

Title	オンラインバーチャルラボの設計・開発スキルを向上するためのバーチャル学習プラットフォームに関する研究
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Abstract

The expansion of using new virtual learning applications in educational institutions requires enhancing educators' skills of design and production in such applications. Those skills must be acquired by educational technology students for the future of education because they often lack the above skills in their curriculum. The main purpose of this research is to investigate the effectiveness of virtual learning platform (VLP) in order to cultivate the students' skills in designing and producing online virtual laboratory (OVL) with a standard way. In the context of this research, the OVL is an online practical environment for a specific topic, which makes learners active such as learning by experience and by trial-and-error. On the other hand, the VLP means a web-based learning system including several functions/tools for presenting and managing the OVL.

In order to teach the educational technology students how to design and produce OVL (DPOVL), a new instructional design (ID) model is proposed as standard components for teaching guidelines of DPOVL. Based on the literature review, the model is comprised of the following six phases; OVL pre-design, DPOVL criteria, OVL design, OVL production, OVL experiment-implementation, and OVL evaluation. Moreover, we present a list of practical skills in DPOVL to clarify which kinds of the skills to be cultivated in this research.

We also propose an educational software development process, especially for designing and producing the VLP by integrating some features from software engineering (SE) into the traditional ID framework. The proposed process contains the next five phases; analysis, construction, deployment, implementation, and evaluation, to develop a high-quality product with an iterative process. Based on these model and process, a new VLP software is developed with several innovative tools and special course contents to cultivate the target skills. The developed VLP consists of the following tool groups; a) Learning tools: They support online learning with interactive contents and web activities. b) Management tools: They assist the administration of online learning environment such as user management and content management. c) Communication tools: They facilitate collaboration between the students and the instructors with real-time and/or on-demand style. d) Innovative tools for OVL: They focus on the students' skill cultivation of DPOVL with a template method. e) Evaluation tools: They simplify assessment of the students' performance with various methods like quizzes, questionnaires, and rubric scales. f) Help tool: It guides the students to use the VLP tools through a brief explanation.

Eventually, the empirical experiment was conducted with a quasi-experimental research design in order to evaluate the effectiveness of the proposed VLP in cultivating the skills of DPOVL. Thirty students, who were the fourth grade of undergraduate students majoring in educational technology, Faculty of Specific Education, South Valley University, Egypt, participated in the experiment. All the students as the participants were assigned to one group as a pre- and post-test design. The data were collected by using online instruments; achievement test, performance observation card, product evaluation card, and usability questionnaire. The results indicated that the VLP had a positive impact on cultivating the following knowledge and skills with significant effectiveness; a) Attaining the knowledge regarding theoretical and practical aspects of DPOVL, b) Acquiring the skills related to a practical aspect of DPOVL, c) Producing the OVL products in the various educational domains. It was also suitable for the educational technology students to learn with the proposed VLP in a comfortable way. From these results, the VLP could provide a significant learning environment to cultivate the specific skills in DPOVL.

In conclusion, there are five main contributions of this research in the educational technology field; firstly, it proposed a new ID framework to teach the educational technology students DPOVL with the fixed format and suitable components. Secondly, it defined the list of 34 practical skills for DPOVL. Thirdly, it adopted the iteration process in designing and producing the VLP to keep the educational software high quality. Fourthly, it provided the novel VLP with the template method to learn the practical skills effectively in DPOVL. Finally, the results of the experiment showed that there was the significant difference with the large effect size between the pre-test mean scores and the post-test mean scores of the experiment group with respect to developing knowledge and skills of DPOVL. In addition, the results indicated that the proposed VLP had a positive impact in producing the OVL products in several educational domains with high mastery level. In the end, the students strongly agreed on the usability of the VLP software.

Keywords: Virtual Learning Platform, Virtual Learning Application, Online Virtual Laboratory, Skill Learning Support, Educational Technology Student.