

Pedagogical Aspects of E-learning Implementation: What Have We Learned?

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Abstract—In this paper we present our experience regarding LMS (Learning Management System) platform "Moodle" used in teaching computer-assisted courses at Faculty of Civil Engineering in Rijeka. Recent student population represents first generations that have been surrounded with computers in every aspect of everyday life since their birth. Therefore teaching process had to be adjusted according to students' expectations. Because of these reasons, during past years we have been experimenting with several LMS solutions our intent being the improvement of communication and collaboration with our students. In the last academic year, we collected some new experience using Moodle. At the end of the semester we conducted a research and tried to find answers to some questions: what was successful, what new problems arose, how the students accepted this new way of learning, what should be changed in the future?

Index terms—civil engineering, education, LMS, Moodle

I. INTRODUCTION

For new generations of students, computers are an integral part of everyday life: since their earliest age, they have been growing up immersed into technology, which is a fact that cannot be ignored during development of the teaching process. In the same time, the implementation of Bologna process [1] with its new requirements encouraged us to try and integrate all the given facts and adjust our approach to teaching of computer related courses at Faculty of Civil Engineering. For example, during the last several years, in courses "Informatics" and "Computer Programs", by implementing the new dedicated software tools we have tried to improve communication and collaboration with our students. Of course, all the changes we introduced were carried out according to known standards high education is laid upon, such as "Seven principles for good practice in education" [2].

In course of the last three years, we decided to adopt the hybrid (or blended) teaching model – the model which represents synthesis of traditional teaching and e-learning surroundings.

Several facts influenced our decision to change the teaching model. The opening questionnaire, conducted among first year students (since 1999) at beginning of

every academic year, provided us some very interesting results [3], [4].

Let's point out some of the findings that encouraged us to introduce changes:

1. Majority of students possess their own personal computer at home, with Internet access
2. Computers are used very frequently, or on everyday's basis, most often for games and entertainment (multimedia, on-line communication with their friends, etc.), and students are well versed with Internet services
3. The students show some distance towards formal ITC education, and because of that it is very important to permanently introduce changes into this segment
4. Students' expectations regarding higher education are high

Guided by all afore mentioned reasons, especially by the fact that the students use web technology well and often, we decided that the e-learning platform we chose had to be web-based.

In the last several years, we have used following tools to conduct classes of "Informatics" and "Computer Programs" [5], [6]:

- *From 2003 to 2005*: web page with information and teaching material offered to download (situated on students' server and accessible from local network only: it contained assignments, guides, results and grades)
- *From 2005 to 2006*: MS Sharepoint Services 2.0
- *From 2006 to 2007*: LMS platform Moodle, which was called FRAK

I. HYBRID TEACHING MODEL

With LMS (Learning Management System) platform implementation into teaching process we had to accept the changes of the teaching model, and the hybrid (blended) model was chosen. [8]

During decision making, there were several criteria that needed to be taken into consideration:

- Is the new model going to improve the teaching process?

- Is the new model acceptable for our students' population and their prior knowledge?
- Are the students going to accept the new model well?
- Does the institution have the proper infrastructure for the new teaching model?
- Are the teachers ready for the challenge brought by the new model?
- Is the new model scalable, i.e. easily applicable to more different courses or students?
- Is the new model sustainable?

After careful consideration, it was concluded that there was a positive answer to all of questions listed [7].

In our e-learning model, classes are performed immediately – face-to-face – with on-line materials presented for accessibility and distribution of courses' content (see Figure 1). Traditional lectures are held during the entire semester, with collaboration tools utilized during practical exercises. We have tried to balance on-line and off-line components, with latter being subject to their context.

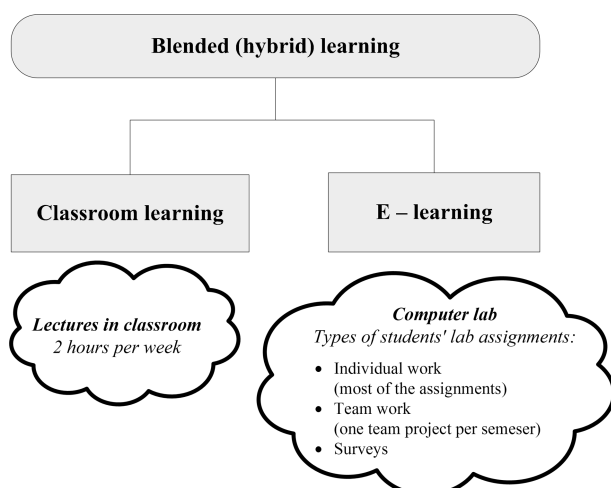


Figure 1. Year 2006/7: Teaching Model

Furthermore, the implementation of LMS platform excelled in collaboration with study-as-you-work students because those are mostly students with work obligations that tend to interfere with students' lecture attendance. For them we applied teaching model based on e-learning (see Figure 2).

- 3-year study of Civil Engineering (work and study scheme)
- 2006: 15 students

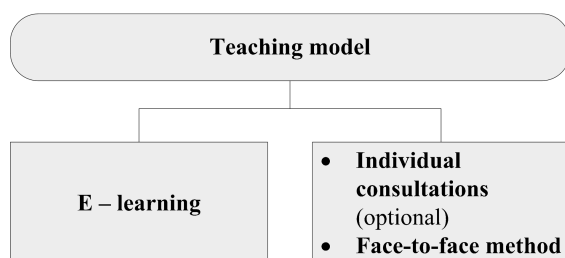


Figure 2. Higher education of working adults

II. III. 2006 – IMPLEMENTATION OF LMS MOODLE

After deciding that we were ready to shift to the application of the specialized LMS package, we began to

search for the software which would meet several requirements:

- it should be web oriented
- it should be stable enough
- it should be compatible with our authentication scheme
- we want both the software and the database on our own web server
- installation has to be relatively easy to perform
- license has to be cheap or free

After having tested a few available open source platforms, we chose Moodle: At first we used version 1.5, and then, at the beginning of the academic year 2007/08 we upgraded to version 1.9 (currently under development, but stable) [9]. Our Moodle instance runs on Linux Debian server.

The new web site was named “FRAK” (*Fakultetski RAčunalni Klub* in Croatian), because it was the name of faculty computer club that drew together both members of staff and more ambitious students in order to further improve their computer skills.

A. Organisation and access to FRAK

(<http://www.gradri.hr/frak>)

Until now, the entire two generations have completed their computer related courses through our LMS platform: total of 364 students from both university studies and professional studies.

In the first year of implementation FRAK was used in teaching “Informatics” and “Computer Programs” (see Table 1):

TABLE I.
COURSES ON FRAK PORTAL
DURING 2006/7 ACADEMIC YEAR

Curriculum	Course name	Classification	Year	Sem.	Enrolled students
University studies	Informatics	mandatory	I	I	116
	Computer programs	electoral	I	II	81
Professional studies	Informatics	mandatory	I	I	56
	Computer programs	mandatory	I	II	52
In total:					205

In the academic year 2007/08, we have opened another four courses, so now there are eight active courses, our colleagues showing more and more interest every day.

Our users log in with their personal AAI@Edu.hr users' accounts [10]. All ITC resources and services offered at Faculty of Civil Engineering rely on unique authentication scheme – in example:

- access to workstations on our local network (with PGina, a open source Windows plugin, we enabled users to log-on to Windows domain)
- access to their e-mail accounts
- access to FRAK (their user data is imported automatically from LDAP server)

At this point we have to emphasize that all activities: installation and maintenance of LMS, creation and design of on-line courses, preparation of on-line teaching material for all four courses together with lecturing and

conducting practical exercises, evaluation and grading of students' assignments, seminars and tests – including the final exam – have been performed by a team of two teachers.

B. How and when students access FRAK

Practical exercises are divided into two categories:

1. individual assignments – the largest part of practical curriculum; assignments are presented together with detailed instructions
2. team work – once during a semester, students work in groups of three on a shared task and they are expected to present the result of their work

FRAK portal is – besides from the computer lab – accessible from home all the time, thus enabling students to have access to teaching material and to be informed about course related news.

C. Evaluation of students

Students are evaluated in several ways:

- Individual assignments grades
- Results of tests during the semester
- Seminar grades (content & presentation)
- Final exam

In addition to the above, we enabled students to grade each others' presentations of seminars. Although this grade is not taken into account for the students' final mark, we publish those grades together with comments in order to motivate the students further (Figure 3).

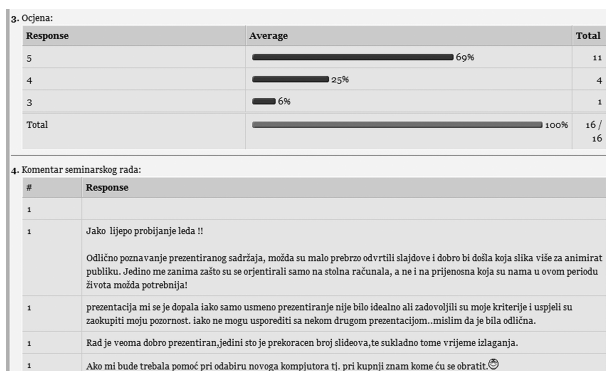


Figure 3. Students grade each other

Throughout the last two years, we have used the following grading model (Figure 4):

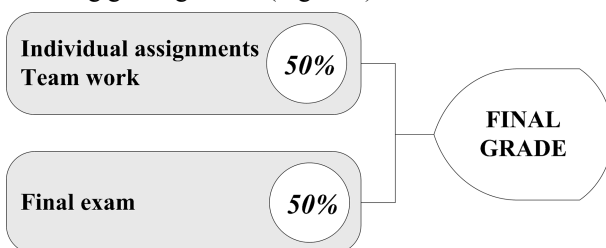


Figure 4. Evaluation of students

III. SOME COMMENTS REGARDING USE OF LMS

In the past two years we have been using a LMS platform, the experience we collected has helped us improve and adjust our teaching environment. Besides the

obvious advantages, we have also noted some potential problems which have to be taken into consideration.

A. Advantages of LMS platform use

Some of the advantages we can refer to are:

- Simple procedure of teaching material updating
- Possibility of monitoring all students' activities
- Simple and effective communication with students (through Forums)
- Assignment upload with deadlines
- Possibility of creation and combining of questionnaires and on-line tests
- Simple and transparent grading with automatic grade calculation
- Centralized administration (students' lists, groups, grades, attendance)

B. Problems we came across

The first installation of Moodle (ver. 1.5) went relatively smoothly, so we undertook an upgrade to version 1.9 without expecting any problems. However, due to the modifications in Moodle (introduction of UNICODE) we had some trouble converting our existing database to the form which would support special Croatian characters.

Except the problems of technical nature, we periodically come across situations related to students' misuse of LMS possibilities. We have tried to solve these problems in the most appropriate manner, and it has to be noticed that these problems are neither frequent nor critical.

1. Copying, or using other people's assignments represents a specific problem which grows in dimension with LMS implementation. We have tried to solve this problem by enhanced supervision and by disabling outside access to assignment upload activities (IP range control).
2. Lecture attendance: Although only presentations for download and not the entire lectures are offered, the fact remains that lecture attendance is lessened compared to attendance we were used to having before e-learning implementation. However, in our case this is not a significant problem and we have decided just to monitor it, without introducing counter measures.

C. Using FRAK – students' point of view

We have collected students' opinions through anonymous questionnaire offered at the end of the semester. With four questions we tried to get insight into students' LMS experience. The results were more than good, and students gave high marks to the new way of learning. Here are the questions and the results:

1. Please, grade working with FRAK: 4.6 (scale from 1 to 5)
2. Do you want to use FRAK in other courses? 88% answered positively
3. I agree that grading with FRAK is good. 88% answered positively (see Figure 5)
4. We offered a possibility of writing a comment. Comments were mostly positive.

Objections were few:

- Some students complain about precise deadlines for assignment uploading
- They would like to receive an e-mail message about grading results (It is possible to do it automatically in Moodle - some students' addresses were not properly set up, resolved this year!)
- One student expressed reservations about the grading method, but wants to continue this way and adapt himself in the meantime

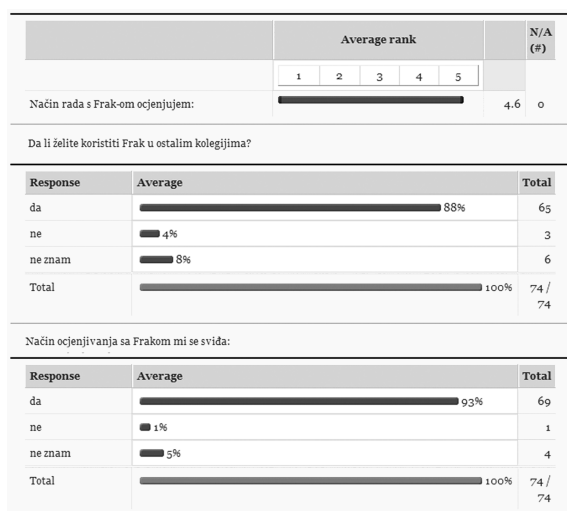


Figure 5. Satisfaction survey

D. Using FRAK – teachers' point of view

LMS is a great challenge for a teacher. We can emphasize some of the pre-requisites crucial for achieving success in LMS environment.

Good skills in computer using – the teacher should be ITC literate and capable of producing the adequate media, and in this way independent so that he can create the content (resources) and manage activities he intends to perform within his course.

The way of working in Moodle environment has been enabled with an intuitive and user-friendly interface that allows relatively fast adoption by the teacher.

Working in LMS environment demands extra work hours – it is a fact that has to be taken into consideration when decision about adopting e-learning is made. Regardless of many advantages that LMS offers, the preparation of online learning material and administration of courses' web page can be very time-consuming.

Therefore this segment suggests that it would be more than useful if institution could provide some kind of support to the teacher – i.e. help with production of presentations, multimedia resources, and online lectures. Frustration due to the extended job volume can be lessened because working with e-learning software is motivating and it offers new possibilities of teaching improvement.

There are many new activities that can make teaching (and learning) more interesting for both the student and the teacher: forum discussions, blog, wiki, online lessons. Knowledge and skills can be tested through online tests and questions and the student can be informed about his or her success the very moment he or she submits the

answers. The student can upload the assignment on the LMS portal and receive the grade together with feedback from the teacher on the same spot.

IV. CONCLUSION

The dilemma about using e-learning in teaching process or not is a nonexistent one.

All over the world millions of students attend various forms of on-line courses and it can be said that e-learning is definitely one aspect of lifelong education which expands from year to year. Because of that we consider it necessary to present the described way of learning to the students during their higher education, so that they can easily adopt any new model introduced later.

Students have high expectations of higher education. Since they are ready and willing to adopt new technologies, they have accepted implementation of LMS well and rewarded its introduction with the highest marks.

At the same time they have proved to be demanding when it comes to the appearance of online material.

LMS can be a great challenge for a teacher who has to be very well acquainted with information and communication technology.

On one side, e-learning offers significant gain with activities that make communication with students simpler; it enables better supervision of students' work; the grading becomes transparent and the work itself more interesting and more motivating.

On the other side, creation of online learning resources and activities takes more time. Here is where support on the institutional level is required in order to encourage further growth of e-learning development.

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