E-LEARNING: SITUATION AND PERSPECTIVES

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Original scientific paper

This paper analyzes the process of learning by using ICT as a platform the goal of which is to facilitate accessibility and flow of information as well as interaction among participants involved in learning, which aims at improving the learning process itself. Special stress is placed on distance learning in a web-based environment. Proposals for a faster and easier integration of such type of learning are given and both its advantages and shortcomings are discussed. The paper also presents an analysis of the approach to e-learning and distance learning at engineering faculties that might be generalized and applied to other branches and learning levels. Changes necessary for introduction of distance learning and e-learning are proposed as well. Shortcomings of the current approach to teaching are pointed out, but possible shortcomings that might occur as a result of e-learning are also emphasized.

Key words: e-learning, distance learning, web, ICT

E-learning: Stanje i perspektive

Izvorni znanstveni članak

Ovaj rad analizira proces učenja primjenom informacijsko-komunikacijskih tehnologija kao platforme koja ima za cilj olakšati dostupnost i protok informacija, te interakciju među sudionicima učenja i tako poboljšavati proces učenja. Poseban naglasak dan je učenju na daljinu u web okruženju. Dani su prijedlozi za brže i lakše integriranje ovakvog načina učenja, te su razmotrene njegove prednosti i nedostaci. U radu je prikazana analiza pristupa e-učenju i učenju na daljinu na tehničkim fakultetima koja se može poopćiti i na druge struke i razine učenja. Također je dan prijedlog za nužne promjene pri uvođenju učenja na daljinu i e-učenja. Ukazano je na nedostatke sadašnjeg pristupa poučavanju, ali isto tako i na moguće nedostatke koje bi donijelo e-učenje.

Ključne riječi: e-učenje, učenje na daljinu, web, informacijsko-komunikacijske tehnologije

1
Introduction
Uvod

ICT has been increasingly used in everyday life, so that its usage in teaching and learning has become indispensable. Introduction of e-learning has become the technology imperative, since it improves both teaching and learning and develops habits and routines referring to lifelong learning. There is a growing need of faculties and universities for an on-line system of education.

Since experts in the field of technical sciences must be ready for extensive and frequent changes of technology, adjusting at the same time to labor market conditions, their lifelong education is considered to be essential [7]. It represents the fundamentals for successful work and adjustment to technology changes in one's working life.

Introduction of ICT into an environment is a complex process. A technological innovation such as e-learning will be encouraged only in such organization that supports this change in various ways. This means that introduction of e-learning is to be planned and carried out by the system or institution administration. The staff must be given the possibility of continuing their education aimed at gaining knowledge required for dealing with technology.

For the beginning, faculties might take advantage of all on-line courses offered to educate both their staff and students. Prerequisites for further independent development of one's own products could be carried out at the same time. The problem that might be faced is that courses can be neither altered nor adjusted without prior permission from the author. Another obstacle, especially important for older generations, is the fact that most of the contents that are offered are given in English. If learning and teaching are taken into consideration with special emphasis placed on English for Specific Purposes (ESP), it should be mentioned that especially great potential lies in the field of development and distribution of teaching materials and resources in general. For example, within the framework of the TEMPUS project [9] and through cooperation with the Linguistic Center of SSTU, Surrey University, Oldenburg University, Volgograd Technical University and Samara Technical University, a currently ongoing project "Foreign Language Education for Russian Technical Universities on the Volga" gives the staff opportunity to develop and apply new trends in teaching LSP (Language for Specific Purposes). "Writing Professional English" is yet another international project [11] in the field of ESP that was initiated by the Institute of Foreign Languages, Faculty of Mechanical Engineering, Brno University of Technology, Czech Republic, in cooperation with four partner institutions, and it is related to writing skills. It is also important to mention that the application of e-learning in any field is based on two equally essential components. According to [14], the human component implies education of teachers, both in the field of foreign languages and directed toward gaining knowledge and practical skills pertaining to new technologies, since they are expected to create their own materials, design web pages, etc. The second component is composed of support, which encompasses equipment and everything necessary to make it work, i.e. both hardware and software.

2
Introduction of e-learning in form of a project
Uvođenje e-učenja u obliku projekta

The main goal of the project aimed at introducing e-learning is to develop multimedia contents for courses with the goal of building them into the Learning Management System (LMS) and prepare them for practical application in on-line education. According to [8], by this project the following could be achieved:

! In comparison with existing textbooks, better presentation and visualization of the contents improves the teaching itself;
! Interaction with students enhances the teaching process by using web-based communication tools, discussions and tasks via the Internet;
! Students not living in the area the educational institution is situated in as well as students from neighboring countries are also given the opportunity to study;

! An increase in the number of students enrolled;
! An increase in individual course pass rates;
! Lifelong learning of the staff occurs independently of time and place;
! Modern university education that would enable entrance into the integrated European space of higher education.

3
A conceptual solution for introduction of on-line teaching
Idejno rješenje uvođenja on-line nastave

Part of lectures should be held in a classical way, i.e. as so-called orientation workshops. The purpose of orientation workshops is to introduce students to their teachers and courses, as well as to introduce teachers to their students, working modes, commitments, deadlines, course assessment and other rules referring to the course itself. Workshops should familiarize students with a new semester and their commitments.

In this new form of studying, courses are held via the LMS system in which participants study course contents in terms of units, and by doing tasks they prove their knowledge and analyses in relation with the contents studied. Tasks can have the form of essays and may replace seminar papers. Project tasks can be carried out individually or in a group. Written tests and oral examinations may be replaced by on-line tests [18].

Every course can have certain course contents, literature, teaching methods, student assessment and examination methods, course assessment and ECTS credits.

When it comes to courses part of which is to be carried out in a laboratory, in addition to on-line education, part of those courses is also to be held in laboratories, but certain additional laboratory exercises will be presented in form of simulation or virtual laboratories within the framework of the LMS system.

Within the framework of all courses, discussions may be used as form of mutual communication between students on the one hand, and students and teachers on the other. Students can ask both their fellow students and teachers for help. According to topics given within discussions, the contents studied are to be discussed, opinion is to be given and the problem is to be analyzed. Discussions are assigned points. Students are also assigned points for their tasks and on-line tests that would be translated into ECTS credits [16]. While working on their assignments, students maintain asynchronous communication with their instructors - tutors via e-mail and forums, whereas synchronous communication is realized via chats and interactive board.

4
Design of e-learning contents
Izrada sadržaja e-učenja

It is necessary to organize on-line study as a project with active participation of a project team. This team consists of a project manager, specialists in respective fields, instructional designers, media designers, web/media programmers, and persons providing assistance to students. Specialists and teachers teaching individual courses play a very important role in e-learning contents design, especially when it comes to materials and contents development and design from a pedagogical point of view, as well as student knowledge assessment. Every course is then composed of teaching units in a certain number of contact hours. Goals, instructions and tasks, tests, quizzes, additional contents and web links should be defined precisely for every section and every teaching unit.

Elements of cognitivism and constructivism [1] should be stressed in teaching. Teaching contents and materials must motivate students to learn; hence they must be presented in various ways: presentations, video recordings, web sites, discussions. Topics dealt with in individual tasks should enable application of student knowledge to real life. According to [20], constructivist theory would enable students to create their own knowledge from the information they obtain, with interactive teaching and learning, cooperation with other students, participation in discussions and exchange of experiences contributing to the overall process. The LMS system of study enables interaction of students with themselves, with the teaching materials, as well as with other students and the teacher himself/herself. Under such circumstances, teachers may teach anywhere and at any time. On-line materials can always be updated, and students could detect changes immediately [10].

Instructional designers play a very important role in materials design and help out respective teachers to harmonize the relations between materials, activities, tasks and assessment methodology. Media designers (i.e. graphic and multimedia designers) provide support with respect to defining creative ways of using multimedia for educational purposes. Web programmers transform documents to html format, make presentations, animations and tests, and maintain web sites within the framework of the LMS system. For successful implementation of on-line courses into the LMS system, the system of support provided to students is indispensable, in whose development web programmers and other persons in charge are to take part.

5
Human resource risk
Rizik ljudskih resursa

Participation of the teaching staff requires their education directed towards the use of new teaching technologies. What might be helpful are various on-line courses like the ones covering browsing and searching the Internet, ECDL on-line courses, on-line textbooks and various seminars that deal with the role of teachers regarding support they offer to students and on-line teaching. The staff is definitely much more effective if they know that their readiness shown towards innovative on-line teaching activities will be acknowledged and that their efforts will result in safe jobs, higher salaries and other benefits [6].

Attention must be paid to planning user support. The institution should make provisions for various forms of support to students, such as on-line entry and registration for distant students, technical support, consulting and advisory service for program selection, tutorial help, help with organizing learning, literature availability and other forms of support depending on the structure of students [19]. Individuals who have the power of implementing certain strategies or procedures that would direct the institution towards its goals and mission are entrusted with the support plan implementation [2].

5.1
Student access to technology and their attitude towards ICT assisted teaching and learning
Dostupnost tehnologije studentima i njihov odnos prema poučavanju uz pomoć ICT-a

Prior to introduction of e-learning into the teaching process, the key issue for students refers to their access to computers. It would be useful to elaborate the strategy concerning the use of technology within the segment foreseeing how students will access technology. A questionnaire given in Appendix I was carried out among the total of 200 students. Questionnaire results are shown in Tab. 1 and the diagram in Fig. 1.

The conducted questionnaire shows that computer-assisted learning is not a novelty to engineering students and that a very high percentage of students (about 95 % of all third- and fourth-year students (*year*) that took part in the questionnaire - *ICTsuccess*) expressed satisfaction with their knowledge necessary for using ICT. 84 %, 12 % and 4 % of students rated their knowledge necessary for using ICT (*ICTscore*) by grades excellent, very good and good, respectively, which in form of self-assessment represents a sound basis for using e-learning as a learning method. 99 % of students confirmed that they would like to continue their education and training in the field of ICT (*ICTedu*), and 98 % of them would like to use ICT much more as help with learning (*ICTwill*). 21 % of students consider relationship and interaction with the teaching staff during classes insufficient (*interact*); thus it should be improved. Engineering students are mainly aware of the importance and role of English in relation to ICT, so that 12 % and 81 % of them (which makes the total of 93 %) assessed the English language competence important and very important, respectively (*ICTeng*). Almost all students (99 %) consider their current knowledge of English satisfactory for using ICT in teaching/learning (*eng*). 24 % of engineering students expressed their dissatisfaction with distance learning classes they have had so far (*distlearn*). About 44 % of students expressed their uncertainty regarding on-line learning without classroom teaching (*online*), but all of them are familiar with e-learning (*e-learn*).

5.2
The use of ICT by the teaching staff working at engineering faculties
Korištenje informacijske i komunikacijske tehnologije u radu nastavnog osoblja na tehničkim fakultetima

60 teachers (*age*) participated in the questionnaire addressing the use of ICT in classes and e-learning

Table 1 Questionnaire results - students
Tablica 1 Rezultati anketiranja studenata

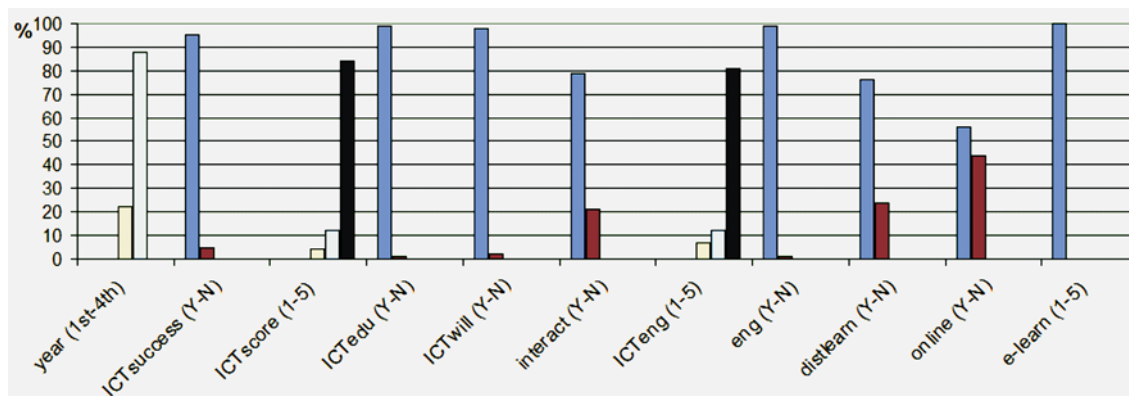| Parameter	Range	Value , %
year (1st-4th)	1	0
	2	0
	3	22
	4	88
ICTsuccess (Y-N)	Yes	95
	No	5
ICTscore (1-5)	1	0
	2	0
	3	4
	4	12
	5	84
ICTedu (Y-N)	Yes	99
	No	1
ICTwill (Y-N)	Yes	98
	No	2
interact (Y-N)	Yes	79
	No	21
ICTeng (1-5)	1	0
	2	0
	3	7
	4	12
	5	81
eng (Y-N)	Yes	99
	No	1
distlearn (Y-N)	Yes	76
	No	24
online	Yes	56
	No	44
e-learn	Yes	100
	No	0

Figure 1 Graphical representation of student questionnaire results
Slika 1 Grafički prikaz rezultata anketiranja studenata

(Appendix II). Questionnaire results are given in Tab. 2 and the diagram in Fig. 2. The questionnaire conducted with the teaching staff working at engineering faculties gives a good 'picture' as to the use of ICT, but it also points out the need for continuing education of the teaching staff in that field. About 71 % of teachers expressed satisfaction with their knowledge necessary for using ICT (*ICTsuccess*), and 78 % of them rated their knowledge by the grade excellent (*ICTscore*). Proportionally, 75 % of teachers rated student knowledge by the grade excellent (*studscore*), and 98 % of them believe that students they work with are sufficiently computer-literate to be able to use ICT as help with learning (*ICTstud*). Average groups of students they work with consist of 75 students (*groups-avg*) and 77 % of the teaching staff believes that the size of a group is adequate for the

teaching process and successful teaching in terms of quality (*groups*). However, 58 % of responses express dissatisfaction with communication and the possibility of interaction with students during classes (*interact*). All teachers are familiar with e-learning (*e-learn*). 6 % and 94 % (which makes the total of 100 %) of teachers at engineering faculties assessed the English language competence important and very important for using ICT in teaching/learning, respectively (*ICTeng*). The percentage of teachers who consider their current knowledge of English satisfactory for using ICT in teaching (*eng*) is a bit lower (86 %).
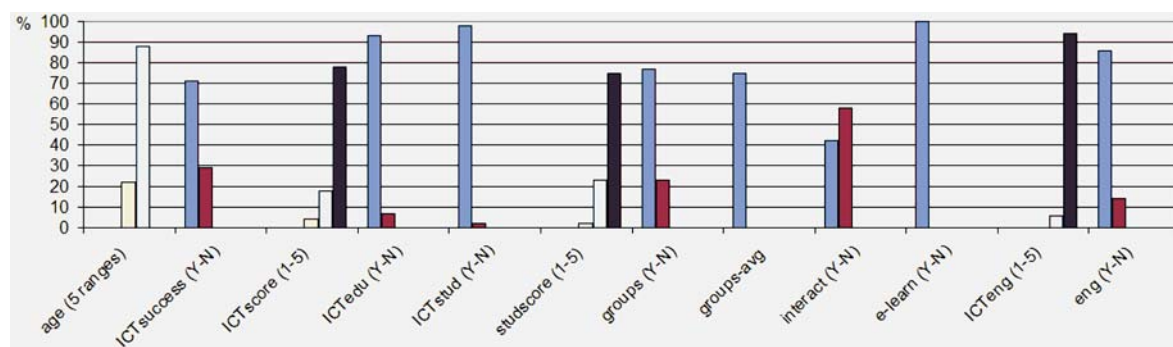
Figure 2 *Graphical representation of questionnaire results – teaching staff*
Slika 2 *Grafički prikaz rezultata anketiranja nastavnika*

Table 2 *Questionnaire results – teaching staff*
Tablica 2 *Rezultati anketiranja nastavnika*

Parameter	Range	Value, %
age (5 ranges)	20-30	43
	30-40	26
	40-50	15
	50-60	13
	>60	3
ICTsuccess (Y-N)	Yes	71
	No	29
ICTscore (1-5)	1	0
	2	0
	3	4
	4	18
	5	78
ICTedu (Y-N)	Yes	93
	No	7
ICTstud (Y-N)	Yes	98
	No	2
studscore	1	0
	2	0
	3	2
	4	23
	5	75
groups (Y-N)	Y	77
	N	23
groups-avg	integer	75
interact (Y-N)	Yes	42
	No	58
e-learn (Y-N)	Yes	100
	No	0
ICTeng (Y-N)	1	0
	2	0
	3	0
	4	6
	5	94
eng (Y-N)	Yes	86
	No	14

5.3
English for Specific Purposes and e-learning
Engleski jezik struke i e-učenje

Rapid technological development has significantly influenced the overall development of all human activities, including education, in which there exists the omnipresent idea referring to technologically-based education in all disciplines. According to [15], in the process of teaching and learning a foreign language with special stress placed on English, since the English language is currently dominant in the field of communication (the so-called *lingua franca*), there exist numerous useful forms of activities with various forms of computer-assisted language learning or CALL. CALL has reached its peak in the integrative phase due to development of multimedia and the Internet by means of which users can mutually communicate in real time and at unspecified distances. Although envisaged at first as a form of interaction among students and computers, at its later developmental stage CALL also includes other forms of communication or so-called Computer Mediated Communication (CMC) technologies (such as Moos, e-mail, chat rooms, videoconferencing, as described in [17]). By introducing high-tech features a classical term CALL has been systematically replaced by more sophisticated terms like WebCT-based learning [5]. Another related term is NBLT (*Net-based language teaching/learning*), which implies linking computers via a local and/or global network [12].

Although ESP classes at engineering faculties have always been specific [4], reduction of classroom hours, changes in students' lifestyles and work patterns, the concept of lifelong learning and new possibilities offered by e-learning facilities, are just a few reasons that have made them even more specific. The potential of e-learning has caused tremendous changes in language learning/teaching with respect to the following six key dimensions: connectivity, flexibility, interactivity, collaboration, extended opportunity and motivation [9]. Theoretically, it is possible to introduce e-learning into ESP classes either as support in courses in which e-learning was not a required element, or as the so-called *blended learning*, i.e. a combination of traditional and electronic practices (e.g. ESP teaching/learning by means of a virtual platform *Moodle*, as described in [12]) or as fully on-line classes accomplished via e-learning (which is feasible with almost all part-time courses in humanities and social studies, as done at the Faculty of Education, University of Matej Bel, Banska Bystrica, Slovak Republic [13]).

6
Conclusion
Zaključak

Distance learning, and especially e-learning, represents a desirable and necessary form of help with learning at engineering faculties. It enables students to learn independently of time and space, but it also offers better communication between students and teachers and students' team work. On the other hand, it mitigates the problem of irregular learning and encourages students' independent work. Furthermore, e-learning creates a possibility of supplementing the teaching material via the LMS or a web application, as well as a possibility of distance learning cooperation between scientific and educational institutions and exchange of teaching materials. This might increase not only the level of quality, but also the level of students' independent work due to activities pertaining to developing

their own projects, programs and web applications. The questionnaire carried out at engineering faculties shows that both teachers and students are ready and more than willing to introduce such form of teaching and learning. In relation to the aforementioned, it cannot be neglected that engineering faculties are actually equipped better for such form of classes, so that they might be taken at least as technical leaders of introducing such form of learning. ICT accessibility and user-friendliness exemplify the fact that e-learning might be used in all fields and levels of education. The Bologna process necessitated many changes in contents, forms, intensity and dynamics of teaching and learning, and e-learning is definitely one of the forms that meet those challenges. Finally, it has to be emphasized that there should be no fear that such forms of teaching and learning might push the teacher out of the teaching/learning process, since such systems represent only a platform through which the teacher teaches. However, it should not be neglected that the role of teachers in the process of learning will be reduced as much as teachers themselves allow that to happen through the application of the mentioned technologies or as much as imprudent legislation of knowledge commercialization forces them to do so in the future.

Acknowledgement

7
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APPENDIX I
QUESTIONNAIRE ADDRESSED TO ENGINEERING STUDENTS

Dear colleagues, in attempt to introduce some positive changes in the process of learning and teaching, we have decided to survey the use of ICT at engineering faculties. We would like you to answer the following questions:

1. What is your year of study?

   A) 1st year of study
   B) 2nd year of study
   C) 3rd year of study
   D) 4th year of study

2. Are you satisfied with your knowledge necessary for using ICT?

   A) YES
   B) NO

3. From 1 to 5, assess your own knowledge necessary for using ICT.

   1 2 3 4 5

4. Would you like to continue your education and training in this field?

   A) YES
   B) NO

5. Would you like to use ICT much more as help with learning?

   A) YES
   B) NO

6. Are you satisfied with relationship and interaction with the teaching staff during classes?

   A) YES
   B) NO

7. From 1 to 5, assess the importance of the English language competence for using ICT in teaching/learning.

   1 2 3 4 5

8. Do you consider your knowledge of English satisfactory for using ICT in teaching/learning?

   A) YES
   B) NO

9. Are you satisfied with distance learning classes you have had so far?

   A) YES
   B) NO

10. Do you think you could learn on-line, without traditional classroom teaching?

   A) YES
   B) NO

11. Are you familiar with e-learning?

   A) YES
   B) NO

Thank you for your cooperation.

APPENDIX II
QUESTIONNAIRE ADDRESSED TO THE TEACHING STAFF WORKING AT ENGINEERING FACULTIES

Dear colleagues, in attempt to introduce some positive changes in the process of learning and teaching, we have decided to survey the use of ICT at engineering faculties. We would like you to answer the following questions:

1. What is your age?

   A) 20-30
   B) 30-40
   C) 40-50
   D) 50-60
   E) 60 and above

2. Are you satisfied with your knowledge necessary for using ICT?

   A) YES
   B) NO

3. From 1 to 5, assess your own knowledge necessary for using ICT.

   1 2 3 4 5

4. Would you like to continue your education and training in this field?

   A) YES
   B) NO

5. Do you think that students you work with are sufficiently computer-literate to be able use ICT as help with learning?

   A) YES
   B) NO

6. From 1 to 5, assess their knowledge and skills necessary for using ICT.

   1 2 3 4 5

7. Do you think that the size of a group of students you teach is adequate for the teaching process and successful teaching in terms of quality?

   A) YES
   B) NO

8. What is the average size of a group of students you teach?

   _____

9. Are you satisfied with communication and the possibility of interaction with students during classes?

   A) YES
   B) NO

10. Are you familiar with e-learning?

   A) YES
   B) NO

11. From 1 to 5, assess the importance of the English language competence for using ICT in teaching/learning.

   1 2 3 4 5

12. Do you consider your knowledge of English satisfactory for using ICT in teaching/learning?

   A) YES
   B) NO

Thank you for your cooperation.