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The design of web-based learning model using collaborative learning techniques and a scaffolding system to enhance learners’ competency in higher education

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Abstract

The purpose of this research is to design a web based learning model using collaborative learning techniques and a scaffolding system to enhance learners’ competency in higher education. The research and development methodology is employed in this work. In the phase of designing the web-based learning model shown in this paper, the target group consists of experts. Several methods used in designing the web-based learning model are as follows: 1) Examining and analyzing the principles and theories, 2) Exploring the instructional context concerning about instructional design and learning environments, 3) Synthesizing a framework of designing the web-based learning model, 4) Designing the web based learning model and 5) Evaluating the efficiency of the web-based learning model. Many learning principles and theories are related to this study such as constructivist learning theory, collaborative learning techniques and principles about instructional design. The results are revealed as follows.

Firstly, the web-based learning model using collaborative learning techniques and a scaffolding system to enhance learners’ competency in higher education composes of 5 components that are: (1) Problem base, (2) Resources, (3) Related cases, (4) Scaffoldings and (5) Community for collaborative learning. Secondly, the design of the model evaluated by 4 experts complies with learning principles and theories and the experts accept the model in a high level at 72.56% overall.

Keywords: Instructional design, Web based learning, Constructivism, Collaborative learning, Scaffolding;

1. Introduction

In the era of globalization, web based learning is attractively and widely applied in Thai education system. The environments of web based learning are unlimited dimensions with distance and thus it supports learners to access diverse kinds of information and knowledge resources. Also it provides a space for learners to share experiences and knowledge as well as corporate with peers without the limitations of time and distance – learning and without boundary (Palmieri, 1997). Even though the web based learning supports the flexibility of learning among learners, there are research results indicating that learners are still playing the role of knowledge consumer in the traditional
didactic teaching instead of constructor. Today, several educators advocate the learner-centered approach in education, that is currently, it is focused on construction of knowledge which is favored in educational settings rather than the transmission of knowledge (Spiro et al., 1995; Amornsinlaphachai et al., 2012). In higher education, our students are facing multiple problems in workplace. We are charged with preparing our students for life in the real world. This is consistent with the Thai National Education Act 1999 and Amendment Act (No. 2) 2002 which state that the education will be based on the principle that all learners are capable of learning and developing themselves and the students are considered as the most important.

The learning process must focus on skills of thinking process to face the situation and to apply knowledge to solve ill-structured problems in the real world based on learners’ cognitive. The use of collaborative learning techniques and a scaffolding system is able to enhance this competency of learners in higher education (Deejring et al., 2012). The collaborative learning techniques help the students to exchange their knowledge for multiple perspectives and prevent students from misconception; hence we should encourage the students to build their knowledge and the concept (Driscoll, 2000). This web based learning model based on constructivism learning environments of Jonassen’s Model (Jonassen, 1999) can help students to construct knowledge more than transfer knowledge to students. The scaffolding system based on the principle of Zone of Proximal Development: ZPD (Vygotsky, 1978) is able to improves students’ competency. Apart from above, the characteristics of media and a media symbol system meet students’ knowledge construction and the use of the media on a network has the features of a hyperlink, hypertext and hypermedia. Thus the media symbol system is influencing in students’ cognitive process while they are learning (Kozma, 1991; Chaijaroen, 2005).

From the reasons mentioned above, the researcher realized the need to study and design a web-based learning model, using collaborative learning techniques and a scaffolding system to enhance learners’ competency in higher education, based on the theoretical framework and various researches. The model encourages students to construct knowledge and enhance students’ competency by using collaborative learning techniques and a scaffolding system. This will be useful for effective learning as well as the professional in higher education.

2. The Purposes of Research

2.1 To design a framework of a web based learning model using collaborative learning techniques and a scaffolding system to enhance learners’ competency.
2.2 To synthesize a theoretical framework of this study.
2.3 To study experts’ opinions of this study.

3. The Scope of Research

3.1 The target group used in this design phase consists of 4 experts to evaluate content, media and design
3.2 The scope of content used in this study is a part of the subject of 414210 System analysis and design for education studied at Nakhonratchasima Rajabhat University, Thailand.
3.3 The research variable studied in this work is the web based learning model using collaborative learning techniques and a scaffolding system to enhance learners’ competency in higher education.

4. Methodology

The research and development methodology used in this work consists of the following steps.

4.1 Instruments of research

The instruments of the research are as follows.
1. The opinionaire of instructional context used to survey opinion of the lecturers and students about learning context composes of open-ended questions. The issue is related to designing the web based learning model using collaborative learning techniques and a scaffolding system to enhance learners’ competency.
2. The document analysis record form consists of 3 aspects that are the instructional design based on CLEs (Jonassen, 1999), a collaborative learning technique and a scaffolding technique based on social constructivism (Vygotsky, 1978) and media theories. These aspects create the theoretical framework and the designing framework for designing the web based learning model using collaborative learning techniques and a scaffolding system to enhance learners’ competency.

3. The effectiveness evaluation of the web based learning model created from the designing framework comprises of the principle of assessment in web-base learning (Khan et al., 1997) and the principle of evaluation in learning environments. This evaluation uses open-ended questions comprising of 3 major issues that are content, media on web and learning environments model and design.

4.2 Data collection

The study was conducted to collect data as the following details.
1. Opinion survey in the context of learning about the condition of teaching and learning context.
2. The review of literatures and the analysis of document.
3. The synthesis of literatures and opinions to create a conceptual design of the model.
4. The data derived from the effectiveness evaluation of the web based learning model.

4.3 Data analysis

The data is analyzed as follows.
1. Acquisition of the contextual conditions on learning and teaching of students by using descriptive analytical and summary interpretation. The data was derived from the opinionaire about education.
2. Acquisition of the theoretical framework by using data analysis to describe and summarize analytical interpretation derived from information about principles, various theories related to the research and document analysis.
3. Designing framework acquisition by using data analysis to describe and summarize analytical interpretation from the data recorded in the document analysis record form.
4. Acquisition of expert assessments about the web based learning model by using data analysis by summarizing interpretation. The expert assessments include learning content, media and design.

5. Results

The results of this study are as follows.

5.1 Synthesis of theoretical framework

The basic theoretical framework consists of importance four major theories as shown in Figure 1. These theories are as follows. Firstly, the pedagogy focuses on the instructional design along with constructivism learning environments (Jonassen, 1999) and social constructivism (Vygotsky, 1978). Secondly, the contextual principles compose of learners’ personal characteristics, level of using ICT and internet related experience, graduate desirable features, guidelines for teaching, and the essence of the analysis and design courses. Thirdly, the web-based learning technology includes multimedia and information technology. Finally, the cognitive factor in web based learning design consists of the fundamental in message design and media symbol system.
5.2 The study of context

The study of context revealed the condition of Computer education program as follows. The learning experience of students will emphasize on lectures which the students will write down the contents. The lecturers show slides of presentation with content. Students are divided into small groups to present reports in front of the class. The students in the computer have to learn with various software programs including Microsoft office and search-engine on the Internet. Furthermore, the students have no experience of using social network application in learning. However teachers have to transfer knowledge in the traditional didactic teaching. The students have no experience in collaborative learning to solve problems and do not have any scaffolding system to help them. It is also found that students have no learning experience with activities that promote the web based learning model using collaborative learning techniques and a scaffolding system to enhance learners’ competency in higher education.

5.3 The synthesis of the design models’ concept

The synthesis of theory, philosophy, pedagogy, psychology of learning, media symbol system and technology leads to a fundamental for designing this web based learning model as the following.

1. The cognitive conflict, to activate cognitive structure, including the situation in problem analysis and design of various systems based on the basic framework of Jonassen (Jonassen, 2004) helps to design and present problems in the real world context. These encourage students to solve problems and prepare themselves when they encounter various problems at workplaces, as shown in Figure 2.

2. The supporting cognitive equilibrium consists of (1) Resources and (2) Collaboration as the following details. Resources are based on the design principles for multimedia presentations (Mayer, 2005) by organizing information. Information processing of the students uses animation, visual and audio to get more effectiveness than lecture does. For collaboration, students are divided into small groups to solve the problems based on concept of Vygotsky.
(1978), Honebein (Honebein, 1998) and Palloff (Palloff et al., 2005) to allow students to interact with each other and provide the opportunity to articulate for multiple perspectives as well as discuss with teachers and experts. These can avoid misunderstanding or misconception as shown in Figure 3.

![Figure 3. Framework designed for supporting cognitive equilibrium](image)

3. To promote and assist the students who are under the zone of proximal development based on Social constructivist theory (Vygotsky, 1978), the components of enhancing learners’ competency and knowledge construction are (1) Related cases, (2) Scaffolding consisting of Metacognitive Scaffolding, Strategic Scaffolding, Conceptual Scaffolding and Procedural Scaffolding and (3) System Analyst Community, as shown in Figure 4.

![Figure 4. Framework designed to support construct knowledge and enhance learners’ competency](image)

5.4 The efficiency of the web based learning model

The web based learning model derived from the design framework comprises of (1) Problems, (2) Resources, (3) Collaboration, (4) Related Cases, (5) Scaffolding and (6) Community. Examining the quality of the model through the various experts found the following issues. Firstly, the content is accurate and appropriate to the level of learning among students. In addition, the content looks interesting, up to date and timely today. As well as the content is subject to extensively study. The resources use suitable theory. Secondly, the use of up-to-date technologies and multimedia can help the students to understand information easily. Thirdly, the design of the web based learning model is exactly consistent with the principles and theories used as the fundamental for design. Overall, the model is appropriate to enhance the learners’ competency.
6. Summary and Concluding Remarks

The web-based learning model using collaborative learning techniques and a scaffolding system to enhance learners’ competency in higher education consists of 6 components that are (1) Problems, (2) Resources, (3) Collaboration, (4) Related Cases, (5) Scaffolding and (6) Community. The result of this study is to design the elements of the web-based learning model that enhances learners’ competency by using collaborative learning technique and a scaffolding system. There is a theoretical basis, as following: (1) Pedagogy focusing on instructional design along with constructivism learning environments (Jonassen, 1999) and social constructivism (Vygotsky, 1978), (2) The contextual principles such as learners’ personal characteristics, level of using ICT and internet related experience, graduate desirable features, guidelines for teaching, and the essence of the analysis and design courses, (3) Web-based learning technology and (4) Cognitive factor in web based learning design such as the fundamental in message design and media symbol system.

The experts who evaluate this model found that the content of the model is accurate, right up to date timely. Design can encourage students to construct knowledge and enhance learners’ competency by using collaborative learning for learners’ multiple perspective and the scaffolding system can help learners who learn below the zone of proximal development. This is because the design of the model is based on a theoretical basis (Instructional Design theory). This theory leads to the practice. To construct the knowledge based on constructivism learning environments and social constructivism, a problem situation will be used to activate students to be disequilibrium in concept. This will encourage students to solve problem leading to equilibrium in the concept and enhance students’ competency via collaborative learning in a community to exchange multiple perspectives. These cause the students improve their competency.

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References


