E-LEARNING IN HIGHER EDUCATION: CASE STUDY

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Abstract: *By using the "case study" method on a selected example of a higher education institution, the paper analyzes e-learning on safety study programs. The analysis covers the context of the higher education institution, the existing status of application, the strategy of future e-learning development, and the characteristics of e-learning in the selected course, including a description of the course, learning objectives, teaching strategies and methods, assessment of knowledge and the role of the teacher as an e-learning tutor.*

Key words: *e-learning, higher education, safety study programs*

1. INTRODUCTION[1]

Modern humanity is faced with a fascinating situation introduced by new technologies to all areas of human activity. Intensive technological development, an explosion of information in all economic sectors and, in particular, development of information and communication technologies, development of new scientific disciplines and scientific methodology, an exceptional rate of changes in systems and their environments, could not avoid the area of education [13].

New information and new technologies affect, directly or indirectly, the reform and improvement of the educational system, changes to the content, and advancement of teaching and learning techniques and technology. However, while technology in other areas of human work and activity has significantly advanced [6, 9] the education system, as one of the most inert systems in social development, has very much remained at the level of a standard work organization. Regarding this, modern theoreticians of education warn that if educational systems in their entirety are not changed more quickly, there is a risk that they will be far behind the developments in other areas [14].

The demands of modern society for global knowledge, uniform standards, timely information and possibilities of connecting the acquired information and experience at a universal level indicate deficiencies in the traditional educational technology and a clear need for new technologies and learning innovations in higher education.

E-learning is an innovation [12] that was provided with most entrepreneurial capital and most grandiose promises, of which the following three deserve to be highlighted:

1) Combination of new electronic technologies and newly accepted theories will result in a revolution in pedagogy itself[2].
2) The possibility of providing e-learning anytime and anywhere, provided there is access to a computer and internet connection.
3) The market will provide the necessary funds for full implementation of e-learning possibilities.

Perhaps it is not so surprising that reality never even came close to keeping these promises. However, to discard e-learning because we think it is just another fashionable insanity would mean we have not understood its essence. Understanding what happened to e-learning and why is crucial if we want to understand how and why technology will probably affect the educational processes, now and in future [15].

Safety has an important economic and broader social significance in all its areas (occupational safety, fire protection, environmental protection, etc.). The presents risks and risks permanently generated in the working and living environments impose a need for constant and timely adoption and dissemination of knowledge and information and development of the profession and science in the area of safety. This provides a certain challenge of quickly and efficiently responding to the modern requirements and needs for innovation of higher education in this area. Traditional approaches to education are simply unable to keep up with this pace, so lifelong learning becomes imperative in modern times. In this context, the implementation and development of e-learning in study programs provides significant opportunities.

2. METHODOLOGY

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[2] If we closely analyze the behaviorist, cognitive and constructivist schools of thinking, we easily observe many common features. Te designing of online materials may include principles of all three schools and these theories have contributed in different ways to the designing of online materials and will continue to be used in the development of teaching materials for online learning [1].

We used the case study method, analyzing e-learning in detail on a selected practical example of a higher education institution and a course. We analyzed the context of the higher education institution, the present situation with respect to the use of e-learning, the strategy of future development of e-learning at the higher education institution, and characteristics of e-learning in the selected course.

The paper starts with a hypothesis that electronic advancement of the learning model (e-learning) expands its impact on the overall teaching/education process of the higher education institution (teaching method, teacher-student communication, consultations, assessment and valuation of knowledge, extracurricular activities, etc.).

We selected the University College of Applied Sciences in Safety of Zagreb, Croatia as the sample higher education institution. The selected course is "Safety Management".

3. RESULTS

ANALYSIS OF E-LEARNING AT A HIGHER EDUCATION INSTITUTION WITH SAFETY AND SECURITY STUDY PROGRAMS

The context of the higher education institution

The University College of Occupational Safety (later the University College of Applied Sciences in Safety) in Zagreb (Republic of Croatia) began to operate in the academic year 1997/98 as a single four-year study program, the completion of which provides university-degree education and the professional title of Graduate Safety Engineer with the indication of the major in the study program: Occupational Safety and Fire Protection, and the abbreviation Grad. Saf. Eng. As of the academic year 2001/2002, the Collage has organized and provided, in three generations, a postgraduate professional safety study program of 1.5 years or 3 semesters, the completion of which provides the professional title of Master of Science in Safety and the abbreviation MSc-Safety. In addition to Zagreb, the University College of Applied Sciences in Safety gave courses for remote student groups in Čakovec, Pazin, Osijek and Split where it still gives them with a permanent permission of the competent ministry as a dislocated study program [10].

As of the academic year 2005/2006, the following programs are conducted at the University College of Applied Sciences in Safety under the new Bologna higher education system:

1) Undergraduate professional safety study program, first level of Bologna higher education, with the following majors: Occupational Safety and Fire Protection; study program duration: 3 years/6 semesters; professional title: Professional Bachelor in Safety Engineer, abbreviation: BS-Sec. Eng.; ECTS points: 180; total number of courses: 34.

2) Specialist graduate professional safety study program, second level of Bologna higher education; majors: Occupational Safety, Fire Protection and Environmental Protection; study program duration: 1 year/2 semesters; professional title: Professional Specialist Engineer in Safety and Security; abbreviation: Prof. Spec. Sec. Eng.; ECTS points: 60; total number of courses: 20.

This is a part-time study program (with work) under a regular program and an academic calendar consisting of 30 weeks of course a year. Courses are taught on weekends (Fridays, Saturdays, Sundays) to adapt to the attendants who are mostly employed in the business sector and other organizations. The students are adults of all ages, from all parts of Croatia and there is 800 of them in total in all years of the study program in the academic year 2010/2011. Some of the teachers (around 40 of them) are university professors and some are practical and business experts.

The founders and owners of the higher education institution are private legal persons and not the government, which is why the College is accredited as a college "with a public license".

The University College of Applied Sciences in Safety has implemented and certified a quality management system under the international standard HRN EN ISO 9001:2009.

Analysis of the present situation with respect to the use of e-learning at the higher education institution

Certain elements of e-learning were first used in the academic year 1998/1999, which was the second year of College's operation, when a group of first-generation students prepared and released a CD with electronic and multimedia student learning materials [11]. CD compilations of papers were later released according to this model for all years of the study program and there was great interest for their use among the students.

Today, e-learning is based on developed use of modern ICT technologies, electronic identity, the Infoeduk@ system, Forum and Safety Portal.

Electronic identity is assigned to all students, teachers and associates of the College for using the network resources of the Croatian Academic Research Network (CARNet, http://www.carnet.hr/) and the University Computing Center (SRCE, http://www.srce.unizg.hr/). The base for the electronic identity is the AAI@EduHr authorization infrastructure of the science and higher education system in the Republic of Croatia.

In the Infoeduk@ system, all students have their personal internet mailboxes that they are authorized to access and access them securely by using their own electronic identities. They are thus able to communicate electronically with students, teachers, administrative staff and College management. It contains all electronic documents and forms for study program purposes. The mailbox enables viewing of course contents, knowledge testing methods and learning outcomes with the use of tools for registering and canceling of examinations, colloquia and exercises, an overview of grades and selection of optional courses and work in student teams. The technical infrastructure of and support to the internet mailbox is supplemented by the Moodle e-learning system.

Digital curricular contents are developed in a separate organizational unit – the e-learning Electronic Education Center of the University College of Applied Sciences in Safety (http://www.vss.hr/moodle). A SCORM (Sharable Content Object Reference Model) model is used [7].

Around 10% of the courses are currently prepared for e-learning.
The Internet Forum of the University College of Applied Sciences in Safety (http://forum.vss.hr/index.php) was launched in the academic year 200/2008. It is used to exchange information and as a source of information for students and teachers through moderated categories and groups. The Forum has nearly 3000 members with over 30000 messages entered. In addition to its informative character, the Forum has a scientific character because several projects were launched on jointly by teachers and students.
The Safety Portal (http://www.portal-sigurnosti.com/) is a place for online exchange of current technical information in the area of safety. It is also used as knowledge base because professional and scientific papers from various conferences, conventions, journals, etc. are published on it – around 300 papers have been published on it to date.
Special attention is paid to education of students for the use of ICT, both by theoretical teaching and practical exercises in the College's own IT center. Informatics is present as a compulsory course from the first year of the study program. In addition, the College has introduced systematic education of teachers for e-learning and every year a certain number of teachers attend CARNet's E-learning Academy (http://www.carnet.hr/ela) in the following programs: E-learning Management, E-learning Tutoring and E-learning Course Design. 10 teachers of the University College of Applied Sciences in Safety have completed some of these programs and use the acquired knowledge for development of e-learning for their courses.

If we analyze the situation according to an "e-learning continuum", it can be defined as a "teaching tool" because the "standard classroom" is supported by the use of ICT (CD, internet mailbox for electronic documents and notifications, forum).
According to Zemsky and Massy [15] the present status of e-learning can fall in the domain of the market niche "e-learning as sofware for help with learning and teaching" because certain curricular materials (electronic scripts and presentations) are published on the College's website in a system enabling communication between students, teachers, the administration and the system itself by using a closed form of communication through messages that can only be viewed in a user mailbox.
Considering the overall present situation, the degree of acceptance of e-learning at the College is still at the level of "innovators" and partly "new course configurations" and is only actively used in a few courses.
The paradigm of "constructivism" prevails in the present e-learning system [1]. The students are placed in the center of learning, while the teacher of a course attempts to have merely the role of an advisor and assistant. The most prominent feature of the observed impact of constructivism on learning is interaction, both with the teacher and the content, as well as with other students, thus providing the possibility of learning from others and mutual confirmation of ideas to improve safety in practice.

Analysis of the strategy for future development of e-learning at the higher education institution

The University College of Applied Sciences in Safety strives to focus on the students as its "educational service users", their satisfaction in the acquisition of knowledge that they can immediately use in practice, and the principles and requirements of the implemented and developed quality management system in educational processes. What needs to be highlighted among the publicly defined elements of strategic management is the mission:"Dissemination of ideas and transfer of information on the modern approach to integral safety through education and training of safety professionals, employee representatives, employers and their authorized persons " [5].

There is also the strategic orientation of the management of the University College of Applied Sciences in Safety toward development of e-learning, following the position that "e-learning will impose a change to the way of teaching" [15]. This is why the main reason for the introduction and development of e-learning is the possibility of "advancing teaching" [3]., which is necessary because of increasing theoretical and practical requirements and the complexity of the professional field of safety.
The emphasis is on education of teachers and students for the use of e-learning and further organizational and technical development of the Electronic Education Center as a separate organizational unit within the University College of Applied Sciences in Safety. The key aspect should be the context of a private higher education institution and professional safety study programs provided as part-time study programs for employed adults who study and work concurrently. This is why we need to focus on the issue of students and the suitability of the e-learning learning system for the profiles and specific characteristics of students, the simplicity of its use and its reliability.
Following these strategic determinants of future development of e-learning at the College, it is possible to achieve the objective set, according to which the number of courses fully using e-learning should increase from the present 10% to 50% in the next 5 years.

ANALYSIS OF E-LEARNING IN A COURSE WITHIN THE SAFETY AND SECURITY STUDY PROGRAM

Course description

The "Safety Management" course is provided in the 3rd year of the professional safety study program at the University College of Applied Sciences in Safety.
As of the school year 200/2008, it has been a compulsory course with 8 ECTS points. The curriculum is provided by lectures (40 classes), consultations and exercises (20 classes).
The analysis of the approaches to teaching used in the course shows that the paradigm of "constructivism" [1] prevails in it due to the requirement for the students to use and prove the information and knowledge in their own business practice. The plan includes a development perspective of teaching due to the need of constant supplementation with new information in the area

concerned. The previously acquired knowledge needed to master the learning materials pertain to technical areas of safety that the students acquire during the first and second years of the study program.
The purpose of teaching a course is to acquaint the students with the basic theoretical knowledge of management as theoretical supplementation of their previously acquired technical knowledge and to acquaint them with modern management techniques and skills and the possibilities of their practical use in safety areas.

Learning objectives

According to the objectives set in the "Safety Management" course, the students will be able to:
1) define management and explain its significance for safety;
2) categorize five basic functions of management and associate them with three basic safety functions;
3) distinguish between, compare and associate three basic levels of safety management in business systems' practice;
4) use the basic concepts of safety management in practice;
5) categorize the content of safety project management and use it in practice;
6) prepare and present the conceptual plan of a safety project on a practical issue, in cooperation with the team;
7) explain the issues of integral safety management in practice;
8) develop positions on the possibility of integrating safety areas and reach a conclusion on the need to organize integral safety management in practice.
The safety management learning objectives are defined to cover all categories of Blooms taxonomy of educational objectives in the cognitive domain and the psychomotor and affective domains.

Teaching strategies

Considering the defined learning objectives, three teaching strategies were selected: 1) cooperative learning, 2) situated learning, and 3) self-focused learning.
These three teaching strategies were selected because of the need, considering the purpose of the course and learning objectives, for the students to have control of learning, to participate in it actively and to adapt the order and pace of learning to their needs, while the teacher will have the role of an organizer, associate and advisor. They are the most appropriate ones to the learning style where the students will learn by discovering, researching and acting, thus achieving the learning objectives.
These teaching strategies can generate importance of developing activities for students that will make them able to: develop their own understanding or transform the understanding the safety management concept, associate things to be able to use abstract understanding in a concrete manner, and reinforce their knowledge on real-world issues (business practice), thus opening paths toward practical communities through teamwork. This also generates a "learning community" [2] with its three interactive components of presence, namely: social presence, cognitive presence and teaching presence. In addition, this results in creation and introduction of activities encouraging interaction between two or more students, between teachers and students and between student and a group of students and sources of knowledge, as an important role in development of teaching presence.
The analysis of the possibilities and contributions of the selected strategies to the achievement of learning objectives underscores the strategy of cooperative learning because it creates the foundations for teamwork and team learning and is closely associated with the constructivist theory of learning, which is dominant in the course.

Teaching methods

The teaching methods were selected according to the selected teaching strategies and defined learning objectives, contributing to the achievement of learning objectives and the possibilities of online use.
The projects learning method is key to the achievement of defined learning objectives because it is its integral use that will enable the students to associate the theoretical and practical contents of the course and to prepare and present the conceptual plan of a safety project on a practical issue in cooperation with the team, thus achieving the central and most demanding learning objective that combines all other objectives. The method enables the students to deepen the knowledge acquired and confirm their knowledge on a safety project case study, which is the key factor for improvement of safety and students' working methods in future business practice. Students in a project team (5-10 students) prepare the conceptual plan for a safety project for two months within the course. By using available tools (noncommercial free ones or commercial ones such as MS Project), the students learn and practically achieve all elements of safety project management, working online in a group (exchanging information and files by e-mail and via the internet mailboxes). This method arises from the teaching strategies of cooperative and situated learning.
Online discussion is the most appropriate for exchange of information in connection with all learning objectives, arising from the strategies of cooperative and situated learning, as well as self-focused learning. Students conduct online discussion throughout the course (entire semester) on the internet forum, in special forum groups relating to a course. The teacher opens forum topics (relating to the content of the course and learning objectives) by introductory questions and theses and an invitation to a discussion, and students join the discussion with their answers, opinions and questions. The teacher is also the discussion moderator and provides additional information concerning the topic of discussion.
Students use the conference method arising from the cooperative learning strategy to ultimately present the prepared safety project conceptual plan publicly (through a computer presentation with a digital projector) at a one-day "internal conference" at the closing of the course. After being posted in the internet mailbox, the presentation becomes constantly available online for viewing and learning on the basis of it to other project teams and new generations of students. They thus use the computer teaching method arising from the self-focused learning strategy.

Assessment of knowledge

As according to Brown [4] "the efficiency of an assessment method depends on the outcomes of assessed learning and specific tasks rather than just the assessment method", the appropriate knowledge evaluation methods are also planned.
Formative assessment for the purpose of observing a student's learning progress, divided by teaching units and defined learning objectives, is performed by using the essay method. All students write these short essays (up to 500 words) after each thematic unit and publish them on the online forum in special topic groups where they conduct additional online discussions concerning teaching topics and their essays, moderated by the teacher. These compulsory student activities will not be quantitatively graded by the teacher, but just recorded and analyzed, including feedback and recommendations to students for further learning. These formative assessment methods arise from all three selected teaching strategies: cooperative, situated and self-focused learning.

A summative assessment and grading of knowledge for the purpose of determining the level of student attainment and achievement of all defined learning objectives will be performed by using the following methods: projects and presentations. After a public presentation of safety projects and a classroom discussion, the discussion continues online in a special forum group, after which the students grade other teams' projects by using the simple option of online surveys, thus accounting for 50% of the grade, while the other 50% is in teacher's domain. Based on the principles of the cooperative strategy associated with the constructivist theory of learning, the use of these methods of summative (final) assessment of knowledge will confirm their suitability for changes and improvements of students' learning methods and attainment of all defined learning objectives, especially the central objective after the attainment of which the students will be able to prepare and present the safety project conceptual plan on a practical issue in cooperation with the team.

Teacher's role

The teacher of a course is also an e-learning tutor for the course. His/her role is primarily performed by providing academic support to students in learning and attainment of learning objectives. In the orientation category, the tutor defines the learning context course requirements and learning objectives. The tutor has the role of the conductor in all online discussions, directing and encouraging thematic discussions. The tutor also provides technical assistance (by online consultations) to students in safety project preparation and procedural support in problem solving. Within the strategic support category, the tutor provides students with an opportunity to monitor their progress by encouraging and valuating their additional activities.

4. CONCLUSION

The speed of inflow and complexity of technological and scientific information in the modern information age results in the need to implement a constant learning process in a higher education organization. In this respect, the development and use of e-learning provides unimagined pedagogical and didactic/methodological opportunities.

Previous considerations confirm the hypothesis that electronic advancement of the learning model (the use of e-learning) expands its impact on the overall process of higher education learning (teaching methods, learning strategy, knowledge assessment and valuation, as well as extracurricular activities (portal, forum, etc.) for the purpose of adopting and expanding scientific and technical knowledge and association and development of cooperation between higher education institutions in the relevant areas.

The integral analysis of the e-learning status at the selected higher education institution in Croatia demonstrates the needs and possibilities of its further development and use[3]. This requires an integral and systematic approach with ongoing organizational development. Of course, the development of e-learning implies cooperation and association of this higher education institution with others, especially those engaging in the same or similar issues in the region.

Regarding higher professional education institutions in Serbia, the following institutions have accredited basic study programs in the area of e-learning: High Technical School of Professional Studies in Novi Sad for the Fire Protection and Information Technologies study programs, while e-learning is used at the High Technical School of Professional Studies Novi Beograd for the Industrial Engineering study program.

The basis for a change and improvement of the present situation in higher professional education and higher education in general are the following projects: Project "*Development of new information and communication technologies, based on advanced mathematical methods, with applications in medicine, telecommunications, power systems, protection of national heritage and education"* (III044006), funded by Serbian Ministry of Education and Science; Project DL@WEB - Enhancing the Quality of Distance Learning at Western Balkan Higher Education Institutions (2010-2013), A 3-year international project, funded by TEMPUS agency (project SM 511126-2010);

[3] In addition to management's support, provision of technical prerequisites and teachers' and students' personal interest, it is necessary to systematically plan the development of e-learning for the respective courses. Based on course description, this planning must start with determining the purpose of the course and defining the specific learning objectives from student perspective. The e-learning plan for the Safety Management course with regard to the observed case study (University College of Applied Sciences in Safety, Zagreb, Croatia), containing selected teaching strategies and methods and assessment and student support methods is the basis for successful introduction and development of e-learning in the course, as well as for advancement of standard teaching and a contribution to the attainment of the course purpose and learning objectives.

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We believe that research and comparative analysis of e-learning development in Croatia and Serbia (planned by the authors of this paper) will help identify the key problems and difficulties in this area. The world has become interdependent, which results in the need for learning and education from sources of other cultures and acknowledgement of other peoples' achievements. This is the way to overcome ethnocentrism and tribal mentality. Education and learning can help us realize the present controversies and problems more fully and to seek adequate ways to overcome them. We will proceed to constantly reexamine the educational policy and contemplate e-learning and knowledge in the area of safety, necessary for tomorrow's world and sustainable future.

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