Teaching Construction Management Core Subjects with the Help of eLearning

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Abstract

At Szent István University’s Ybl Miklós Faculty of Architecture and Civil Engineering construction management subjects are required courses for all students, meaning that Architecture, Civil Engineering and Construction Management BSc student, both full and part-time have to take them in the third year. In Construction Management 1 students get acquainted with the basics of construction projects and cost calculations, while in the next semester the topic is scheduling. The courses are created according to a blended learning model, where face-to-face teaching and elearning are combined. The former is provided in the form of lectures and recitations (integrated with computer lab sessions), while the latter is facilitated by the university’s moodle-based elearning system.

In this paper, the blended nature of the construction management courses is discussed. Moreover, the new study materials developed within the framework of the New Széchenyi Plan and co-funded by the European Social Fund provide opportunities for further improvement, which are also presented.

Keywords: blended learning, construction management, eLearning, teaching.

1. Introduction

Construction Management 1 and 2 are taught for third-year – both full and part-time – Architecture, Civil Engineering and Construction Management BSc students at Szent István University’s Ybl Miklós Faculty of Architecture and Civil Engineering. In an attempt to accommodate 21st century students’ need for the use of information technology and following the trends for new ways of teaching, the courses are organized according to a blended learning model. It means that face-to-face instruction is mixed with the use of our university’s moodle-based eLearning system.

First, some ideas about blended learning are discussed. Then the subjects are introduced shortly. In the next part of the paper, our current teaching practice is dealt with in detail. Lastly, our newly developed study materials are presented.

2. Blended learning

According to Reiser (2001), IBM’s researchers developed CAI (computer-assisted instruction), which was the first program to be used at public schools. In the 60s, computers were used on the university level as well. However, by the end of the 70s, they had made very little impact on education. In the early 80s, when microcomputers became available for the public, the interest in them increased. Still their influence on instructional practice was rather small until the mid-90s. Since then, the use of computers for instructional purposes has significantly increased.

In 1998 the UNESCO’s World Declaration on Higher Education for the 21st century stated that “higher education is being challenged by new opportunities relating to technologies that are improving the ways in which knowledge can be produced, managed, disseminated, accessed and controlled”. It was also noted that new information and communication technologies provide opportunities for improving the contents of courses, altering teaching methods and making education available for more people.

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The EDUCAUSE Center for Analysis and Research has published their study on undergraduate students and information technology every year since 2004. The main goal has been to map the relationship between students and technology. The longitudinal data obtained over the years reflect the changes in technology. Students have been positive about the use of technology in education; however, they are quite slow when it comes to adaptation. The study shows that, while students still need a certain level of face-to-face interaction, they value basic resources the most, for example, course management systems (Figure 1). They prefer to separate their private lives from academics; therefore the use of social media is not welcome by them. Those students who require guidance on how to use technology for academics prefer to acquire the necessary skills in class. (Dahlstrom, Walker and Dziuban, 2013)

The term blended learning has been defined in many ways. The expressions hybrid model and mixed mode are also used as synonyms. Oliver and Trigwell (2005) felt that blended learning is ill-defined. It could mean different approaches based on what modes are actually blended. According to Graham (2006), it is the mix of face-to-face and computer-aided instruction, with an emphasis on the latter. In this paper, this definition is applied when our practice of the blended learning environment is discussed.

Kandies and Stern (1999) stated that in the beginning only study materials were placed on the internet. However, this does not have any added pedagogical value. Therefore the range of applications should be widened. They believed that hybrid learning environment makes the students more active and self-directed learners. Also the fact that students are encouraged to communicate with their teacher via email increases their interaction, and the shier students benefit even more from this opportunity.

For blended learning to be efficient, the digital literacy skills of both parties – students as well as teachers – have to be developed. Kandies and Stern said that teachers should learn how to exploit the opportunities provided by new technologies. Similarly, Kruger and Bester (2014) expressed that teachers have to adapt to the new ways of teaching in the 21st century. Hall, Nix and Baker (2013) stated that digital literacy skills are necessary for students to be able to follow the courses. Their survey also showed that students favor the integration of the development of such skills into the curriculum.

In sync with the ECAR study, Buzzetto-More’s research (2008) revealed that students value the presence of lecture notes, discussion boards online. Also they found it convenient to do exams, submit assignments and check grades on the internet.

According to Carman (2005) five key elements of the blended learning environment can be defined. The first is live events, which mean synchronous sessions led by an instructor. The second is online materials to facilitate self-paced (asynchronous) learning. The next one is collaboration of various forms including both peer-to-peer and peer-to-mentor interaction. The fourth ingredient is assessment, while the last one is reference materials.

The web-enhanced part of blended learning can be facilitated by different systems. Watson and Watson (2007) aimed at clarifying the difference between the various types. Course management systems (CMS) are
probably the most common ones. While learning management systems (LMS) are more than that, since they are also administrative tools registering the progress of the students.

3. Construction Management subjects

Students are recommended to take Construction Management 1 in the fifth semester. The course offers an insight into construction projects. Students get acquainted with the different phases of the projects and the stakeholders together with their contributions. Various project delivery systems are also discussed. The largest chapter deals with the construction costs, their classification and how the construction budget is made. Different norm databases and the rules associated with their usage are also discussed. Students get acquainted with ProJack, a project management application developed in Hungary, as well. The homework assignment is to make a quotation for the construction of a small holiday house, starting with the calculation of the quantities, and ending with creating the budget in the selected PM software. Students work in pairs on this assignment.

Construction Management 2 is suggested to be taken in the sixth semester. The students learn about modern scheduling techniques, the possible applications of CPM, MPM (Precedence Diagramming Method) and the linear scheduling method. Students can understand how scheduling affects the resource plans taking the economic aspects into consideration, and how financial scheduling of organizations affects the feasibility. The homework assignment is to prepare the schedule for the construction of the same house as for which the budget is assembled in the previous semester.

In case of both subjects, there is a one-hour lecture and a two-hour recitation every week. The attendance to the latter is mandatory.

4. The application of eLearning

Firstly, it has to be noted that eLearning is the name of our university’s moodle-based course management system. Therefore, in this paper, it is not used as the term for online courses.

In said system every subject has its own page, which could be filled with content by the instructors teaching the class. Since its introduction in 2008, Construction Management subjects have shown the most activity. From the very first class of Construction Management 1, students are taught to try to look for answers on the subject’s eLearning page. The syllabus and schedule of topics containing the most important information, such as the date and nature of tests, deadlines for assignments and how the final grade is calculated, are always uploaded before the given semester begins.

Lecture notes and recitation slides are also available prior to the classes providing the opportunity of arriving to the classes prepared, maybe even with some questions. Asynchronous, self-paced learning is also facilitated by online quizzes, which give the right solutions, after submitting the answers, and extra reading materials for those who are interested.

All the necessary documentation about the holiday house used for the homework assignment is also uploaded. Then the ready assignments should be submitted online, which is a more convenient than handing it in on paper. Moreover, this way both student and teacher have access to the files, if for some reason it needs to be checked in the future.

Students are also encouraged to use the message board to ask their questions for two reasons. Firstly, because other students may have the same question, and they could also benefit from the reply. Secondly, due to the fact that it helps the interaction not only between students and the teachers, but also among students, as a peer might answer the question as well. Everyone enrolled in the course gets email notifications about the posts in the discussion forum, this way students do not have to be logged in to get the information. Due to this fact, making important announcements on the message board is the fastest way to notify students.

Exams are also written via the eLearning system. These are very much like the tests provided for practice. Test results appear immediately after all answers are submitted. This makes the teachers’ job easier. However, it is also good for the students, since they not need to wait for their grades. Figure 2 shows how the corrected test looks like. The questions are listed on the right-hand side. If the number is colored in green, then the answer is correct, while red means that it is not. Also these tests could be accessed anytime, which is good for administrative reasons as well.
In order to help the students get used to the system, with which they do not get familiar during their previous studies unfortunately, it is used in one form or another in every recitation class. Firstly, the slides with the small assignments solved in the course of the lessons can be seen there. This is also an easy way to cut the use of paper. Secondly, these assignments have to be uploaded at the end of the class. Therefore when they have to submit their homework at the end of the semester, they know exactly how it works. In addition, in a few classes short quizzes have to be solved. Since they work the same way as the exam, the exam is not the first time they see an online test, and this “skill” helps them concentrate on the questions themselves.

Due to the fact that everything is handled in the same system, where all data is stored, every assignment, test result etc. can be accessed anytime in case it is needed. This makes administration easier. Students can also check their progress, because they can see the marks that they receive during the semester.

There are also special sections devoted to part-time students. Since most of them are having full-time jobs, it is even more important for them to be able to access the study materials and all necessary information wherever and whenever they need it, and can find the time for studying.

Owing to the fact that both subjects are offered in English for the Erasmus students as well as for the Hungarian students, all materials can be found and almost every feature is used in English too.

In spite of the fact that the eLearning system is actively used in case of these subjects, it still has a lot more possibilities to offer, which should definitely be considered in the future. Moreover, it is constantly developed to provide even more opportunities for improvement.

5. New study materials

A two-year project of developing new, up-to-date e-learning study materials for 13 subjects – including Construction Management 1 and 2 – has just ended. Our faculty has taken part in a Social Renewal Operative Program within the framework of the New Széchenyi Plan run by the National Development Agency. 95% of the budget is subsidized; it is co-funded by the European Social Fund.

14 lessons has been written for each course corresponding with the number of lectures in a semester. This way the titles of the lessons constitute the curriculum of the given subject for one semester.

Each lesson is divided into chapters, and these are made up of pages. The website-like appearance provides easy navigation between the various parts. See, for example, Figure 3. The three rows of text on the top show you the subject, the lesson and the chapter respectively. The latter one is also indicated on the “timeline” below.
In case of Figure 3, we are looking at Construction Management 2’s sixth lesson: MPM: Basics, Time Analysis with Minimal-type Relationships, whose third chapter is MPM/PDM Time Analysis. The little squares in the top right corner represent the pages of the chapter. The orange one indicates the current page.

![Figure 3. One page from MPM: Basics, Time Analysis with Minimal-type Relationships (sixth lesson of Construction Management 2)](image)

Every lesson is made up of different elements. These are the following: text, figures, interactive videos, non-interactive videos, tasks. The planned amount of each element is given in case of all lessons.

Naturally, the text is the most essential part of the study materials. Being digital means that even the text could be enhanced. The most important definitions appear in pop-up bubbles after clicking on the words. Also links can be added to the text. These can be divided into two groups. To the first one belong those links that point to a certain part of another lesson either of the same or of another subject, thus enabling the connection between the lessons. The other group includes those links that lead to websites, where students can find extra information in the form of texts, figures or videos etc.

Figures can include many different types, as well. There can be tables, photos, sketches created by the authors or obtained from external sources.

Interactive and non-interactive videos can also appear in the materials due to the fact that they are going to be accessed through the internet and not on paper. The difference between the two types is that in case of interactive videos students are more involved; they can choose what they would like to see. Videos can, for example, demonstrate a process, like how to perform the time analysis of a CPM network. Those students who are unsure of their CPM calculation skills can just watch the video. Once they get more confident, they can determine the early and late occurrences of the events on their own, and check their solution. Animations can also summarize the text and figures of the lesson, for instance to sum up all the data a table in a norm database contains, or provide additional information on a topic discussed, for example, display pages from old books on how to calculate the construction costs.

Tasks can be found at various places in the lessons. They are usually at the end of the chapters or lessons. They can be of different types. There are, for example, multiple choice and multiple response questions. If the
right answer is ticked, the smiley is going to smile (see Figure 3), if not, it gets sad/angry. In case of multiple response questions, when more than one answer has to be checked for the right solution, the face only appears when all of them are ticked.

Some tasks require calculations. In case of one half of these tasks, the solutions are given, and can be reached by the students when they would like to see them. In case of the other half, the answers are not provided.

No matter what type the exercise belongs to, they all serve the same purpose. They measure the students’ level of understanding. This way they would know what parts of the lesson they have to go through again.

Every lesson ends with a bibliography. This, on the one hand, is important, because we do not want to commit plagiarism, so we always properly apply references. On the other hand, we could add extra sources of information, as well, for students who are interested in certain topics.

6. Summary

Due to the fact that students nowadays expect the use of information and communication technology in education, when teaching Construction Management these demands are attempted to be satisfied. With the development of technology, the way of teaching should also be changed, and possibly improved. This situation challenges the traditional methods and with that the teachers as well. Although probably face-to-face interaction can never be completely substituted by computers, in a blended learning environment, ICT gets in the mix, and maybe even becomes dominant.

With the help of our university’s eLearning system, all the necessary information can be accessed anytime, anywhere. This makes the job of both students and teachers more convenient. Even though many features of the system are used, there are several possibilities for future improvement. The first step would be to find a way to successfully integrate the new online materials, which have been developed, into our existing system.

References


