

E-Learning Course Development – Quality Standards

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ABSTRACT

Quality management is a very important part of every e-learning system. In this paper we will describe 11 standards that were developed at Zagreb School of Economics and Management (ZSEM) for the purpose of evaluating the quality of e-learning courses developed within the WebCT platform. The standards were divided into three groups: static, dynamic, and administrative. We analyzed the results of evaluation for courses developed in the period of the past two years to find out if there was any progress, to determine how the results for each standard have changed over time and how the results for the three groups of standards changed over time.

Keywords - e-learning, quality, standards, evaluation, developed courses

1. INTRODUCTION

Many research papers that deal with the quality of e-learning from the aspect of the instructor [1]-[4] or the user [5]-[7] have recently been published. According to Frydenberg [1] there are nine standards pertaining to the quality of the e-learning system (Table 1). In this paper special attention is given to Standard 4.

TABLE 1
E-LEARNING STANDARD

1. Institutional commitment
2. Technology
3. Student Services
4. Instructional Design and Course Development
5. Instruction and Instructors
6. Delivery
7. Finances
8. Regulatory and Legal Compliance
9. Evaluation

The Zagreb School of Economics and Management (ZSEM) was founded in 2002. The School's development was the key reason for constant use of all the possibilities that ICT (Information and Communication Technologies) offer for incorporation in the education process [8]. The direction of ZSEM [9] played an important role in the implementation of a LMS (Learning Management System). This role involved mostly choosing the WebCT platform [10] as the main LMS for use in continuous communication between students and professors, and also ensuring its constant use for all courses year after year [11]. In the first 5 years of ZSEM's existence 66 courses were developed on the undergraduate level. All our professors were trained as designers to develop online courses on the WebCT platform, and students were trained to use WebCT courses.

According to the Bologna Declaration, at the end of each semester every university must evaluate all courses held in that semester, and all professors that were teaching. For this purpose ZSEM used the WebCT platform and in 2005 developed online evaluations [12]. The results and data of the evaluations produced on the WebCT platform were easily analyzed further on. In order to complete the evaluation process and add to data gathered from the students who took all the courses, and the opinions on all the courses per semester and all the professors involved, the e-learning team regularly performed an evaluation of all courses developed within the WebCT platform. Statistics for these two evaluations overlapped only partially. Student surveys included evaluations of complete courses, lectures, the professor's quality as a lecturer, the professor's availability to students and of WebCT activity. Evaluation implemented by experts in the e-learning group was used exclusively for analyzing the quality of the WebCT courses that were developed.

Each professor was obliged to develop an online course within the first year of lecture and to upgrade it

over the years. The e-learning team produced guidelines for every course, with specifications of the contents included. Besides shared content, each course could contain elements pertaining to its own identity and specific content in regard to the course. Evaluations in the first two years were descriptive. The goal was to stimulate professors to give their own suggestions on how to develop given courses even more. As the result of these evaluations, we developed standards that gave us the possibility to verify each course using quantitative standards.

2. STANDARD DESCRIPTION

Table 2 shows the group of 11 standards that we currently use for evaluating developed WebCT courses. There are three groups of standards: static (S1 – S4), dynamic (D1 – D4), and administrative (A1 – A2). The team of evaluators of the WebCT courses may use additional points to reward certain parts in each course (5% – 10%) that were done extremely well, which enter into one of the three groups of standards.

TABLE 2
STANDARDS FOR ONLINE COURSE QUALITY EVALUATION

STANDARD	COURSE NAME
S1 – Syllabus (max – 10)	<ul style="list-style-type: none"> • Exists and is updated at the beginning of semester – 5 • Positioned first on the homepage – 5
S2 -Lectures (max – 10)	<ul style="list-style-type: none"> • Lectures are organized in the Lectures directory – 5 • Lectures are regularly updated – 5
S3 -Part Time Students (PTS) (max – 10)	<ul style="list-style-type: none"> • Created special icon for PTS– 5 • Icon PTS is available only to selected students – 5
S4 – Design (max 10)	<ul style="list-style-type: none"> • Site is well organized, everything has its own directory – 5 • Site is well designed (clear letters, contrast, etc.) – 5
D1 – Calendar (max – 10)	<ul style="list-style-type: none"> • Used for mid-term exams and exam notification – 5 • Used also for other notifications – 5
D2 – E-Mail (max – 10)	<ul style="list-style-type: none"> • Professors regularly reply to students' e-mails – 5 • Old e-mails are deleted from inbox and outbox – 5
D3 Discussion (max – 15)	<ul style="list-style-type: none"> • Regular discussion, notification and common topics – 5 • Discussion connected to the course (at least 5 topics with min. 10 posts per topic) – 5 • Old topics are archived or deleted – 5
D4 – Online Tests (max 15)	<ul style="list-style-type: none"> • At least one online exam that simulates real exams and is used to test student knowledge (for practice purposes) – 5 • Online exams for homework – 5 • Online mid-term exams (submitted for grading) – 5

A1 – Number of Students – 5	<ul style="list-style-type: none"> • Updated student databases (special attention is given to students who have already passed the course and are no longer enrolled – their records are not necessary and need to be deleted) – 5
A2 Self-registration- 5	<ul style="list-style-type: none"> • Self-registration – turned off after the first three weeks of class – 5
O – Other	<p>Additional points (up to 10)</p> <ul style="list-style-type: none"> • Developed content – 5 • Additional materials that precisely use WebCT options (Index, Links, etc.) – 5 • Taped classes – 5 • Well organized Manage File – 5 • Additional meaningful material (according to the evaluators' perception) – 5 etc. <p>Negative points</p> <ul style="list-style-type: none"> • Wrong course name or lecturer's name on the WebCT Course – (-5) • Materials that should not be distributed according to their privacy rights – (-5) • Notifications about other courses (lecturers who teach two courses put notifications for both courses on only one course page, because this is easier) – (-5%) etc.

Static standards refer to the part of the page that must exist and be updated on a regular basis, and is not directly connected with lecturer-student communication. They include the following standards: design and view, a syllabus that is regularly updated at the beginning of semester (it is important to place it in the first position of the index page), the lectures directory, cases, projects, etc. Static standards account for 40% of the final score. During the development of each course, elements pertaining to the static standards are developed first.

Dynamic standards include e-mail, discussions, chat, calendar, and online exams. Besides standard communication through e-mail, it is important that professors respond to students' e-mails on the WebCT. Also, it is important that old e-mails and discussions are archived or deleted so that they do not cause confusion among students currently enrolled in the selected courses. Discussions can be a very important part of the e-learning system [13]-[16]. Online discussions may be open or closed, and depending on the type of communication, they may be between students and the professor, the professor and students, or between students only. Some courses have highly developed discussion boards, so that students stay active in the ongoing discussion even after they have finished the course. An important part of the dynamic standards is the calendar and the virtual notification board. The calendar includes all mid-term exam dates and final exam dates, as well as all other notifications. Dynamic standards are especially important because as soon as the student logs on to the WebCT, the latest news is immediately shown for each course (the e-mail, the calendar, the chat). Online exams are also a part of the dynamic standards. A small percentage of lecturers have developed a database of test questions for simulating real mid-term exams. Some courses

continuously use online exams, even for regular homework. At this time only three courses use the WebCT platform as a tool to conduct regular online exams. A major advantage of this type of student testing is the automatic collection of test results. Also, each student can see his or her results as soon as he/she finishes such online exams, and, likewise, receive feedback and explanations for all the incorrect answers [17]. Lecturers should put in extra effort when creating online exams, since the question database is growing with time and the effort is worthwhile. Online evaluations at the end of each semester are made in the form of anonymous online appraisals and can be accessed from a link on each course page. However, they were not taken into consideration in this study, because this evaluation was made for ZSEM as a whole, and the evaluation team made separate evaluations active through links for every course [12]. Dynamic standards make up 50% of the final grade.

Administrational standards refer to the regular updating of the student database and to turning off the self-registration option after the first three weeks of class. The problem occurs when the student databases of some courses still include persons that passed the course several years ago. Due to this, the server is additionally overburdened. This group of standards accounts for 10% of the final score and is not connected to student evaluations. However, a correlation does exist between student evaluations and administrative standards. Those lecturers who communicate more often with the students and that are more active on the WebCT platform also update the student database more often.

3. RESEARCH HYPOTHESES

To test our theory we decided to use data from the WebCT analyses performed twice a year. As specified before, all courses on the WebCT must satisfy 11 standards established by the e-learning team. These standards and their descriptions were shown above in Table 2.

In this study we wanted to test the following 4 hypotheses:

- 1) There will be a statistically significant improvement in the average grading of all courses (N=42), and in all of the standards observed (N=11), from the academic year 2006/2007 to the academic year 2007/2008.
- 2) Courses for freshmen, sophomores, juniors, and seniors in academic year 2007/2008 will improve significantly in statistical terms in comparison to the same group of courses in the previous year, i.e. in the academic year 2006/2007.
- 3) Some of the 11 observed standards will improve from the academic year 2006/2007 to the academic year

2007/2008; also, we expect that more improvement will be found in the standards for calendars, e-mail, discussions or online tests.

- 4) The three observed groups of standards – static, dynamic, and administrative (which consist of 11 observed standards for online WebCT courses), will statistically improve from the academic year 2006/2007 to the academic year 2007/2008.

To test our hypotheses, we used data from the evaluations of the WebCT courses from two time periods, from the academic year 2006/2007 and the academic year 2007/2008. This data covered all obligatory courses (N=42).

4. RESEARCH RESULTS

To test our first hypothesis and to find out if there were general improvements between the two time periods, we applied a paired-sample t-test analysis. Since we wanted to see if the grades of all courses improved, we looked at the average result of all standards for each course, but also at the results of average standard points per course.

TABLE 3
ANALYSIS OF IMPROVEMENT BETWEEN TWO TIME PERIODS

	Average per course			Average per standard		
	M	Std. D.	t-test	M	Std. D.	t-test
AY2006/2007	59.17	20.95	4.396**	5.38	4.52	5.116**
AY2007/2008	66.67	17.86		6.06	4.28	

** $p < 0.001$; * $p < 0.05$

As seen in Table 3, if examined per course, the average result of the courses in the academic year 2006/2007 was $x=59.17$, whereas in the academic year 2007/2008 it was $x=66.67$. If we look at the results of the average points per standard, then the results for the academic year 2006/2007 show that courses averaged $x=5.38$ points per standard, and in academic year 2007/2008 they averaged $x=6.06$.

Both these analyses show significant statistical improvement so we can conclude that, in general, WebCT courses improved, and teams of professors that worked on them imported new materials and used WebCT courses increasingly as a supporting tool. We were interested at the beginning of this research to see whether all 4 years of the undergraduate program follow the same rhythm and if there was the same improvement and change in the WebCT during all of these years. To find out if the courses for freshmen, sophomores, juniors, and seniors in the academic year 2007/2008 significantly improved in statistical terms when compared to the same courses from the previous year, the academic year

2006/2007, we also applied a pair-sample t-test analysis (Table 4).

TABLE 4
ANALYSIS OF IMPROVEMENT BETWEEN 4 YEARS IN TWO TIME PERIODS

	Average per course			Average per standard		
	M	Std. D.	t-test	M	Std. D.	t-test
1st y 2006/2007	60.00	24.12	2.478*	5.45	4.68	3.149*
1st y 2007/2008	70.00	15.23		6.36	4.46	
2nd y 2006/2007	50.83	18.32	2.022*	4.62	4.65	2.983*
2nd y 2007/2008	58.75	17.60		5.34	4.55	
3rdy 2006/2007	67.00	18.14	3.498*	6.09	4.30	2.152*
3rdy 2007/2008	72.50	17.83		6.59	3.89	
4th y 2006/2007	60.63	22.27	1.938	5.51	4.22	1.824
4th y 2007/2008	66.25	20.83		6.02	3.95	

** $p < 0.001$; * $p < 0.05$

No matter which average results we took, per course or per standard, there was a significant improvement in the quality of the WebCT online courses taught to the first three years of the undergraduate study. For seniors, this improvement was also noticed, but it was not so significant in order to be considered statistically significant. The results show that constant improvement occurred in all of the four years of the undergraduate program and that new generations are constantly provided with new information and better online courses.

If we look at the average results per course in the academic year 2007/2008, we can notice that all of the grouped courses did not produce the same results. The best results of the WebCT course evaluation had courses taught to the 1st and the 3rd year of the undergraduate program. From this we can conclude that more work needs to be done by professors teaching the 2nd year who have online WebCT courses in the 2nd year of the undergraduate program, since the average result per course for that year was $x=58.75$. This problem requires more research and attention.

In conducting our research, we were also interested in whether we could find statistical improvements for specific standards in regard to the quality of WebCT courses. Courses meet some standards better than others (Figure 1).

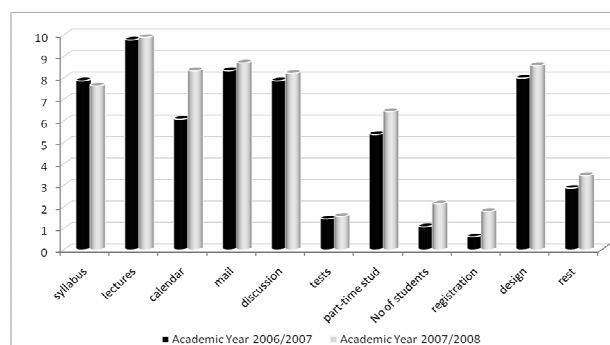


FIGURE 1
AVERAGE RESULTS ON 11 STANDARDS IN TWO TIME PERIODS

If we look at the average results, we can conclude that most of the WebCT courses have posted lectures, mail links, calendar links, and reasonably well designed discussion topics. Tools that are still evolving are the online tests. Also, very few teams of professors that work on different WebCT courses have checked to see if the number of students enrolled in the class is the same as number of students registered to the WebCT courses. Generally, results are improving.

To test the hypothesis whether some standards, such as the calendar, mail links, discussion links and online tests showed a statistical improvement, we again applied a pair-sample t-test (Table 5).

TABLE 5
ANALYSIS OF IMPROVEMENT OF 11 STANDARDS IN TWO TIME PERIODS

		N	M	Std. D.	t-test
Pair 1	syll06	42	7.86	3.15	0.703
	syll07	42	7.62	2.97	
Pair 2	lect06	42	9.76	1.08	0.573
	lect07	42	9.88	0.77	
Pair 3	cal06	42	6.07	4.06	4.635**
	cal07	42	8.33	3.25	
Pair 4	mail06	42	8.33	2.39	0.771
	mail07	42	8.69	2.23	
Pair 5	diss06	42	7.86	4.30	0.771
	diss07	42	8.21	3.28	
Pair 6	test06	42	1.43	3.18	0.374
	test07	42	1.55	3.40	
Pair 7	PTS06	42	5.36	4.19	1.851
	PTS07	42	6.43	3.87	
Pair 8	nostud06	42	1.07	3.03	1.937
	nostud07	42	2.14	3.69	

Pair 9	reg06	42	0.60	1.64	3.186*
	reg07	42	1.79	2.43	
Pair 10	des06	42	7.98	3.32	1.302
	des07	42	8.57	2.77	
Pair 11	rest06	42	2.86	3.69	1.704
	rest07	42	3.45	3.58	

** $p < 0.001$; * $p < 0.05$

If we look at the 11 tested standards in the two given time periods, the results are generally improving and two of them are statistically significant. It seems that professors used calendars more often as a tool in the WebCT courses in the academic year 2007/2008 than in the academic year 2006/2007. Even though they are still not doing it enough, in the two time periods professors have significantly improved when it comes to checking whether or not the course was left with a possibility of self-registration after the first three weeks of the academic year.

As a final problem, we wanted to find out whether the three groups of standards changed over time. The average results showed that the static standards were the most developed group of standards, followed by the dynamic standards, and then by the administrative standards (Figure 2). The results for the two time periods showed an improvement for all groups of standards, and the most improved group was the one with the worst score, i.e. the group of administration standards.

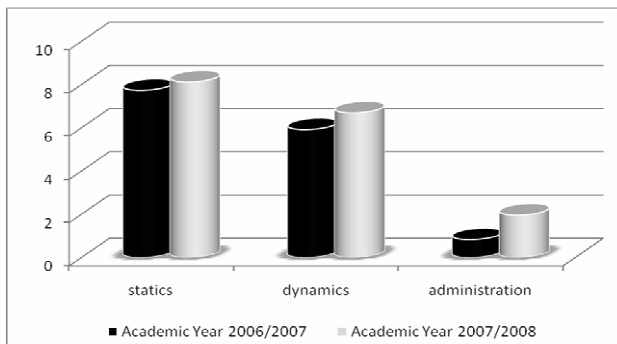


FIGURE 2

AVERAGE RESULT OF 3 GROUPS OF STANDARDS IN TWO TIME PERIODS

Table 6 shows the paired-sample t-test analysis which was used to test the last hypothesis of our research, which stated that the three groups of standards would improve significantly in statistical terms in the two time periods.

TABLE 6
ANALYSIS OF IMPROVEMENT OF 3 GROUPS OF STANDARDS
IN TWO TIME PERIODS

		N	M	Std. D.	t-test
Pair 1	stat06	42	7.74	2.16	1.915
	stat07	42	8.13	1.92	
Pair 2	dyn06	42	5.92	2.59	2.874*
	dyn07	42	6.70	2.15	
Pair 3	adm06	42	0.83	1.89	3.029*
	adm07	42	1.96	2.56	

** $p < 0.001$; * $p < 0.05$

The dynamic standards and the administrative standards, in statistical terms, improved significantly. The static group of standards, which are developed at the beginning of all courses, have not improved significantly in statistical terms in the two time periods.

5. CONCLUSION

The results of the study show:

- When general results for the academic year 2006/2007 and 2007/2008 are compared and analyzed, we see a significant statistical improvement in evaluations, average grades of courses and average scores on standards for WebCT courses.
- Results of evaluation for the group of courses for the 1st, 2nd and 3rd undergraduate year have significantly statistically improved, in the two time periods (the academic year 2006/2007 and the academic year 2007/2008) both in average course scores and average standard scores. Results for the group of the 4th year courses have also improved, but this improvement was not statistically significant.
- Even though improvement was made in all 11 standards used to evaluate the quality of the WebCT courses, only two standards have improved significantly in statistical terms. Professors are using calendars more often as tools for communicating new information to students. Also, they are paying more attention to turning off the self-registration option after the first three weeks of class.
- Although there was improvement for all 3 groups of standards between the 2006/2007 and 2007/2008 academic years, this was statistically significant only for the dynamic and the administrative standards. Results for the third group of standards, static standards, were the best, so there was little room for improvement.

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