Yang, J. C. et al. (Eds.) (2018). Proceedings of the 26th International Conference on Computers in Education. Philippines: Asia-Pacific Society for Computers in Education

Designing of Constructivist Mobile Application Learning Environments to Foster Creative Thinking on Basic Photography Skill for High School Students

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Abstract: This research study aimed to synthesize theoretical framework and designing of constructivist mobile application learning environment to foster creative thinking on basic photography skill for high school students. The target group consisted of 3 expert reviewers for content, instructional design and constructivist mobile application learning environment design. Research methodology is developmental research; developmental research consisted of 3 processes which were designing process, developing process, and evaluating process. The procedures were as follows: (1) to examine and analyze the principles and theories, (2) to synthesize theoretical framework, and (3) to synthesize designing framework. The result revealed that: 1) to synthesize theoretical framework comprise of 6 components as following that. Contextual base, Psychological base, Pedagogies base, Creative Thinking base and Technologies and media base. 2) To synthesize design framework of mobile application learning environment to foster creative thinking of 6 components i.e., (1) Problem base, (2) Resource, (3) Creative Thinking Photo Lab, (4) Collaboration, (5) Coaching, and (6) Scaffolding. The efficiency of this learning environment was evaluated by expert review. It was found that the learning environment is appropriate on 3 aspects: content, mobile application learning design, and learning environment design.

Keywords: Creative Thinking, Mobile Application, Learning Environment, Constructivist

1. Introduction

Thailand society stepped into the digital world and economic social activities are carried out quickly, Competition was increasing for more data access of information through the online world, so Human Development to prepare to face the change is important (National Education Act of B.E. 2542 (1999). Creativity has been identified as a key educational goal and essential 21st century skill that should be supported in schools (Chan & Yuen, 2014; Robinson, 2011). Creativity has been identified as a key educational goal and essential 21st century skill that should be supported in schools. In recent years, scholars and educators alike, have stressed the importance of preparing students for a future that will demand complex problem solving and creative thinking. Enhancement of creative thinking on learner based on the web-based learning environment was achieved using the principles and theories for synthesizing the theoretical framework and the environmental design which promote creative thinking (Chaijaroen, Kanjak & Samat, 2012)· The theories and web-based characteristics were brought into the design of instruction that utilized the learning environment media and methods with important components of the Constructivist Theory. A constructivist mobile application learning environment is the constructivist learning environment where learners can capitalize on mobile learning tools, such as laptops and tablets and their associated high access to broadband Internet. These constructivist learning environments foster communication beyond the local group, efficiently provide resources and research, as well as empower the user to think more broadly. An

effective constructivist mobile learning environment was built by following the conceptual models of technology, pedagogy and content knowledge (TPCK) and substitution, augmentation, modification and redefinition (SAMR). Emphasis was placed on shared learning resources, course redesigns, formative assessment and reflection.

Thus, this research was aimed at designing framework of constructivist mobile application learning environment to enhance creative thinking, from synthesizing of the theoretical framework and learning environment. In order to obtain the basis for constructing the appropriate and efficient learning environment models for the learners.

2. The purposes of this study

This study aimed to synthesize theoretical framework and designing of constructivist mobile application learning environment to foster creative thinking on basic photography skill for high school students.

3. Methodology

The research methodology is Developmental Research in Type I (Richey, R.C and Klein J.D., 2007) consists of three processes, the first is product design process, the second is product development process, and the third is product evaluation process.

3.1 Target Groups

The expert reviews for assessment the efficiency of constructivist mobile application learning environment were as follows: three content validity experts, three instructional designers, three constructivist mobile application learning environment designers.

3.2 Research Instruments

The instruments in this study consisted of experimental instruments: the constructivist mobile application learning environment to promote creative thinking and data collection instruments. Both are described below. 1) The instrument for experiment included the constructivist mobile application learning environment to promote creative thinking. The process of the design was as follows: (1) to examine the principles and theories, (2) to synthesize designing framework of the constructivist mobile application learning environment, (3) to design the constructivist mobile application learning environment based on above mentioned designing framework, and (4) to evaluate the efficiency of the constructivist mobile application learning environment. 2) The instruments for data collecting including: (1) the record form of document analysis, and (2) the evaluation form for the experts.

3.4 Data Collecting and Analysis

The researchers collected the data as follows: 1) Synthesis of theoretical framework and Components of the learning environment. The data were collected by analyzing principles, theories, related research of the constructivism theory, cognitive theory, media and technology theory, and pedagogy. 2) Synthesis of Designing framework of the learning environment: The above synthesized theoretical framework was taken into this process. The underlined theories base such as, contextual base, constructivist base, pedagogical base, creative thinking base, and technology and media base (mobile learning and media symbol system) for the synthesis of the theoretical framework of the learning environment. 3) Design and develop of the learning environment based on foundation of creating designing framework was adopted. 4) Evaluate of the learning environment by experts.

4. Research Results

The designing and development of the learning environment that promote student's creative thinking are following:

4.1 Synthesis of theoretical framework

The results show that the theoretical framework of learning environment comprised of five basic theories: **(1) Contextual base** are follows: basic education curriculum in Thailand, and Course content, **(2) Psychological base** are follows: Constructivist cognitive (Piaget, 1992) and social constructivist (Vygotsky, 1992) theory and cognitivism; and Information processing theory (Klausmeier,1985), **(3) Pedagogical base** are follows: OLEs Model (Hannifin,1999), SOI Model (Mayer,1996), Situated learning (Brown, Collins, and Dugoid, 1989), Cognitive apprenticeship (Brown and Collins, 1991), **(4) Creative thinking base** are follows: creative thinking theory (Guilford, 1967) consisted of 4 abilities to think as follows; Fluency, Flexibility, Originality and Elaboration, and **(5) Technologies and media base** are follows: Web-based learning (Badrul, 1998), Mobile application (Ktoridou and Eteokleous, 2005), The media symbol system (Sumalee, 2009) as shown in the following "Figure. 1".

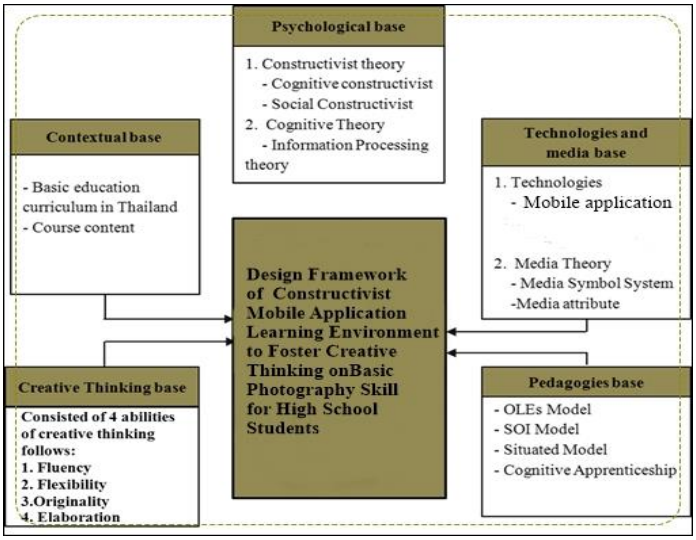
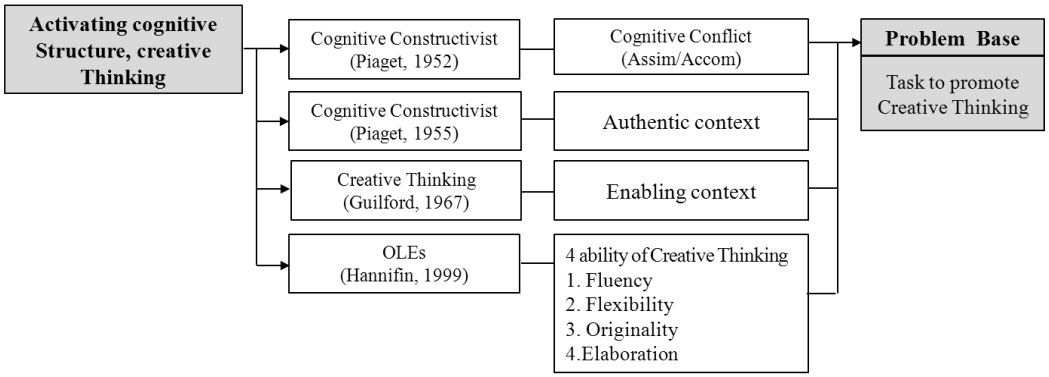


Figure 1. The theoretical framework of the learning environment to enhance creative thinking.

4.2 Synthesis of Designing framework

The results of designing framework of the constructivist mobile application learning environment to enhance creative thinking was synthesized to examine and analyze the principles, theories, review relevant literature, and explore the context concerning mobile application learning environment to enhance creative thinking. Also, the designing framework consist of 4 main ideas as following: 1) The Activating cognitive Structure, Creative Thinking (2) The Supporting cognitive equilibrium (3) Enhancing knowledge construction and creative thinking, and 4) Supporting enhancement for construction knowledge base as shown in the following Figure 2.



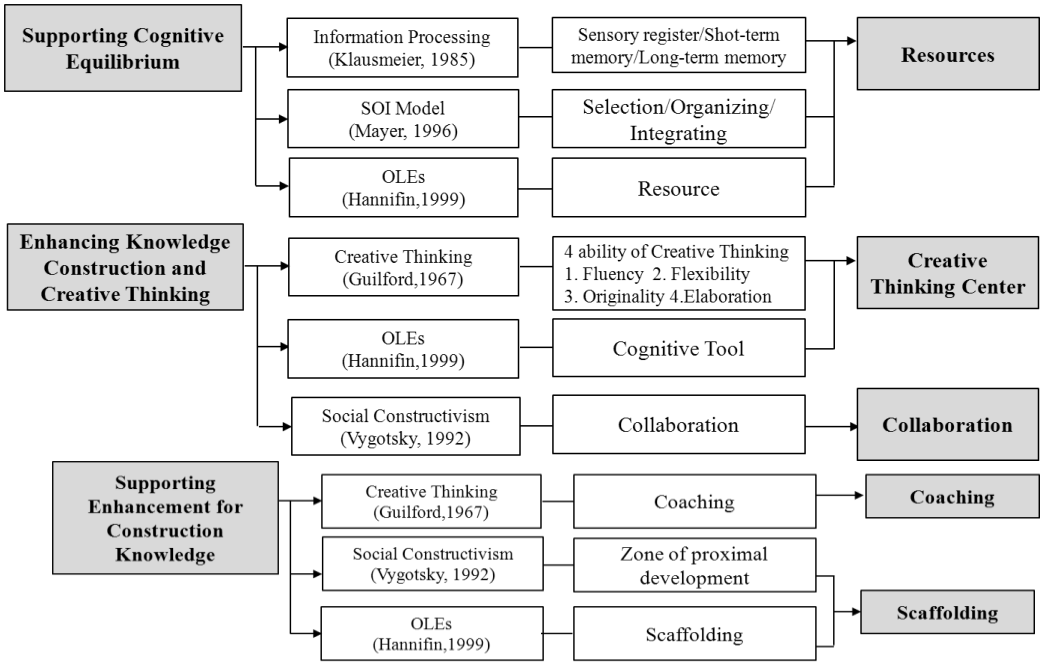
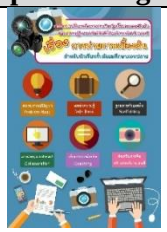


Figure 2. The designing framework of constructivist mobile application learning environment to enhance creative thinking

The constructivist mobile application learning environment to promote creative thinking comprise 6 components as following: 1) Problem base 2) Resourses 3) Creative thinking center 4) Collaboration 5) Coaching and 6) Scaffolding obtaining from major theories in various aspects: Contextual base, Psychologies base, Creative Thinking base, Pedagogical base, Technologies and Media base, and as shown in the following Figure 3 - 8.

Element	Describe the elements	Example of design Shot
Problem base	Problem base: It was shown Problem base for enhancing the learners to construct knowledge and creative thinking.	 *Figure 3.* Problem base
Recourses	Recourses: It was shown Resources for collecting information, content, technology which the students used in Problem base while they were facing it.	 *Figure 4.* Recourses
Creative thinking center	Creative thinking center: It was shown Creative thinking center for enhancing creative thinking (Guildford, 1967) approach for all 4 aspects including fluency, flexibility, originality, elaboration.	 *Figure 5.* Creative thinking center

Element	Describe the elements	Example of design Shot
Collaboration	Collaboration: It was shown Collaboration for supporting the students to share their experience with experts on science subject through facebook for expanding their multiple perspectives.	 *Figure 6.* Collaboration
Coaching	Coaching: It was shown Coaching by teachers and experts on scientist with best practice.	 *Figure 7.* Coaching
Scaffolding	Scaffolding: It was shown Scaffolding for enhancing students to solve problems or learning in case that they couldn't be able to do their own task by themselves.	 *Figure 8.* Scaffolding

4.3 Evaluate the efficiency of the design framework

The results of an expert on learning content, instructional design and the constructivist mobile application learning environment design, a way to check the quality of the specialists (Expert reviewer) Content Design and constructivist mobile application environment to learn from the evaluate form. The learning environment is designed according to the principles of the theory as a basis for the design. Overall fitness and help promote the creation of knowledge-based theory constructivist Whistler undertakings mobile learning is a new technology that promotes creative thinking as well.

Table 1: The result of the efficiency of the constructivist mobile application learning environment

No	List assessment	Experts' opinions
		percent
Learning content		
1	Appropriate learning content.	**80**
Synthesis of the theoretical framework		
2	Theoretical framework	**80**
The design elements of the learning environment		
3	Problem base	72
4	Resources	75
5	Creative thinking center	80
6	Collaboration	74
7	Coaching	82
8	Scaffolding	80
	Total	**77.16**
Comments about the constructivist mobile application learning design		
9	The constructivist mobile application learning design promotes creative thinking	
	Total	**77.87**

According to Table 1, the results of experts consisted of 3 issues as following; 1) the learning content was 80 percent on appropriate learning content, 2) synthesis of the theoretical

framework was 80 percent, and 3) the constructivist mobile application learning environments was 77.16 percent. The total of preconception towards the constructivist mobile application learning was 77.87 percent.

7. Discussion and Conclusion

This study designed the constructivist mobile application learning environment to promote creative thinking. The finding of this study showed that both of theoretical framework and designing framework of the constructivist mobile application learning environment to promote creative thinking (Samat & Chaijaroen, 2015; Chaijaroen, Kanjak & Samat, 2012). However, to enhance students' creative thinking ability, we are going to study about the effect of the learning environment learning with mobile technology on students' creative thinking and knowledge creation.

Acknowledgements

This work was supported by the Academic and Research Affairs, Innovation and Cognitive Technology Research Group, Faculty of Education, and the Research and Technology Transfers Affairs Division, Faculty of Education, Khon Kaen University.

References

Brown, J. S., Collins, A., & Duguid, P. (1989). *Situated cognition and the culture of learning.* Educational Reaearch, 18(1),32 43.

Chijaroen, s. (2009). *Education Technology: Principles, Theories, and Implementation*. Khon Kaen: Khlung Nanawittaya.

Chaijaroen, Sumalee., Kanjak, Issara., & Samat, Charuni. (2012). Development and Efficiency Improvement of the Learning Innovations Enhancing Learners' Thinking Potential. *Procedia - Social and Behavioral Sciences*, 46, 3460 – 3464.

Chan, S., & Yuen, M. (2014). Personal and environmental factors affecting teachers' creativity-fostering practices in Hong Kong. *Thinking Skills and Creativity*, 12, 69–77.

Guilford. (1967). *The Nature for Human Intelligence*. New York: McGraw-Hill Book Company.

Hannafin M. (1999). *Open Learning Environment: Foundation, Method, and Models*, New Jersey: In Charles.

Jonassen, D. H. (1999). Designing Constructivist Learning Environments, In C.M. Reigeluth (Ed.) *Instructional-Design Theories and Models: A New Paradigm of Instructional Theory (Volume II)* (pp. 215-239). New Jersey: Lawrence Erlbaum Associates.

Khan. B.H. (1998). *Web-based instruction*. Marvin Center, The George Washington University, Washington, D.C.

Klausmeier. H.J.(1985). *Educational psychology 5th ed.*. New York: Harper & Row.

Ktoridou, D. and Eteokleous, N. (2005). Adaptive m-learning: technological and pedagogical aspects to be considered in Cyprus tertiary education. *Recent Research Developments in Learning Technologies*, 1-8.

Mayer, R.E. (Ed). (2005). *The Cambridge Handbook of Multimedia Learning.* New York: Cambridge University Press.

Office of the National Education Commission. (1999). *National Education Act of B.E.2542(1999).* Bangkok: Office of the National Education Commission.

Piaget, J. (1985).*The Equilibration of Cognitive Structures: The Central Problem of Intellectual Development.* Chicago: University of Chicago Press

Richey, R.C. and Klein, J. (2007). *Design and developmental research*. New Jersey: Lawrence.

Robinson, K**. (**2011**).** *Out of our minds***.** West Sussex, United Kingdom**:** Capstone Publishing**.**

Samat, C., & Chaijaroen, S. (2015). Design and development of learning environment to enhance creative thinking and innovation skills for teacher training in the 21st century. *Proceedings of the 23rd International Conference on Computers in Education, ICCE 2015,* pp. 667-672.

Vygotsky, L. (1962).*Thinking and Speaking.* Cambridge, MA: MIT Press.