

The Framework for Development of Web-Based Constructivist Learning Environment Model to Promote Critical Thinking Integration with Neuroscience

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Abstract

The purpose of this study was to synthesize theoretical framework and designing framework development of the web-based constructivist learning environment model to promote critical thinking integration with neuroscience. Research design was Model research phase I: Model development. The procedures will be as following; 1) to examine the principles and theories, 2) to explore the instructional context, and 3) to synthesize the theoretical framework and the designing framework of the web-based constructivist learning environment model to promote critical thinking integration with neuroscience. The result revealed that: the theoretical framework consists of 6 foundation bases; 1) Contextual Base, 2) Psychological Base, 3) Pedagogical Base, 4) Technological Base and Media Theory Base, 5) Critical Thinking Base, and 6) Neuroscience Base. The development of web-based constructivist learning environment model to promote critical thinking integration with neuroscience comprises of 7 components as follows; (1) Problem Center, (2) Knowledge Center, (3) Cognitive Tool Center, (4) Collaboration Center, (5) Critical Thinking Care Center, (6) Scaffolding Center, and (7) Coaching Center.

Keywords: constructivist, web-based learning environment, critical thinking

■ Introduction

Learning in the 21st century which is the knowledge-based society driven by the potential knowledge and thinking skills, plus the progress of technology, thus it will pursue knowledge continuously throughout life. This causes many people to develop themselves all the time. When the society is developing, the society will have to develop accordingly. Education is the important tool of the development of human knowledge, ability, and thinking skills, especially in the current society, the environment has changed dramatically over the years; therefore, this is necessary to develop them more increasingly. Education management today must focus on human development with the ability to think critically and ponder sophisticated solutions more efficiently, including allocate knowledge with lots of benefits to the utmost. The Revised National Education Plan (2009-2016) focuses on Thai children with the characteristics of learning persons, having skills of seeking their own knowledge and thinking in order to gather information for a provision

to survive in a society of sustainable lifelong learning, This is consistent with the philosophy of knowledge (Epistemology) of Constructivism that knowledge is not true, of course. It changes all the time. The basis of the Constructivist Theory of Whistler, it says that learning is a process that occurs within the learner. The learners are the constructor using the new knowledge with existing knowledge or previous experiences. To create meaningful learning by using cognitive process along with the students actively involved, the teachers are only the learning director and coach to assist the environments for learning that promotes an understanding of the multiple perspective in accordance with the real context to help the students create new knowledge to solve problems in real environment to gain hand on experiences. Therefore, the students will learn the meaning of life and enhance their skills. So the learning of each individual will vary, it depends on the environment, traditions and experiences of the students (Chaijaroen, 2008). To develop thinking skills with critical thinking is one idea that could help par-

ticipants solving problems efficiently associated with the problems because most of the solution requires significant judgment thought. Thinking critically is the ability to think rationally and aim to decide what to believe or what to do before proceeding (Ennis, 2002).

From the reasons and the problems above, the researcher has realized the importance and the need for conducting the research in order to solve the problems which is entitled “The Framework for Development of Web-based Constructivist Learning Environment Model to Promote Critical Thinking Integration with Neuroscience”. The study will apply the process of teaching and learning and emphasize on the students in the design and development of learning environment models. The model can be used as a medium to develop thinking skills and the selection of learners and use it as a method to manage learning, courses content in parallel with the development of critical thinking. The findings may lead to the development of the students in order to respond to the changes in the social world and the world today and it will be useful in applying knowledge to develop the researcher’s profession and a guideline for further research.

■ Methodology

The purpose of this study was to design and develop constructivist web-based learning environment model to promote critical thinking integration with neuroscience. The target group consisted of 6 experts to evaluate in term of content, media and measurement and evaluation, 3 instructors who taught the Advanced English Reading subject from Faculty of Humanities, 30 students who studied in the Advanced English Reading subject of second semester in 2015 academic year, Chiangrai Rajabhat University. Research design used in this study was the Model research in Phase 1: Model Development (Richey & Klein, 2007). Several methods used were document analysis and survey research which qualitative collecting data. In particularly, the content used in this study was the part of EIL 1206: The Advanced English Reading in the topic of reading news. Research variable studied

in this work was constructivist web-based learning environments model to promote critical thinking integration with neuroscience based on instructional design theory.

The instruments in this study consisted of experimental instruments: web-based learning environment that promote critical thinking. The process of the design and development were as follows: (1) to examine the principles and theories, (2) to synthesize framework design of the web-based learning environment, (3) to design and develop the web-based learning environment based on above mentioned designing framework, and (4) to evaluate the efficiency of the web-based learning environment. The instruction for data collecting including: (1) the opinionaire of instructional context in the course of EIL 1206: The Advanced English Reading was used to survey opinion of the lecturers and students about learning context used open-ended questions. The issue was related to education that promotes knowledge construction and critical thinking. (2) The record form of document analysis, (3) the participant characteristic survey form included the features of the following participants: designer, developer, lecturers and students which are based on development process of Richey and Klein (2007), (4) the evaluation form for the experts, (5) the learners’ opinionnaire toward the web based learning environment model, (6) The learners’ critical thinking tests, and (7) the achievement test for students who learn in the Advanced English Reading subject.

The data were analysed as following: (1) the expert reviews in several domains, such as content, media, instructional design, critical thinking, constructivist learning environments, and measurement and evaluation of experts. The data were collected by the researchers and analysed by analytic description, interpretation and summarization. (2) The learners’ opinions toward the web based learning environment. The data were collected by the researcher and analysed by analytic description, interpretation, and summarization. (3) The critical thinking test and achievement test. The data were collected and analysed by descriptive statistics: mean, S.D., and percentage. The qualitative

data were collected and analysed by analytic description, interpretation, and summarization.

■ Results

The results of this study, the Model research phase I, to design and develop the constructivist web based learning environment model to promote critical thinking are as follow:

1. *Synthesis of a theoretical framework*

Research related documents shown that the basic theoretical framework consists of six major basis importance of fundamental; (1) Contextual Base, (2) Psychological Base, (3) Pedagogical Base, (4) Technological Base and Media Theory Base, (5) Critical Thinking Base, and (6) Neuroscience Base.

2. *Contextual study*

Results of this study found that the condition of teaching of the Advanced English Reading subject as follows: the students' learning experience with emphasis on lectures, which the students wrote down the contents. The instructor showed slides presentation and students were divided into small groups to present report in front of the class. The students' experience in the computer had to learn with various software programs including Microsoft Office and searched on the internet. Using various social networking applications not at all in learning. However, the students didn't have experience of problem-based learning. Moreover, the students didn't have experience in the constructivist learning environment, with the tasks of learning to provide the students solve the problems. It also found that students didn't have learning experience with activities that promote critical thinking.

3. *Designing framework of constructivist web-based learning environment*

In order to create designing framework of constructivist web-based learning environments model to promote the students' critical thinking were taken into consideration. The details were as following:

1) The Activation of Cognitive Structure: It is

illustrated the relationship between the underlined theories as follows: constructivist theories and cognitive constructivism (Piaget), CLEs model (Jonassen, 1999), and Critical Thinking (Ennis, 2002) it was designed on complex problem context as the component of Problem Base.

2) The Support and Enhancement in Knowledge Construction: It is illustrated the relationship between underlined theories as follows: Cognitive Load Theory (Sweller, 1988), SOI Model (Brown, Collin, & Duguid, 1989), Information Process (Klausmeier, 1985) it was designed as the component of Knowledge Center.

3) The Enhancement Cognitive Structure, Critical Thinking: It is illustrated the relationship between underlined theories as follows: social constructivism such as OLEs (Hannafin, Land, & Oliver, 1999) it was designed as the component of Cognitive Tool Center. Social Constructivist (Vygotsky, 1978) it was designed as the component of Collaboration Center. For promote critical thinking (Ennis, 2002) it was designed as the component of Critical Thinking Care Center.

4) The Encouragement and Support Knowledge Construction and Learning Performance such as cognitive skills and critical thinking. It is illustrated the relationship between underlined theories as follows: Social Constructivist (Vygotsky, 1978) it was designed as the component of Scaffolding Center, and CLEs Model (Jonassen, 1999) it was designed as the component of Coaching Center.

The designing framework are synthesized based on the above mentioned theoretical framework. The relationship between the underlined theories and the components of the constructivist learning environment was constructed.

4. *The efficiency of the constructivist web-based learning environment model to promote critical thinking*

The evaluation of effective of the constructivist web-based learning environment model to promote critical thinking by product evaluation (Chaijaroen,

2008). To examine the quality of the model through the various experts found that (1) 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 contents are subject to extensive study, the contents are to clarify the concept of the information for the daily or students' construction of knowledge. Language can communicate directly with the concept in learning, compact, hierarchy, and easy to understand. In addition to be suitable for method or principle and theory used in the model design which based on constructivism, such as information in resources, which consist of extensive knowledge to solve problems that relevant to situations. The contents are presented in the interest patterns, such as the letters are highlighted in colour, which in order to enhance the students' information processing to recognize them easier and contribute to better learning, (2) the media network that is designed navigation help the students find information easily. The designs of navigation structures are recognized easily to access information and stability. In addition to the students familiar to use these navigator, and (3) the design of learning environment. It is exactly consistent with the principles and theories used as fundamental of design. Overall, the learning environment is appropriate and enhance the students' critical thinking.

■■ Discussion

The results of the design and development of constructivist web-based constructivist learning environment model was to promote critical thinking integration with neuroscience revealed that: The theoretical framework consists of 6 foundation bases; 1) Contextual Base, 2) Psychological Base, 3) Pedagogies Base, 4) Technologies Base and Media Theory Base, 5) Critical Thinking Base, and 6) Neuroscience Base development of web-based constructivist learning environment model to promote critical thinking integration with neuroscience. The development of web-based constructivist learning environment model to promote critical thinking

integration with neuroscience comprises of 7 components as follows; (1) Problem Center, (2) Knowledge Center, (3) Cognitive Tool Center, (4) Collaboration Center, (5) Critical Thinking Care Center, (6) Scaffolding Center, and (7) Coaching Center. In addition to found that: This models which designed and developed the quality models, which is evident from the evaluation by the various experts found that the content is accurate, right up to date timely. Design and media can encourage students to construct knowledge and enhance critical thinking. The result is that, because due to the design has been designed based on a theoretical basis instruction design theory that the principles into practice such principles to construct knowledge based on constructivist theory, which a problem situation to activate students disequilibrium. Encourage students to solve problem lead to equilibrium. It also has adopted the critical thinking to design integrated into the critical thinking center that allows students to select knowledge, knowledge deconstruction, adapted knowledge reconstruction. These issues cause the students able to apply to new situations. It was found that the differences observed in this study were the new findings and the learning environments to promote students' critical thinking.

■■ Conclusion

The purposes of this study were to design and develop web-based constructivist learning environment model to promote critical thinking integration with neuroscience. The theory foundations for the design of model consisted of psychological and learning theory, instructional design, communication and message design and the research and development model. It was synthesized as theoretical framework and learning context as basis in designing framework associating the design elements of the model.

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