E-learning system to enhance cognitive skills for learners in higher education

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Abstract

The objective of this research study was to develop the e-learning system to enhance cognitive skills. The system comprised two sub systems: (1) e-learning system in Blended Learning Environment (BLE), and (2) e-learning system in Virtual Learning Environment (VLE). Both systems were tested by 240 higher education students categorized in three major disciplines including health science, science and technology, and social sciences and humanities. Afterwards, the systems were approved by the experts. The results showed that the systems should consist of four core elements: input, process, output, and feedback, as detailed in the article.

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Keywords: E-Learning System, Cognitive Skills, Higher Education

1. Introduction

The National Education Act B.E. 2542 (1999) introduced education reform focusing on student-based learning to allow students to be able to develop their full potential, develop self-learning behavior, and acquire knowledge.
Khokin V learning management to accommodate the advancement and the preparation for learners in 21st century (Noawanit, 2010). Therefore, instructors in higher education should support the learning continuously because learners in higher education is a new generation who have to change ideas in classroom and learn through social media. Therefore, instructors can improve learner’s cognitive skills and necessary learning attitudes in the classroom period.

There are six important elements for the designing of this teaching method: electronic contents, learning management system, communication, evaluation, instructor’s role, learner’s role, supporter’s role, and teaching method. The ratio of the teaching method is online teaching at 30-79% and classroom teaching 21-70% (Jintavee Khaisang, 2010; Bonk & Graham, 2006; Waterhouse, 2005; Wilson & Smilanich, 2005; Sloan Consortium Foundation, 2005). E-Learning in VLE is learning via website focusing on activities that allow students to participate in like a real classroom to enhance learner’s capacities. Students can study anywhere and anytime, promoting ‘self-paced learning’ which is the goal of education – to develop learners for lifelong learning. E-learning in VLE not only develops cognitive skills for learners, but also encourages learners for self-learning and self-direct. At present, global education focuses on world class standard program, emphasizing on digital literacy from primary school to secondary school (Upper Secondary Education Bureau, Ministry of Education, 2010). Therefore, higher education should support the learning continuously because learners in higher education is a new generation who will bring country to the development and will be developed to be a professional. Therefore, instructors in higher education should have an insightful knowledge, deep understanding, broad digital literacy, and skillful online learning management to accommodate the advancement and the preparation for learners in 21st century (Noawanit, 2011; Agudo-Peregrina, Á.F.and et.al, 2014, Kalay, 2004; Hodhod and et.al, 2010).

According to the above issues, the researcher concluded that higher education students were an important target group that should be developed cognitive skills to respond to education reform, self-paced learning, lifelong learning that emphasized on preparing learners for technology, and the TQF: HEd. on cognitive skills development. Knowledge gained from this research will contribute to the advancement of academic discipline on technology and communication studies by developing e-Learning system to enhance the cognitive skills of higher education learners.
The research will be used as an example for the integration of education technology and education science because there has not been any e-Learning system to enhance cognitive skills for higher education yet. Therefore, it is needed to develop e-Learning system to enhance cognitive skills for higher education which will be applied in higher education.

2. Objective

To develop e-Learning system to enhance cognitive skills for learners in higher education.

3. Research Question

What and how are the input, process, output, and feedback of e-Learning system to enhance cognitive skills for learners in higher education.

4. Hypothesis

1. After students in higher education study in e-Learning system in Blended Learning Environment, they will have cognitive skills significantly higher comparing to that before studying.
2. After students in higher education study in e-Learning system in Virtual Learning Environment, they will have cognitive skills significantly higher comparing to that before studying.

5. Research Method

Phase 1: Study of the input which is the process of e-Learning system to enhance cognitive skills for learners in higher education.

The study was conducted by collecting opinions of 400 higher education instructors out of 153,499 of under the Office of Higher Education Commission (Bureau of General Administration, Office of Higher Education Commission, 2010). The formula of Taro Yamane to calculate the sample size (n) with an acceptable random sampling error is ± 5% (Yamane, 1973) was used to study the input which is the process of teaching and learning using e-Learning system to enhance cognitive skills for learners in higher education to get a beta system.

Phase 2: Develop e-Learning system to enhance cognitive skills for learners in higher education

2.1 A beta e-Learning system to enhance cognitive skills for learners in higher education was reviewed by seven experts in enhancing cognitive skills in TQF: HEd of learners. The experts examined the input, process, output, and feedback of meaning transferring, content covering, and the appropriateness of using the system. Also, comments were made about e-Learning system to enhance cognitive skills for learners before testing.

2.2 Designing e-Learning system to enhance cognitive skills. This phase is divided into two sub projects: 1) e-Learning system in Blended Learning Environment, and 2) e-Learning system in Virtual Learning Environment and were monitored by ten experts.

Phase 3: Examine the result of using e-Learning system to enhance cognitive skills for learners in higher education.

E-Learning was tested in students in higher education as follows: e-Learning system in Blended Learning Environment (BLE) was tested by 120 students in Health Science, Science and Technology, and in Social Sciences and Humanities disciplines in one semester of the academic year 2012. Meanwhile, E-Learning system in Virtual Learning Environment (VLE) was tested by 120 students in Health Science, Science and Technology, and in Social Sciences and Humanities disciplines in one semester of academic year 2012. The subjects used in the research were selected by purposive sampling method with the required qualifications.

Research result was found that both analyzing of mean (\(\bar{x}\)), standard deviation (SD), and comparing result of the average scores of cognitive skills pre-test and post-test of 120 students that studied with the BLE and 120
students that studied with the VLE had the average scores of the cognitive skills post-test in these two groups were statistically significantly higher than the average pre-test scores at .05.

**Phase 4: Propose e-Learning system to enhance cognitive skills for learners in higher education**

After collecting experimental results and comments from the subjects, the researcher improved the system. The system was approved by 15 experts in the field before achieving the final e-Learning system to enhance cognitive skills for learners in higher education.

![Fig. 1 e-Learning System to Enhance Cognitive Skills for Learners in Higher Education](image)

Research result can answer research questions as follows:

E-Learning system to enhance cognitive skills for learners in higher education is a research to create e-Learning system. The system includes: (1) Input which consists of elements including learner’s role, instructor’s role, learning environment, learning resources, and motivations, (2) Process which is the process of instruction including analytical thinking process, creative thinking process, scientific thinking process, systematic thinking process, and applicative thinking (this process will take the result of e-Learning system in BLE and e-Learning in VLE of sub projects to analyze and develop the proper e-Learning system), (3) Result which is cognitive skills, and (4) Feedback which is the evaluation of the system.
1. **Input** includes the principle of e-Learning system to enhance cognitive skills for learners in higher education. This research divided teaching and learning process into two systems: e-Learning system in BLE and e-Learning in VLE. Elements and tools in such teaching and learning process to enhance cognitive skills for learners in higher education include the followings:

1.1 **Elements in teaching and learning process to enhance cognitive skills for learners in higher education include the followings:**

   1.1.1 Learner’s role: learner will individually pursue for knowledge and learning their own pace.

   1.1.2 Instructor’s role: focusing on evaluating of the actual learning which emphasizes on learning output and learning process, such as, evidence of the system that reflects on the development of cognitive skills of each discipline.

   1.1.3 Learning Environment: innovative tools and equipment have to accommodate the system. Additionally, appropriate tools for learners, such as, social media are available to motivate learning.

   1.1.4 Resources: instructors prepare resources and information for learners including computers, Internet, books, or information data to facilitate learning and encourage students to develop cognitive skills. Resources are divided into human resources or supporters, and information communication and technology resources.

   1.1.5 Reinforcement and Motivation:

      1.1.5.1 Internal motivation, such as, attitudes towards learning and aptitude in the discipline.

      1.1.5.2 External motivation, such as, students assist each other to learn, while instructors and supporters facilitate students to achieve their goal of learning.

1.1.6 Context and Technology Tools:

   1.1.6.1 Curriculum context refers to elements that are divergent in each discipline and objectives of each course which focuses on different cognitive skills.

   1.1.6.2 Administration context refers to e-Learning management that accommodates technology skills of instructors. There are supporters who are technical staff in e-Learning management to support instructors for effective teaching.

1.2 **Tools for teaching and learning process to enhance cognitive skills for learners in higher education include:**

   1.2.1 Virtual learning environment which is a model that allows students to participate in the virtual environment that is similar to a classroom such as Opensimulator, Secondlife.

   1.2.2 Learning Management System (LMS) which is the management system focusing of learning via network. The system contains tools and elements for instructors, learners, and administrators, including course management system, content creating system, learner management system, content delivery system, and communication and interaction tool system, such as, chat room, e-mail, webboard, attendance record system, and report system.

   1.2.3 Social Media Presentation is used to deliver content via electronic media so that learners can study anytime and anywhere via any online devices. Instructors can record the lecture and upload to the system for students to review for self-study, such as, Slideshare.

   1.2.4 Electronic books (e-Book) are books that are in electronic format or that are stored as electronic file. They are readable by electronic devices, such as, notebook computers, tablets, and mobile phones.

   1.2.5 Streaming Video refers to technology that allows the transfer of multimedia data over the Internet and displays it on a short time without waiting to download the file to a computer as it take time to download the whole multimedia file. Therefore, streaming video allows many users to receive information at the same time.

2. **Process** is learning and teaching process for learners in higher education which are: (1) teaching science, including teaching models, teaching methods, and teaching techniques, and (2) learners’ role, instructors’ role, and supporters’ role. Considering teaching science and the roles, learning activities were created for learners in three disciplines: (1) Health Sciences with activities that develop systematic thinking process, analytical thinking
process, and applicative thinking process, (2) Science Technology with activities that develop scientific thinking process, systematic thinking process, and analytical thinking process, and (3) Humanities and Social Sciences with activities that develop creative thinking process, creative thinking, and systematic thinking process.

3. Output is cognitive skills for learners in higher education in three disciplines: (1) Health Science including systematic thinking, analytical thinking, and application, (2) Technology Science are scientific process, systematic thinking, and analytical thinking, and (3) Humanities and Social Science consists of creative thinking, analytical thinking, and systematic thinking.

4. Feedback

4.1 Evaluation can be divided into:

4.1.1 Formative Evaluation means the assessment during the study period by observing learning in face-to-face context and evidences of behaviors in online context that is relevant to thinking process of each discipline.

4.1.2 Summative Evaluation or overall assessment is cognitive skills assessment of each discipline using pre-test and post-test.

4.2 Assignments and activities were handed out each week. Student’s behaviors were observed every week by instructors or research assistants.

4.3 Teaching plans and activities were improved to be relevant to each discipline’s context and learners. Additional innovative tools include social web application and 3D virtual world.

Acknowledgements

This paper was a part of the project funded by the National Research Council of Thailand (NRCT) in 2012. The author would sincerely thank to NRCT. Sincerely thanks must also go to Chulalongkorn University and Thailand Cyber University Project who are the supported institutes. Special thanks also go to all advisors, scholars, and experts for their help and support in creating new knowledge via this paper to strengthen the educational technology and communications field.

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