Design and development of constructivist multimedia learning environment to enhance computer skills for computer education learners

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Abstract

The purpose of this research was to design and development of constructivist multimedia learning environment to enhance computer skills for computer education learners. Developmental research (Type I) (Richey and Klein, 2007) was employed in this study. Several methods used were document analysis, survey and case study. The procedures were as follows: 1) to examine the principles and theories 2) to synthesize designing framework 3) to design and develop the constructivist multimedia learning environment based on above mentioned designing framework, and 4) to evaluate the efficiency of the constructivist multimedia learning environment to enhance computer skills. The results revealed that: 1) The constructivist multimedia learning environment comprises of 8 components as follows: (1) Problem base (2) Resources (3) Related case (4) Cognitive tools (5) Computer skill lab (6) Collaboration (7) Scaffolding (8) Coaching centre, and 2) The efficiency of the constructivist multimedia learning environment is shown in several aspects as following details: 1) The Experts review 2) The learners’ opinions 3) The learners’ computer skills: basic skills, intermediate skills, and advanced skills.

Keywords: Constructivist multimedia learning environment, Computer skill, Basic computer skills, Intermediate computer skills, Advanced computer skills, Computer education learners;

1. Introduction

The present trend of economic and social development of many countries has changed their focus to economic and social development of wisdom and learning. But to develop such a society must have knowledge of Computer and Information Technology to provide benefits and access to knowledge in various fields by using computer and information technology as cognitive tools to lead to the spread of knowledge to the learners to learn appropriately. In particular, the learning management in higher education the learners have to focus on the process of knowledge construction. The learners must develop their thinking processes such as reasoning, creative and analytical thinking, systematically problem solving as well as computer skills. Thus, the ability to use computer skills and information technology skills are needed to practice (Office of Higher Education Commission, 2010). Computer skills are effective skills in using various computer programs. The computer skills are highly necessary for the learners in...
computer education that they need to integrate computer and information technology in the learning management process. Such a course of application program that contents need to use their computer skills at different levels and can be applied to the integration of computer skills in the learning management. Consequently, innovation is taken into consideration in order to increase desirable characteristics especially in the knowledge construction and computer skills for the learners. Thus, the multimedia learning environment which develops based on constructivist theories is appropriate and supports the knowledge construction and computer skills of the learners.

Therefore, this study aimed to design and development of constructivist multimedia learning environment to enhance computer skills for computer education learners and to examine the learners’ computer skills. This will lead to the guideline for design and develop the innovation that can help the learners to knowledge and develop computer skills. It’s also consistent with the education reform regarding to ability and skills required of the learners in higher education (Office of Higher Education Commission, 2010) and be effective living skills to face new things in society in the future.

2. The purpose of this study

This study aimed to design and development of constructivist multimedia learning environment to enhance knowledge construction and computer skills for computer education learners.

3. The target group of this study

1) The expert review for assessment the efficiency of constructivist multimedia learning environment were as follows: two content experts, 3 instructional designers, three multimedia learning designers and two measurement and evaluation experts, and 2) Forty-six third-year students in Computer education, Faculty of Education, Khon Kaen University.

4. Research Design

The developmental research Type I (Richey and Klein, 2007) was employed in this study. Several methods were used such as document analysis, survey, and case study.

5. Research Instruments

The instruments in this study consisted of experimental instruments: the constructivist multimedia learning environment to enhance computer skills and data collection instruments. Both are described below.

1) The instrument for experiment included the constructivist multimedia learning environment to enhance computer skills. The process of the design and development were as follows: (1) to examine the principles and theories, (2) to synthesize designing framework of the constructivist multimedia learning environment, (3) to design and develop the constructivist multimedia learning environment based on above mentioned designing framework, and (4) to evaluate the efficiency of the constructivist multimedia learning environment.

2) The instruments for data collecting including: (1) the record form of document analysis, (2) the evaluation form for the experts, (3) the learners’ opinionnaire toward the constructivist multimedia learning, and (4) The learners’ computer skills tests.
6. Data collecting and analysis

The researchers designed and developed the constructivist multimedia learning environment to enhance computer skills based on the above mentioned framework and components. It was tried out. The quantitative and qualitative data were collected and analyzed in the following way:

6.1 The expert reviews in several domains, such as content, media, instructional design, computer skills, constructivist learning environments, and measurement and evaluation experts. The data were collected by the researchers and analyzed by analytic description, interpretation and summarization.

6.2 The learners’ opinions toward the constructivist multimedia learning environment. The data were collected by the researchers and analyzed by analytic description, interpretation, and summarization.

6.3 The computer skills test. The quantitative data were collected and analyzed by descriptive statistics: mean, S.D., and percentage. The qualitative data were collected and analyzed by analytic description, interpretation, and summarization.

7. Research results

The design and development of the multimedia learning environment are as follows:

7.1 Synthesis of theoretical framework

The theoretical framework was synthesized based on studying and analysis of principles, theories, and related literature regarding design and development, cognitive theories, constructivist theories, the constructivist learning environment model, multimedia learning, media attribution, media symbol system, and computer skills. The theoretical framework shows five important theoretical foundations as follows: (1) Constructivist base, (2) Computer skills base, (3) Technologies base (4) Media base, and (5) Contextual base.

7.2 Synthesis of the designing framework

The designing framework of multimedia learning environment was synthesized based on mentioned theoretical framework as following details: 1) The activation of cognitive structure and computer skills were designed based on Enabling context (Hanafin, 1999) and Computer Skills (McCoy, 2000 and UNESCO, 2008) as Problem base, 2) The supporting cognitive equilibrium was designed based on cognitive theories as Resources (Hanafin, 1999) and Related case (Jonassens, 1999), 3) The enhancement in constructing knowledge and computer skills were designed based on both Social Constructivist (Vygotsky, 1925) as Collaboration and Cognitive tools (Jonassens, 1999) as Cognitive tools, and Computer skills (McCoy, 2000 and UNESCO, 2008) and Manipulating tool (Hanafin, 1999) as Computer skills lab, and 4) The support and enhancement for constructing knowledge were designed as Scaffolding (Hanafin, 1999), and Modelling and Coaching (Jonassen, 1999) as Coaching centre.

7.3 The constructivist multimedia learning environment to enhance computer skills for computer education learners

The multimedia learning environment was produced based on the designing framework comprised of 8 components as follows: 1) Problem base, 2) Resources, 3) Related case, 4) Cognitive tools, 5) Computer skills lab, 6) Collaboration, 7) Scaffolding, and 8) Coaching centre obtaining from major theories in various aspects: Constructivist base, Computer skills base, Technologies base, Media base, and Contextual base as shown in the following fig. 1.-4.
Fig. 1. (a) Problem base; (b) Resources

Fig. 1. (a) Problem base: It was shown Problem base for enhancing the learners to construct knowledge and computer skills; (b) Resources: It was shown Resources to provide just-in-time information to help learners comprehend and solve the problem.

Fig. 2. (c) Related case; (d) Cognitive tools

Fig. 2. (c) Related case: It was shown Related case for representing a set of related experience and providing different perspectives; (d) Cognitive tools: It was shown Cognitive tools for constructing knowledge and enhancing computer skills. The learners were supported in performing their learning tasks.

Fig. 3. (e) Computer Skills lab; (f) Collaboration
Fig. 3. (e) Computer skills lab: It was shown Computer skills lab for enhancing Computer skills based on McCoy (2000) and UNESCO (2008); (f) Collaboration: It was shown Collaboration for supporting the learners to share their experience with experts by using Face book, Web-board and Twitter for expanding their multiple perspectives.

Fig. 4. (g) Scaffolding; (h) Coaching centre

Fig. 4. (g) Scaffolding: It was shown Scaffolding for enhancing students to solve problems, to learn and construct the knowledge by themselves; (h) Coaching centre: It was shown Coaching centre by teachers and experts in computer skills with best practice.

7.4 The Constructivist Multimedia learning environment efficiency assessment

The efficiency of the constructivist multimedia learning environment to enhance computer skills for computer education learners’ illustration as following: 1) the Experts review which was found that the learning content, media, instructional design, computer skills, constructivist learning environments, and measurement and evaluation experts, was appropriate; 2) the Learners' opinions studies were learning contents, media, and design are appropriate, and also support knowledge construction and computer skills of learners, and 3) the Learners’ computer skills (Basic skills: Learners must know basic hardware and software operations, applications software, a web browser, communications software, presentation software, and management applications, Intermediate skills: Learners must be aware of a variety of subject specific tools and applications and able to flexibly use these in a variety of problem-based and project-based situations, and Advanced skills: Learners must be able to design a variety of computer network, digital resources, and electronic environments are used to create and support this community in its production of knowledge and collaborative learning) which was found that there were 70% of qualified students.

8. Discussion

According to the above findings, found that it was supported by the findings of Forman and Pomerantz (2006); Alaa (2009); Grant, Malloy and Murphy (2009), and Nilgün and Nuh (2009), found that the learners showed their computer skill including: (1) Basic skills—such as computer operating systems, fundamental processing commands, spreadsheet applications, presentation graphics, and database management, (2) Intermediate skills—such as societal and ethical issues, intermediate word processing, spreadsheet applications, presentation graphics, and database, multimedia, and telecommunication/internet, and (3) Advanced skills—such as advance word processing applications, spreadsheet applications, presentations/multimedia development, web page development, and applications programming.

Above mentioned reason that can be supported the learners for developing their computer skills based on conceptual framework of McCoy (2000) and Unesco (2008). It also supported Salomon’s (1977) with statement that “Learning could cause activation for skill development which was related to the needs of learning task”, and these findings are consistent with Chaicharoen Sumalee and others (2008); Wattanachai Suchat and others (2008); Kanjug
Issara (2009); Samat Charuni and Chaijaroen Sumalee (2009), and Samat Charuni (2011), with develop environment that promotes learning and thinking such as synthesis thinking, conceptual thinking, application thinking and critical thinking, promoting potential of the brain, enhancing expert mental models and creative thinking. The results of these studies were the design components of the learning environment that develops learner’s computer skills.

For the results of this study are shown above, may cause from instructional design: ID Theory. Because of ID Theory is the instructional design which based on the principles and theory. It can be illustrated by the quality of the multimedia learning environment that assessed by expert review. It is shown the quality in several aspects: the content is accurate and appropriate, Media designed to support the knowledge construction and computer skills is based on the theory. In addition, the multimedia learning environment in each of the components of such a problem base which provides the learners faced with the real world problem. This can lead to application the knowledge in the daily life. Moreover, learners can use Complex Tools in Computer Skills Lab for employing open-ended technology tools specific to their problem-based learning task area. Empirical evidence derived from learners, theories and principles that support the learners to be able to create enhancement for computer skills.

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