A context-aware video prompt approach to improving students' in-field reflection levels

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ABSTRACT

Engaging students in reflection during real-world observation and inquiry activities has been recognized as an important issue for improving students' learning achievement and motivation. Many studies in the literature have adopted text-based reflection prompts as an important strategy to promote learning performance, this study argues that using videos as a reflection prompt would be more effective for improving learners' ubiquitous learning experiences and can provide a more sensible scenario that is better fitting the real-world contexts than the text-based prompts. In this study, a context-aware video-based prompt approach is proposed for improving students' reflection levels and satisfaction by providing timely and personalized guidance using mobile, wireless communication and sensing technologies. An experiment was conducted for evaluating the effectiveness of the proposed video-based prompt strategy with 70 participants in two groups. The results show that learners' reflection levels were significantly improved with the use of the proposed approach and that positive attitudes were observed toward the use of video-based prompts in the context-aware ubiquitous learning environment.

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1. Introduction

The rapid advancement of computer and network technologies has attracted researchers to develop web-based learning environments in which learners can access digital learning materials as well as utilize various learning facilities (Hsu et al., 2012; Ketelhut & Schifter, 2011). Although using such digital learning systems has the advantages of economy and convenience, educators have indicated the necessity of situating students in real-world environments, in which they can learn to deal with real-world issues and identify the problems to be coped with (Lave, 1991; Li & Lim, 2008).

At the same time, the efficiency and popularity of mobile and sensing technologies have provided a good opportunity to personalize learning guidance by conducting learning activities in real-world learning contexts (Chen, Hwang, Yang, Chen, & Huang, 2009; Hung, Lin, & Hwang, 2010). With the help of these new technologies, individual learners, by using mobile devices to access digital content via wireless communications, are able to learn in real-world situations with support or instructions from the computer system (Hwang & Chang, 2011; Shih, Chuang, & Hwang, 2010). Furthermore, the learning systems are able to detect and record students' learning behaviors in both the real world and the digital world with the help of the sensing technologies. Such a sensing technology-enhanced mobile learning has been called *context-aware ubiquitous learning* (Hwang, Tsai, & Yang, 2008). It not only provides learners with an alternative to deal with problems in the real world, but also enables the learning system to more actively assist the learners in the right place and at the right time (Chu, Hwang, Tsai, & Tseng, 2010; Ogata & Yano, 2004).

While context-aware ubiquitous learning is recognized as having high potential for motivating learners and improving their learning performance, researchers have also suggested the importance of providing effective learning support in order to benefit students in real-world learning activities (Hwang & Chang, 2011). Dewey (1933) firstly proposed the idea of reflection, which describes the process in which a learner thinks actively, continually and carefully about the learned knowledge and ultimately arrives at a conclusion. Bain, Ballantyne, Packer, and Mills (1999) further proposed five levels of reflection from low to high by analyzing a learner's reflective writing,

namely reporting, responding, relating, reasoning, and reconstructing. Many studies have confirmed that reflection is crucial for knowledge construction and contributes to learning performance (Chen, Kinshuk, Wei, & Liu, 2011; Chen, Wei, Wu, & Uden, 2009; Deng & Yuen, 2012; Gao, Chee, Wang, Wong, & Choy, 2011; Leijen, Lam, Wildschut, Simons, & Admiraal, 2009; Quinton & Smallbone, 2010; Tan, Tan, & Wettasinghe, 2011). Through reflection, learners can link their prior knowledge/experience with new idea/experience to create their own new knowledge. The deep thinking that occurs during the reflection process is the key point and this distinguishes it from memorization of learning materials (Marton & SÄAljÖ, 1976, 1984); however, learners can hardly achieve deep thinking without guidance.

Without the support of reflection prompts, learners usually do not know how to reflect (Chen, Hwang, et al., 2009; Chen, Wei, et al., 2009). With appropriate reflection prompts, learners can be guided to think deeply so as to improve their reflection levels. Previous research has tried to use prompts as learning guidance for learners to reflect during a learning process and found that learners' reflection levels can be promoted by reflection prompts (Braine, 2009; Chen, Hwang, et al., 2009; Chen, Wei, et al., 2009; King, 1994). Furthermore, empirical studies have found that well-guided reflection can help to improve learning performance (Camburn, 2010; McNamara, O'Reilly, Best, & Ozuru, 2006). Most research has used a combination of pictures and text in designing learning materials for supporting the plant observation learning activity (Chu, Hwang, & Tsai, 2010; Hwang et al., 2008). The text-based reflection prompt, which presents prompt purely in text format, is commonly and widely used in learning activities and is considered effective in promoting the reflection levels of learners in traditional classroom environments (Braine, 2009; Chen, Hwang, et al., 2009; Chen, Wei, et al., 2009; Hsieh, Jang, Hwang, & Chen, 2011; Quinton & Smallbone, 2010).

In multimedia/computer-mediated learning, videos and animations are widely adopted in learning task orientations for guiding students the best way to learn the learning materials (Bannert, Hildebrand, & Mengelkamp, 2009; Domagk, Schwartz, & Plass, 2010; Wouters, Paas, & van Merriënboer, 2009). Although these research considered reflection prompts as an important strategy to promote learning performance, the designs of their reflection prompts were using the text-only format. According to the authentic learning and situated learning theory of Brown, Collins, and Duguid (1989) and the multimedia design principle of Mayer and Moreno (2003), this study argues that using videos as reflection prompts would be more helpful to learners for improving their mobile learning experiences and can provide a more sensible scenario that is better fitting the real-world contexts than the text-based prompts. Hence, this study adopted video-based reflective supports as the form of reflection prompts to increase information delivery affordance for outdoor learning activities.

The media richness theory has pointed out that a richer format of media can reduce the equivocality and uncertainty during information transfer (Daft, Lengel, & Trevino, 1987). For a learning task with some equivocality and uncertainty, learners can still manage to comprehend
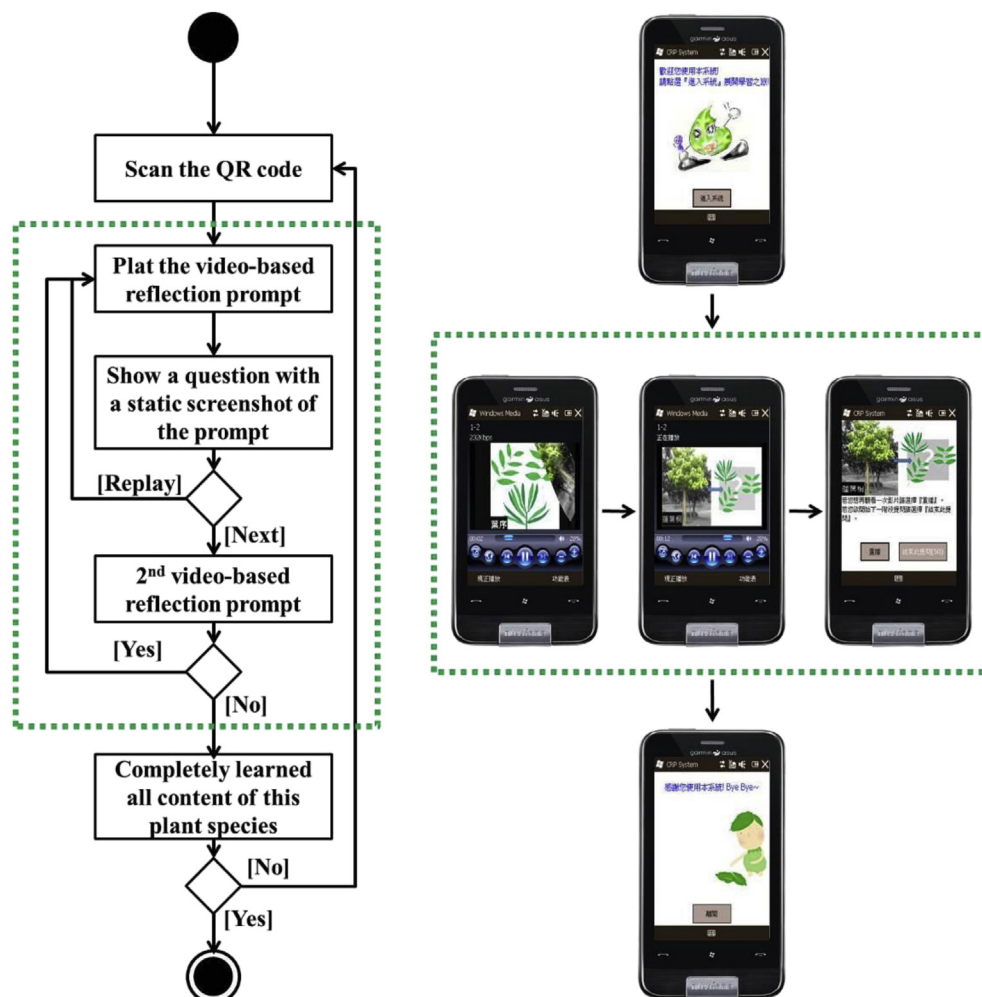

Fig. 1. The flowchart of the CRPS for providing a video-based reflection prompt.