

Students opinion about e-learning in Fluid mechanics courses

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Abstract. E-learning appear to be the new standard of modern education. Learning Management Systems (LMS) enable teachers to provide students with different approach of knowledge and to enhance interaction between teachers and students in simple and low time consumption way. This study was designed to identify students opinions about three courses in fluid mechanics. Each of the courses has a different cognitive complexity. They were lectured as a standard ex katedra and on-line courses. The results of this study shows learners satisfaction and preferences about different type of teaching. A discussion about increase of the students results on final exams are presented in this paper.

1. Introduction

During a last few decades traditional context of learning radically change. A new type of education called electronic learning (e-learning) take an important role in teaching. Use of an educational software and electronic devices and for delivery of content via electronic media such as Internet, audio or video, satellite broadcast, interactive TV, CD-ROM, has become an essential requirement in the modern education [1]. Some researchers are trying to evaluate e-learning focused on technology-based components [2], while others focus their study on the human factor of e-learning systems considering student and instructor satisfaction [3-5]. The student experience and satisfaction, together with the effectiveness of e-learning course are two main criteria for evaluating course quality. Three major issues that influence course quality are: the quality of instructor, the system quality and the course content quality.

There are many factors that influence the students satisfaction with on-line course. Several researchers [6-11], considered that the quality of the instructor is the major aspect of e-learning. The instructors should have enough time to interact with the students in their learning process and good timing for advancing through the course. Teaching styles, and their control over the technology affect the learning outcomes. It is necessary to 'understand the target group', to be aware of the learners characteristics such as motivation, belief, confidence, computer anxiety, enthusiasm, excitement and pride. Understanding and identifying the attitudes of learners in Learning Management System (LMS) is important when investigating learner's satisfaction.

Technical issues such as Internet quality and LMS system quality have an important role in e-learning. The LMS software and the peripherals (hardware) have a significant influence on the effectiveness [12-16]. To achieve high satisfaction and effectiveness, the LMS software must be user-friendly, well-organized, intuitive, easy of use, stable and reliable. The other request, that must be



satisfied is peripherals which are working perfectly. Any hardware disturbance in process of learning significantly diminish perception of satisfaction. A good quality software, perfectly working hardware, and high speed internet connection are “*conditio sine qua non*” (essential) in e-learning.

Well designed learning environment significantly contribute to the course effectiveness and learners satisfaction [17-19]. The perception of satisfaction is significantly increased if content is well-organized, interactive, clearly written, in the right length, useful, effectively presented, flexible, and provide some extra time to catch up the course. Learners place great value on pre-defined structured exam evaluation criteria, making necessary announcements on time, entering grades in time.

Attempts to evaluate the success of e-learning have resulted in a large volume of studies. Many authors are trying to assess the impact of various measures on the quality of the e-learning courses, such as: learning benchmarks [20], learning opportunities [21], learning styles [22], learning environment [23], [24], cost-benefits [25], [26], teaching practices [27], [28], and learning outcomes [29-31]. These diverse research views of measuring the quality in e-learning must be integrated in a quality assurance model for assessing and evaluating e-learning courses.

The traditional teaching methods, such as mentoring, tutorials, and face-to-face lectures, are dominant in the educational sector. On the other hand universities are investing heavily in learning technologies, to improve the quality of learning. While teachers are requested to use the new technology and students are encouraged to improve their learning, educational institutions do not pay enough attention to the questions of how, what, and why e-learning should be implemented [32]. E-learning implementation often takes place without a theory and many institutions do not spend any resources on trying to understand what kind of changes e-learning will bring into their educational system.

2. Methodology

On the Department of Fluid Mechanics (Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb) students are attending seventeen different courses. Nine of them are carried out as ex katedra and e-learning courses simultaneously. Students can choose the mode they prefer to attend. At the end of the semester they show their opinion in a survey. For the purpose of this study three courses are chosen Urban Hydrotechnics (UH), Hydrodynamics of Pipeline Networks (HPN) and Fluid Mechanics (FM). These three courses runs in e-learning environment for over ten years, and a lot of students are attending these courses (UH and HNP about forty students a year, and FM about three hundreds a year). Because of a large number of students, it can be estimated that they are representative group. Only seven questions from the survey are chosen to show students opinion about e-learning.

In this research, the Moodle e-learning system was conducted on three courses with different level of cognitive complexity. The questionnaire was distributed to 2560 university students in ten years period with a 44% response rate. The students were mainly male gender (82%), attending second (36%) and third (64%) year of study. Results of the survey are given in Table 1.

3. Discussion and conclusion

The results of the survey are depicted in Table 1. The first question is rather general one. It shows that there is a positive student's attitude about e-learning and that they prefer e-learning courses. Computer environment is something very common in the student population and generally they prefer to solve their problems on line. All three groups of students shows practically similar enthusiasm about e-learning.

The second question is a little bit a particular one. In this question students are asked about their opinion if on line course is more suitable than classical one. All three groups of students shows practically similar satisfaction about on line courses, but rate of undecided students is relatively high (20%).

Table 1. Survey questions.

Do you like e-learning course?			
	UH	HNP	FM
Yes	100%	93%	84%
Undecided	0	6%	9%
No	0	1%	7%
Do you find on line courses more suitable for students?			
	UH	HNP	FM
Yes	71%	72%	64%
Undecided	27%	21%	15%
No	2%	7%	31%
Do you learn easier using e-learning lectures then ex katedra lectures?			
	UH	HNP	FM
Yes	56%	35%	31%
Undecided	33%	34%	22%
No	11%	31%	47%
Do you find video lectures, better, more suitable and practical then ex katedra lectures?			
	UH	HNP	FM
Yes	82%	71%	59%
Undecided	14%	25%	10%
No	4%	4%	31%
Do you find video lectures, better, more suitable and practical then printed lectures?			
	UH	HNP	FM
Video	35%	21%	14%
Printed	6%	7%	15%
Both	59%	72%	81%
Do you learn more from printed or video lectures?			
	UH	HNP	FM
Video	6%	21%	6%
Printed	18%	42%	39%
Both	76%	37%	55%
Compare this course with others			
	UH	HNP	FM
Less demanding	7%	3%	0%
As others	85%	62%	9%
More demanding	8%	35%	91%

Answering the third questions in the survey the students opinion significantly depend on the course they are attending. The students enrolled on Urban Hydrotehnics learn easier using e-learning lectures then ex katedra lectures, but the students enrolled on Fluid Mechanics have quite the opposite opinion.

A structure of the knowledge in Urban Hydrotehnics are mainly informations, skills and technical facts. Student has to remember facts, understand the basic principles and apply the knowledge on the

typical situations. The linear mode of learning using video lectures are very elegant and not demanding way of learning. Students prefer this method of learning because it is easiest way to learn all the knowledge needed to pass the exam.

On the other hand, students enrolled on Fluid Mechanics has to earn knowledge on substantially deferent level. All the educational learning level, defined by Bloom taxonomy, such as analyzing, synthesizing, evaluating and applying are needed to pass the exam. Linear (streaming) video material is unsuitable for such level of cognitive complexity. Printed lectures are far more suitable material for accepting knowledge on such high level. It is easier to adjust learning tempo on ones ability, some complex parts can be easy repeated and connected with some deferent important part of lectures. In this way learning is hard but quality of the learned material is very high.

For the forth question all the students have similar opinion that video lectures are better, more suitable and practical then ex katedra lectures. This answer is expected one because video lectures are one of the main advantages of e - learning.

The students opinion on the fifth question, if video lectures are better, more suitable and practical then printed lectures is unexpected one. All three groups of students agreed that video lectures are little bit better than printed lectures, but they prefer to have both video and printed material.

The sixth question in the survey looks similar to the fifth question. The students of all three groups find that both printed and video lectures are the most subtable method of learning.

In the last question students evaluate Urban Hydrotechnics as not demanding course. A structure of the knowledge are mainly informations, skills and technical facts. Student has to remember facts, understand the basic principles and apply the knowledge on the typical situations. Only low level of cognitive competence are needed to pass exam. Students evaluate Hydrodynamics of Pipeline Networks as a cognitive more complex course. Fluid Mechanics is most demanding course and students must use all the high demanding cognitive skills to pass exam.

For the courses with low level of cognitive complexity e-learning is optimal solution. Student are very satisfied with video lectures, on line examples and all the benefits of the LMS. Ex katedra lectures, printed examples, and printed lectures are optional for some students.

For the courses where high demanding cognitive skills are needed, on the students opinion, traditional ex katedra lectures seem to be irreplaceable. Students like e-learning as supporting materials, but when they meet difficulties in the learning process printing material and face-to-face teaching are preferred.

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