comments on my journal with me. This very communication was a great motivation and source of positive emotions for me, which helped to set my learning dynamics more effective and higher achieving goals for that class. The instructor also once encouraged me in an on-line discussion to freely state my opinion and to include my own experiences and emotions connected to a particular event. The professor's weekly comments and several encouragements on my work/learn performance increased multiple times my learning interest and again provided positive

emotions which would drive me to focus more on better learning outcomes. The other source of positive emotions was the transformation of myself that took place while studying portions of the Holy Scriptures and class material.

5. Discussion

5. *Rasprava*

Are emotions really part of the learning process, if they are, what is their place in teaching in general, and more specific is it possible to make emotions an integral part of distance learning? In ancient times, holy scriptures of different religions were not only sacred mystical ritual cookbooks, but rather teaching material for the whole person's wellbeing. Apostle Paul's epistles from the New Testament are used as fine example how teacher – learner relationship might look like in distance learning. Three models were considered: people who never met their teacher in person, students who once met their teacher and those who were his disciples – they were personally mentored by him. All those relationships were soaked with deep emotions, starting at the teacher as role-model all the way to the teacher being a "new father" who helps his loved disciples develop their full potential in life. The role of emotion can vary in these relationships; a mentor can call upon other triggers than a teacher. In distance learning teachers should be aware of the relationship level they were able to develop. They should fish between students, during introductory classes, to seek those who are eager to develop deeper relationships and not neglect those who for any reason are satisfied with "just" learning. As I (Milan) was watching Monika in her distance learning classes, it was always the teacher who was initiating a deeper relationship through personalized answers and trying to understand and value her position on given topics. The dark side of distance learning was that some teachers had given robotic, general, non-personalized answers which demoralized Monika to go deeper in learning, instead she just memorized the facts. To be fair, when Monika was passionate about some topics, she learned, she gave herself so much in discussion, writing of papers and other tasks that her teachers were also delighted even though she

had not met them personally. It is possible that part of the emotionally overwhelmed learning is due to religious content – but are we sure that all other subjects that are taught are emotionless or could not develop deeper level relationships between student and teacher?

6. Conclusion

6. *Zaključak*

Technology by itself is emotionless, the only way to express emotions is to engage students in content creation and expression of their opinions,

attitudes and emotions in written or multimedia form. Professors should have all the tools and skills in hands to engage students in online classrooms, the only problem that might occur is they are not familiar with how to use them. Changing the reality of teaching environment where teachers are not anymore the solitary source of information, asks for development of and finding some new roles that professors could play in learning. Once emotions are envisioned as inseparable part of learning one must question the limits of these relationships and how to protect all stakeholders from emotional or any other manipulation or misuse.

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