Design Framework of Constructivist Mobile Application Learning Environment 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, mobile application and learning environment designing. Research methodology is developmental research; developmental research consisted of 3 processes: (1) designing process, (2) developing process, (3) evaluate 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, (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.

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. Education is an important tool in improving the quality of human resources in the country. The important mechanism for economic development, in the economic arena national and international through education. Creativity is a required skill in the global society in 2020. 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 [9]. 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. Mobile application technology can be used for promoting learner's creative thinking in order to have meaning learning. This accordingly happens from interaction with the learning environment. That can create virtual images that appear in a 3D animation, sound, and hypertext hypermedia. In this paper, are presenting the principles related to the basis of creative thinking and innovation skills for producing students in
Thailand 4.0 and the basic context of students training in Thailand that would lead to the development of innovation the enhance creative thinking for students in the world economic 2020.

Thus, this research was aimed at designing framework of constructivist augment reality 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. Literatuer review

A. Mobile Learning Environment

The rapid growth of information technologies along with the increasing flexibility in communications among users have provided new modalities of learning as well as innovative ways to deal with the limitations of traditional learning. For instance, due to the advent and evolution of technology, allied to the ubiquitous computing, a new modality of education based in mobile computing, referred to as mobile learning, has emerged [1].

3. Theoretical framework

The results show that the theoretical framework and designing of constructivist mobile application learning environment comprised of 5 theoretical bases. (1) Contextual base is following: basic education curriculum in Thailand, Course content. (2) Psychological base is following: Constructivist theory; cognitive constructivist [9] and social constructivist [8] and Cognitive Theory; information processing theory. (3) Technologies and media base are following: Web-based learning [10], Augmented Reality [1], the system of media [4], (4) Creative Thinking base are following: creative thinking theory [3] consisted of 4 abilities to think as follows: Fluency, Flexibility, Originality and Elaboration. (5) Pedagogies base Model learning environments are following: OLEs Model [5], SOI Model [6], Situated learning [7], Cognitive apprenticeship [2]. Fig.1. Showed theoretical framework of constructivist augmented reality web-based learning environments to enhance creative thinking on topic design and create three-dimensional grade, 9 students.

![Theoretical framework of the learning environment](image)

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

**TABLE I.** The results of an expert on learning content, the expert assessment. Theoretical framework synthesis and design framework.
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| No. | Lists of preconception towards the Constructivist web-based learning environments | results of the expert (Percentage) |
|-----|---------------------------------------------------------------------------------|-----------------------------------|
| Learning Content |                                                                                  |                                   |
| 1. | Appropriate learning content | 80 | |
| 2. | Theoretical framework | 80 | |
| Web-based learning environments components | | | |
| 3 | Problem base | 72 | |
| 4 | Resource | 75 | |
| 5 | Creative Thinking Center, | 80 | |
| 6 | Collaboration | 74 | |
| 7 | Coaching | 82 | |
| 8 | Scaffolding | 80 | |
| Total | | | 77.87 |

4. Method and result

4.1. Data collection

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, pedagogy and contextual study, (2) Synthesis of Designing framework of the learning environment: The above synthesized theoretical framework was taken into this process. The underlined theories base such, Contextual base, Psychological base, Technologies and media base (AR: technology and media symbol system), Creative thinking base, and Pedagogies base. (3) Designing and developing of the learning environment based on the foundation of creating designing framework was adopted. (4) Evaluate of the learning environment by experts. The analytical description, summarization, and interpretation were used to analyze data.

4.2. Research result

The instruments in this study as following details: (1) The document examination and analysis recoding form to synthesize a theoretical framework, (2) The recoding form for synthesis of the design framework to learning environment to enhance creative thinking, and (3) The evaluation form for synthesize theoretical framework and designing of constructivist augmented reality web-based learning environments to enhance creative thinking.

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