Abstract

Virtual learning environments (VLEs) based on the standard e-learning platforms as MOODLE, Blackboard and similar, are aimed at supporting usual educational modes, i.e. lecture based courses, and activities such as testing and examining, essay submissions, discussions, etc. In this study, the authors examine application of MOODLE based virtual learning environment supporting the Design Studio, a specific educational mode in architectural education. After reviewing four generations of VLEs used in architectural education and explaining the specific characteristics and requirements of Design Studio as educational mode, the Authors present and analyze the case of the VLE used to support the Urban Design Studio conducted by Prof. Petar Arsić in the autumn semester 2010/11, at the Belgrade University, Faculty of Architecture. The analysis shapes the information structure, the usage of basic and additional VLE functionalities, and concludes discussing the response to the specific requirements of the Design Studio. Finally, the paper gives some general conclusions based on the presented case study, related to organizational and technical aspects of e-learning support to specific educational modes.

Keywords: e-learning, virtual learning environments, design studio, architecture, urbanism

1 INTRODUCTION

The AMRES e-Learning Portal [1, 1a] has been established two years ago, with aim to support initial development of web based courses offered by various faculties, members of the Serbian academic network (AMRES) [2]. It is based on the MOODLE platform, a widely spread Open source system [3], initially developed in Australia and recommended by UNESCO [4]. At the beginning of 2011 the number of courses developed at the AMRES e-Learning system exceeds a hundred, and significantly increases each semester.

The Faculty of Architecture is one of the leading institutions within the Academic Network of Serbia in application of e-learning concepts in a blended mode (combination of traditional and e-learning) [5]. Although these concepts have always been applied in an experimental way, they have mostly been used to support lecture based courses. From the last semester, the virtual learning environment has been set for two Design Studio projects. Since the Design Studio represents a teaching mode quite specific for architectural education, the aim of this study is to examine potentials and limitations of VLEs in supporting such specific courses.

2 METHODOLOGICAL APPROACH

This paper is based on the study of the case of virtual learning environment supporting the Urban Design Studio titled “New Millennium and New Tendencies in Designing the Cities”, taught by Professor Arch. Petar Arsić and his assistants, at the University of Belgrade, Faculty of Architecture, in the autumn semester 2010/11[6]. The case has been analyzed from the viewpoint of VLE application and management of knowledge within it, with a particular attention on its organizational and pedagogic implication.

Conclusions based on the study of this case can be applied to other virtual environments supporting similar education modes within the AMRES e-Learning system. The generalization of conclusions is however limited to the VLEs based on the MOODLE e-learning system and need to be further revised if applied to VLEs on other platforms. Some of the conclusions, related to additional needs and required functionalities, could affect further development of AMRES e-Learning system, as well as development of e-learning platforms in general.
3 DESIGN STUDIO AS A SPECIFIC EDUCATIONAL MODE

The Design Studio is considered as a backbone of architectural education, the part of the core curriculum, within which students have been exposed to real-life architectural design problems that they solve through design projects, during a limited time [7]. The sources of Design Studio as a teaching model date over 200 years back, when architectural education was established within the famous École de Beaux Arts in Paris [8]. It refers to both a specific teaching method and the space where the teaching occurs. One of the main characteristics of Design Studio is its social dimension, the fact that the educational process takes place in particular environment where the students communicate with their professors and with other members of the teaching team.

Figure 1 The teaching process in the Design Studio based on the direct communication between participants

Apart from the communication with instructors, the important part of the Design Studio is communication between participating students.

The result of the Design Studio is a series of projects, designed by students as a response to the design brief (Figure 2). The projects consist of a range of various representations of the designed artifacts, such as drawings, sketches, 3D models, physical models, animations, video and audio recordings, texts, etc. The progress of the design has been discussed by the members of the teaching team on a weekly basis and reviewed at the end of each design stage. The resulted designs are presented during the final critique sessions and marked (Figure 3). The selection of the best designs has been kept for further exhibition or as a didactic material.

Introduction of information and communication technologies (ICTs) in architectural practice and architectural education, affected the design studio technology as well.

Figure 2 A student presenting the final project

Figure 3 The studio space during the final review

Application of VLEs in design studio resulted in a phenomenon called Virtual Design Studio – VDS, a geographically distributed design studio [9].

From the point of view of introducing VLEs there are several common characteristics of the Design Studio:

- An intensive exchange of complex professional knowledge that could not be easily structured, neither chronologically nor thematically (apart from architectural and urban design it includes urban planning, construction, building operational system, materialization, etc.)
- Production of a significant amount of various documents – hand drawings, technical drawings, 3D models, texts, animations, photographs, video and audio recordings, etc.), as well as analog models, that need to be stored and kept available during the teaching period and optionally later.
- A need for occasional and permanent exhibiting facilities
- A potential to reuse the results of the design studio activity (i.e. the projects) on the three levels:
internally (within the studio), in the further teaching activities or externally (for example as a response to certain public needs).

It is also important to stress that, unlike the usual courses, the Design Studio concludes with a range of original results (in our case architectural and urban projects), sometimes indicative and relevant to a real life professional problems. So the knowledge acquired and exchanged within the Design Studio is worth some institutional and social efforts, in terms of technological improvements and public accessibility.

4 THE FOUR GENERATIONS OF VIRTUAL LEARNING ENVIRONMENTS SUPPORTING DESIGN STUDIO – AN OVERVIEW

In the development of VLEs supporting architectural education we could distinguish the following four generations [10]:

- **First generation** – VLE developed exclusively for a single course for a one-way communication, i.e. a simple delivery of information; web presentation of courses, no interaction among participants.

- **Second generation** – based on the experiences of the first generation VLEs, standardized, developed for more similar courses, still one-way communication, no interaction functionalities, do not allow publishing of contents produced by students.

- **Third generation** - technologically connected with data-bases, allow many kinds of interaction among participants including publishing by participating students, controlled access, available on the global market as open source and commercial solutions.

- **Fourth generation** – similar functionalities as VLEs of the third generation, connectable with external knowledge resources, virtual libraries, knowledge bases, etc.

The presented case has been established on the AMRES e-Learning system, based on the MOODLE platform, and, according to the systematization above, it belongs to the third generation of VLEs.

5 THE CASE OF A VLE SUPPORTING THE URBAN DESIGN STUDIO

The VLE that is in the focus of this study was created during the autumn semester of the scholar 2010/11, as an e-learning support to the ongoing Urban Design Studio, at the Faculty of Architecture, University of Belgrade. The Studio teaching team lead by Prof. Petar Arsić, included two assistants and one assistant professor. The group of 30 third-year students has been enrolled and successfully completed the course.

5.1 The VLE entry page

The entry page is considered as a quite important element of any virtual environment supporting a dynamic teaching activity. The entry page for this Studio, although based on the standard MOODLE layout, has been designed to reflect the complexity and the dynamics of the ongoing teaching process. While the central part of the interface has been dedicated to the students’ activities, the right side has been dedicated to various resources that have been part of the material prepared by the teaching team.

![Figure 4 The Design Studio entry page](image)

It is quite indicative that the knowledge on location has extensively been codified and made available publicly by various institutions [11]. In this case several government sources of information have been linked with aim to facilitate students’ access to the information related to the planned Belgrade transportation system, Belgrade Master Plan, etc.

5.2 The main structure of the content

The content of the presented Studio Project has been structured both thematically and chronologically. While in MOODLE based platforms just one type of structure can be the primary one, in our case this was the thematic one. The secondary information structure, the chronological one, needed to be included, that means added by some basic html programming techniques.
Figure 5 The exhibition of student’s submissions in the Stage 2 for the location “Stari Merkator”

The primary information structure is made according to the design task that considered five locations (areas next to the stations of future metropolitan transportation system in Belgrade (Olimp, Vukov Spomenik, Trg Republike, Arena, Stari Merkator), for which the urban redevelopment has been designed. This information structure has been used as a framework for a virtual exhibition space, aimed at showcasing student work in each Design Studio stage (Figure 5).

5.3 Standard VLE functionalities

Linking external resources – As mentioned above, many of the resources related to the issues of urban planning and transportation have been linked directly from the virtual environment.

Directory display – A directory structured by Studio Stages has been set for each group of students, and made visible, so that all participants could have access to all studio documents. This activity requires a significant amount of the server space, and probably needs to be outsourced from the main e-learning system.

5.4 Additional functionalities

While using the standard VLE functionalities did not require any additional activity, for the additional functionalities, the Web programmer’s support was essential.

Connecting the external video material – The external video material has been connected from YouTube and from AMRES Media server. The first required some fine tuning on the AMRES e-learning system, to get the video to play directly from the VLE.

Clickable exhibition items – exhibiting students’ projects in various Studio stages requires switching between the small images, and their large-size sources. Since this is not the part of the standard modules, these virtual exhibitions need some basic html programming.

Figure 6 The students’ contributions in the discussion forum as a response to particular tasks

Discussion forum – In the second of the three studio stages, a discussion forum has extensively been used as a channel to communicate:

- Important topics and results of the research process
- Specific methods and techniques of design process
- The additional textual and graphic explanation of the ongoing and further design activity

Glossary – A glossary of terms has been initiated with aim to facilitate students’ understanding of particular, mostly technical, related terms.

Figure 7 An example of the exhibited project

Gallery based on the folder content – As a technical solution for displaying students’ submissions in the cross-section Studio stage, an additional Gallery module has been activated. This task required the Web programmer’s intervention, as well.

Links to the students’ profiles – For some items in the whole information structure, the students’ names need to appear similarly as in the discussion forum. This is especially important on the entry page where the students’ projects have been displayed. While this was solved through some basic html programming, the linking of students’ profiles appeared as an issue for further VLE development.
6 IMPLICATIONS OF THE PRESENTED CASE

The most important implications of the integration of presented system are organizational and pedagogic ones. While the organizational aspects strongly affect the decision to consider integration of e-learning in the teaching methodology, even more important are the pedagogic implications that really help to validate the method.

6.1 Organizational implications

Regarding the organizational implications, introduction of a VLE in the Design Studio:

- Facilitates delivery of design studio information and related documents
- Supports linking with the information systems of related institutions
- Increases externalization of related knowledge within the group of participants (both students and the teaching team)
- Allows remote participants to follow the progress of the studio project and to possibly participate in the discussions, design reviews, etc.
- Makes the Design Studio information accessible long after the teaching period, for both the studio participants and the external interested parts.

Discussing implications of such system in terms of organization, it is important to stress that it requires a significant amount of additional time for editing, management of information, communication with other participants, etc. This needs to be considered when making decisions of its introduction in the standard teaching process.

6.2 Pedagogic implications

The virtual learning environment supporting the Studio, offers many possibilities to all participants, both during the teaching time and after. The data-bases containing examples of students’ projects submitted in previous academic years, as well as numerous examples related to the domestic and international practice, are available to all participants, and accessible from the Studio, professor’s office or any other place where the teaching process occurs. All stages in the development of individual designs, group work alternatives and solutions, as well as the progress of the Studio as a whole, have been available and accessible from the Faculty Web site. This additionally motivates students and the teaching team to gain better results. A general competitiveness brings an additional positive energy in terms of achieving better results within the Studio, as well as compared with other (in this case 10) Studios. Apart from these direct pedagogic implications, there are some pedagogic challenges affecting students and the teaching staff:

- a need to constantly adapt the educational technology according to usual students’ communication habits
- to stimulate constant exploration of new modes of communicating the architectural knowledge

7 DISCUSSION - PHYSICAL AND VIRTUAL STUDIO SPACE

By introducing the e-learning support in the Design Studio, the physical component of the teaching got its virtual complement. It raises several issues and some real challenges that need to be solved. Some of them are related to existing teaching facilities and physical teaching spaces, while the others call for improvement of available e-learning resources and concepts.

7.1 Limitations of physical studio space

Establishing the virtual component of Design Studio requires a comfortable access to the Internet from any point, including the physical studio space (i.e. the classroom where the teaching usually takes part). In the analyzed case, one of the strong unexpected limitations was the fact that the studio space did not provide a wireless connection to the Internet. So the students easily accessed the virtual environment from their homes, but couldn’t access it from their studio classroom. This was partly solved by using USB modems to connect to the Internet via commercial providers, but was a strong and tough indication that contemporary physical teaching spaces need some technical improvement, as well.

7.2 Repository

One of the main characteristics of the Design Studio as a teaching mode, as already stressed above, is an extensive exchange of knowledge. While one part of this knowledge stays tacit, subjective, individual, the other part becomes explicit, represented and documented on a wide variety of ways. There’s an interest of teaching team to maintain the studio documentation in a way that it could be referred at any time during the teaching period, or reused in further teaching activities. So the introduction of a VLE is an opportunity to establish a repository of well systematized Studio materials. Comparing with usual
lecture based courses, the analyzed case of Urban Design Studio requires incomparably more storage space, and in fact, severely consumes the e-Learning server memory.

7.3 Permanent exhibition space

One of the characteristics of the Design Studio, as also highlighted above, is a need to exhibit both the cross-section and final results. The exhibitions occur in physical studio space for various purposes – critique sessions, final presentations, marking, public presentation, marketing, etc. As institutions are limited with space, the exhibitions are temporary, lasting from a couple of hours to several weeks.

The virtual learning environments offer a possibility to keep the exhibited material as long as needed. It can be referred and used in any time, from any space. This raises the issue on the responsibility of preservation of such resources, that together with other digital information, belongs to the realm of the so called “digital heritage”.

7.4 Knowledge base

The issue of an interlinking of the knowledge created within the studio, with a wider knowledge base, be it the one within the educational institution or any other professional or public resource, continues to be unsolved. Extracting the chosen documents from the Studio, such as design brief, location maps, photo documentation, sketches, video materials, final projects etc., and describing them according to the LOM standard [12], would result in a base of learning objects accessible and reusable in further educational activities. Functionality, as a LOM extractor, might be a useful tool in the further development of virtual learning environments.

8 CONCLUSIONS

Introduction of the e-learning support in one of the most important and most specific subjects of architectural curriculum, strongly contributes to an affirmation of e-learning in architectural education in general. The most important benefit of this method is certainly a permanent accessibility to the Studio materials (mostly visual, representing a “permanent exhibition space”), especially the final results that might be used in further academic years. The presented case invoked an interest for creation of several other similar VLEs that are going to be used in next semester. It also contributes to rethinking the existing learning environments, both physical and virtual.

9 REFERENCES:


