

A Prototype Virtual Learning Platform for Teaching Skills of Designing and Producing Online Virtual Labs in Classrooms

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Integration of ICT into classrooms has assisted to enhance students' learning process with interactivity and good performance. The main purpose of this paper is to present the main features and services of our virtual learning platform (VLP) as a prototype web application system for teaching the skills of designing and producing online virtual labs in the classroom. We implemented several functions and contents of VLP for the undergraduate students majoring in educational technology. We conducted an experiment with thirty participants who learned by the VLP system in a lecture. The implementation outcomes indicated that the VLP system as a teaching tool has a positive impact in developing the target skills. The VLP as an ICT application would help instructors to raise efficiency of learning environment in classrooms.

Keywords: Virtual Learning Platforms, ICT in Classroom, Designing and Producing Online Virtual Labs, Educational Technology Students.

1. Introduction

Recently, educational systems have expanded in integrating the information and communication technology in schools and universities. Some of these educational systems established a specialized department for educational technology to enhance students' learning process with ICT applications in such institutions.

The educational technology field aims to provide the students with skills of designing, producing, utilizing, integrating, and evaluating modern ICT applications in order to improve traditional schooling. An online virtual lab (OVL) is one of the modern applications used in the future learning institutions. Most of these OVLs have been approved a positive impact on the enhancement of learning outcomes in various domains (1), (2), (3).

However, current students who study in educational technology departments do not have skills of designing and producing OVL as a new ICT application in education. There are a couple of barriers to teach such skills as follows. At first, there are no suitable educational contents for standard skills for designing and producing OVL without dependence on domains. Second, there are also no online tools which help the students learn the skills without technical and programming difficulties.

In order to overcome these issues, our study presented a prototype VLP system to teach the educational technology students how to design and produce OVLs in a standard way. The prototype VLP system includes several tools and contents for teaching the skills for designing and producing OVL. Especially, a couple of specialized tools provide them with a standard template to acquire a suitable form of OVL.

We implemented the VLP system with thirty students majoring in educational technology. The evaluation results showed the significant impact of the developed VLP in the teaching the target skills successfully.

2. VLP system overview

The scope of the VLP was to design and produce OVLs at educational technology students. This system has provided interactive tools and contents for teaching not only in the ICT classroom but also through distance learning. This system was developed by using CakePHP framework, PHP, JavaScript, CSS, and MYSQL. The present version of the system supports two languages; Arabic and English.

The VLP system consists of two modes; instructor mode for system administrator and student mode. On instructor mode as shown in figure 1, the instructor has full authority for administration of the VLP tools. The student mode provides the students with the interactive contents and specialized tools for designing and producing OVLs.



Figure 1. Instructor mode GUI of VLP system

3. VLP system tools description

3.1 Innovative tools for OVLs

OVL design tool: It enables the students to design their own OVLs with a group of ready-made templates as shown in figure 2. The detail of the templates are as follows:

- Template for OVL framework: It includes; OVL name, target users, domain of course, topics, and general objectives.
- Template for OVL platform: It specifies management tools, communication tools, content display tools to be used in learning session. This design is limited to the proposed tools in the current VLP.
- Template for virtual experiment: It describes seven components of virtual experiment, i.e. educational objectives, theoretical explanation, instructions and procedures of experiment, simulation components and objects, activity, evaluation, and experiment summary.
- Template for overall evaluation: It defines type of evaluation tools like quiz, and description of the tools.

This tool provides the instructor with management function which gathers all OVL designs of the students as learning outcomes.

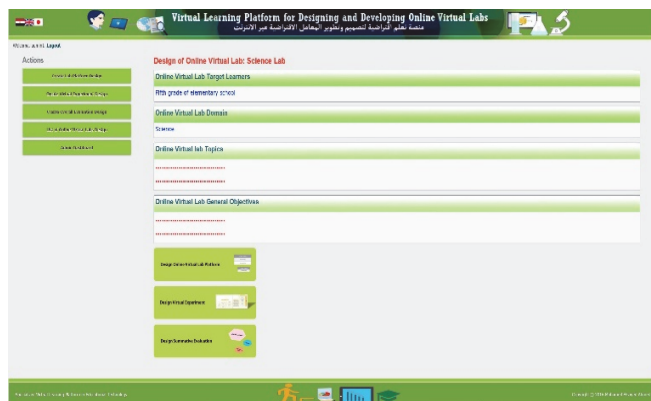


Figure 2. OVL Design screen shot as an example

OVL creator tool: It provides the students with a template based production function for OVLs without any code programming. It also has a management function for the instructor to assess the produced learning outcomes.

- Template for OVL framework: It includes; OVL name, target users, domain of course, topics, and general objectives.
- Produce platform functions tools of OVL were performed automatically after OVL was created.
- Template for virtual experiment: It imports all components of the virtual experiment. For simulation, contents made by Adobe Photoshop and Adobe Animate CC with ActionScript 3.0 are uploaded and published.
- Template for quiz: It has a template for quiz

generation which arranges question items and options.

- Template for forums: It provides templates for forum generation which add topic and comment post.

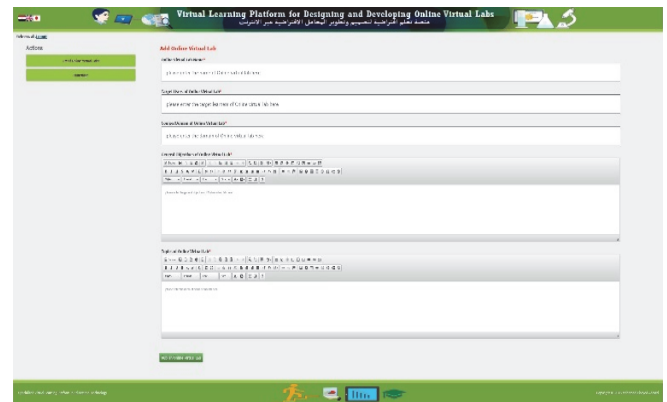


Figure 3. Create OVL framework screen shot

Educational image library tool: It enables the instructors to manage image categories and educational images which help the students in preparing simulation on diverse domains without copyright problem. The students download these images and embed them to their simulation objects.

3.2 Learning tools

Course tool: It enables the instructors to manage course contents, information of units and lessons using ready-made templates without coding. It also displays such contents to the students.

Online Response tool: It enables the instructor to make online responses with two types of questions; true and false and single choice. It also displays such online responses to the students who input a feedback about his progress during learning session in the classroom. Moreover, it provides the instructors with statistical results about the students' responses. This gives the instructors an indicator about his teaching method efficacy in the classroom.

WebQuests tool: The concept of WebQuest is "an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the internet." introduced by Bernie Dodge at San Diego State University⁽⁴⁾. It provides the instructors with a ready-made template including six essential parts; introduction, task, process, resources, evaluation, and conclusion⁽⁵⁾. It also displays such Webquests to the students.

Assignments tool: It enables the instructors to manage assignments. It also displays such assignments to the students and it accept to submit their answer files to the instructors. Furthermore, it enables the instructor to download the student's answer files.

Glossaries tool: It provides two ready-made templates for glossary and terms. The first one

includes the glossary name and descriptions. The second one contains a text explanation and image /instructional drawing, video/audio clips for each term. This tool also displays such online glossaries to the students.

3.3 Communication tools

Video conference tool: It enables the instructors to manage video conference sessions. It also displays such video conference sessions to the students. This tool is realized by BigBlueButton open source system.

Messages tool: It supports communication between the instructors and a specific student with a direct message.

Forums tool: It provides the instructors and the students with a discussion forum for diverse topics with ready-made templates for forums, topics, and posts. It provides the students to publish posts with attachments.

3.4 Evaluation tools

Quiz tool: This tool provides the instructor with ready-made templates to create quizzes with two types i.e. true or false and single choice questions in order to ask questions include image/instructional drawing, video, audio. It also displays such quizzes to the students.

Questionnaire tool: It enables the instructors to manage online questionnaires with closed questions according to 5-Likert scale grade (1 to 5). It also displays such questionnaires to the students. Moreover, it enables the instructor to ask open questions.

Performance observation card/product evaluation card tool: It enables the instructors to manage performance observation cards and product evaluation cards with closed questions with rubric subscale three scores (0 to 2) for VLP students. It also displays such performance observation cards and product evaluation cards to the students.

3.5 Management tools

User management tool: It enables the instructors to manage the target students. It also allows them to login the VLP system. This tool contains ready-made templates for registration of their data.

Teacher information tool: It enables the instructors to manage their information such as academic data, contact data. It also displays such information to the students.

Announcements tool: It enables the instructors to manage educational announcements. It also displays such announcements to the students.

Learning download center tool: It enables the instructors to manage learning files that help to facilitate learning for the students like extra explanation files, presentation files. The students can download them in their learning session.

Cloud Storage files tool: It enables the instructors and the students to store and manage their files in the server. It also displays such files to them anytime anywhere.

Reports tool: It enables the instructors to generate reports about all students' activities in the VLP system such as login activity reports, quiz reports, questionnaire reports, and performance observation card /product evaluation reports.

3.6 Help tool

It enables the instructors to manage the help cases about how to use the VLP system. It provides ready-made template for adding help cases include; help title, help text explanation, and video/audio clips. It also displays such help cases to the students.

4. Experiment setting

4.1 Participants

The VLP system was implemented with thirty participants on the fourth grade in faculty of specific education at South Valley University, Egypt. They were majoring in educational technology. The age of participants ranged from 21 to 24 (Mean = 21.7, SD = 0.65). They took part in the VLP in the second term of academic year 2015-2016 and were taught by the same instructor.

4.2 Experiment procedure

A computer lab with internet connection at the college was provided to the participants as an ICT classroom. At the first, an orientation session was conducted about the purpose of study. The students were registered as learners in the VLP system. Each student was accessed on VLP website (<http://dlc-vm09.jaist.ac.jp:30080/users/login>) with username and password. The students were asked to learn with the developed VLP. The learning process composed of learning the course content about the skills of designing and producing OVLs, participating in discussion forums for topics in enhancing learning, performing online formative evaluation during learning, preparing and submitting assignments, making a design for OVLs, constructing an OVL product. Finally, they were asked to respond one open question via forum tool about "what is your opinion on a VLP system for designing and producing OVLs?"

The main role of the instructor was to facilitate learning with the VLP through observing student performance and to conduct online formative evaluation of online response tool for all students in the classroom. In addition, the instructor created online activities such as forums for discussing learning topics, and supported the students to reach mastery learning. Moreover, the instructor was provided responses to student's inquiries.

5. Overall experiment outcome

5.1 Pros of VLP from the perspective of educational technology students

The VLP system was implemented with 30 students majoring in educational technology in the experiment. 27-student of the participants sent a feedback about their opinions after learning from the VLP system, how to design and produce OVLs. Almost of the participants' opinions were indicated that the VLP has a good solution for teaching skills of designing and producing OVLs. The students' opinions were concluded as below.

The participants stated that the VLP is easy to use, clearness, attractive, good color of design, simple, flexible, and multi-lingual user interface. The VLP organization is easy to navigate by students. It does not require their experience in the use of computers since it is easy and simple platform structure. It does not also require their experience in the field of programming. They only focus on the tasks that the VLP performs.

In addition, they stated that the VLP is considers as an economic tool and it can be used without the guidance of the instructor. It provides enough explanation with suitable grouped tools, which help the students to learn by themselves. They try it several times and communicate with the instructor by forums and messages.

Finally, they reported that the VLP helps them in designing and producing OVLs. It provides theoretical explanation and videos of all the basic skills and professionalism. Such system is useful in learning gradually step by step from novice to advanced level in the creation of OVLs. The platform provides tools, which a assists to create OVLs in diverse domains. It has allowed adding many of virtual experiments for any courses. It is possible to make design of virtual experiments with the simplest by students. It is provided ready-made template to create quizzes and forums.

The results showed that the VLP prototype version had many pros. However, two students reported some cons. One student referred to inconvenience in creating quiz through many steps and pages. In addition, the student stated the user interface is nice design but the other pages not like its design. Another student stated that the explanation of video did not include sound in the developed VLP.

6. Conclusion

In this paper, we presented a VLP solution as a web application system to teach educational technology student's skills of designing and producing OVLs. The present study investigated by thirty students interested in integrating ICT in education. They reported that the VLP is considered as a positive solution for teaching skills of designing and producing

OVLs. In the future, we will conduct improvement for the current version of VLP regarding the technical design of functions. The improving version of VLP will test again in developing the target skills for designing and producing OVLs at postgraduate students.

Acknowledgement

This research is supported and funded by a scholarship provided by the Egyptian Government (Cultural Affairs and Missions Sector, Ministry of higher education). We thank them for their priceless contribution of knowledge to this research.

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