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Development of a problem-based learning model via a virtual learning environment

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ABSTRACT

The primary objective of this research was the development of a problem-based learning model using a virtual learning environment (VLE) for undergraduate students in the Photography for Communication Arts course. The model supports and enhances students' learning, achievements and problem-solving skills. An efficiency test for the model revealed an above average set of criteria at 80/83.93, which conformed to the research hypothesis. The principles of instructional systems design (ISD) and systems approach were integrated into the design and assessment phases of model development, which resulted in more effective management of relevant instructional courses and materials. Based on its efficiency and potential application to real-life situations, the model has been deemed suitable by experts. The selected student group in the problem-based learning model via VLE achieved higher test scores compared to a group of students in a normal classroom with a statistical significance of .05. Because students learn using models that promote self-awareness and make it possible to choose their own topic of study employing resources provided by VLE, an assessment of their work quality found that they gained more knowledge of information technology as well as access to up-to-date information. Students are able to choose the most comfortable time to study. The model encourages students to learn through participation, practice problem-solving skills on an individual basis, and exchange ideas with other members of a group. The virtual environment involves many forms of media and materials that stimulate students' interest in learning and results in higher satisfaction. The gap in the communication channel between students and teachers is reduced due to easier and more informal communication.

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Introduction

Problem-based learning (PBL) is a student-centered pedagogy in which students learn about a subject by attempting to find a solution to an open-ended problem. As found by research conducted by [Hmelo-Silver \(2004\)](#), students practice both thinking strategies and domain

knowledge. Problem-based approaches to learning have a long history of advocating experience-based education.

Psychological research and theory propose that having students learn through problem-solving experience allows them to learn the content as well as new thinking strategies.

PBL is also an active way for students to learn basic problem-solving skills and acquire knowledge through interaction with others, a key skill demanded by nearly every work environment. Students learn within small, self-directed groups to define and carry out specific tasks, either real-life or study-based. In research conducted by [Loyens](#),

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Kirschner, and Paas (2011), PBL represented a major development in educational practice that continues to impact courses and disciplines worldwide. The roots of PBL date back to the mid-1960s at McMaster University Medical School in Hamilton, Canada (Loyens et al., 2011).

According to Pumahapinyo and Suwannattachote (2014), various forms of technology are used to facilitate e-learning, with most applications using a combination of techniques such as blogs, collaborative software, e-Portfolios, and virtual classrooms. Particularly for higher education, an increasing tendency is to create a virtual learning environment (VLE) in which all aspects of a course are handled using a consistent and standard interface throughout the institution (e.g. Moodle, Schoology, Edmodo). This is consistent with Muñoz and Towner (2009), who suggested that students are heavily immersed in Web 2.0 technology (i.e. blogs, twitter, podcasts, wikis, social network sites, virtual worlds, video sharing and photo sharing). Educators are also turning to Web 2.0 tools, drawing upon their abilities to assist in creating, collaborating on and sharing content.

The cutting edge technology called Moodle's Learning Management System (LMS) was selected at Massey University, which was eventually renamed Stream. Today, LMS is used extensively for the delivery of blended learning for internal and distance-learning students across the vast majority of the university's courses and programs. As part of this process, the virtual learning environment has recently been integrated into the teacher's toolkit of teaching tools.

According to Oxford University Press (2015), a virtual learning environment (VLE) is a system for delivering learning materials to students via the web. These systems include assessment and student tracking features, as well as collaboration and communication tools. They can be accessed both on and off-campus, meaning that the system can support students' learning even outside the lecture hall, 24 h a day, 7 days a week.

In Thailand, Phanich (2012) suggested that younger generations of Thai people have characteristics that demand the freedom to select what they want in order to express their personal opinions and individuality. They consider play and enjoyment in conjunction with aspects of work, learning, and socialization. This involves the demand for rapid communication, the ability to search for information and answer questions, and the creation of innovation for everything in life. Therefore, the link between social network learning and 21st century skills has been proven (Greenhow, Robelia, & Hughes, 2009) and VLEs offer increased potential for resolving current educational problems.

Literature Review

Problem-based Learning

The more the focus is on developing students who can devise effective solutions to real-world problems, the more successful those students will become. This is what Crocket (2012) articulated for the 'Global Digital Citizen Foundation' with the concept of 'Solution Fluency', which concerns

solving complex problems effectively in real time using unique and carefully-designed solutions.

Etherington (2011) reported on the success of using a problem-based learning approach in teaching primary science, stating that it had replaced the traditional content-driven syllabus in 2010 for an evaluated group in New South Wales. It was also discovered that the PBL course had a positive impact on pre-service teachers' motivation to teach scientific ideas within a real world context.

In problem-based learning, students apply an 'inquiry method' to seek knowledge and solutions through the questioning and investigation of locations, objects, people, books, evidence and information. Therefore, a learning process can result from seeking a solution or setting a question that is collaboratively and carefully selected by a group of students and their lecturers. The problem is determined to be the starting point for the learning process, which motivates students to keep investigating so they can better understand the mechanics of the problem as well as the solution.

This is consistent with Newble and Clarke (1986), who concluded that problem-based learning leads to a deeper approach to learning. A significant amount of evidence supports the value of active and cooperative learning (Johnson, Johnson, & Smith, 1998).

An educational virtual classroom environment has been defined as one that affords the potential to carry out asynchronous and synchronous learning, while problem-based learning (PBL) is used as the process to implement the planned scenarios, such as case studies, as well as to aid learning in a multi-disciplinary or multi-skills context (Bignell & Parson, 2010).

Despite clear evidence, there is an ongoing debate concerning the usefulness of asynchronous versus synchronous e-learning (Hrastinski, 2008). Simply stated, asynchronous learning might be considered an older form of e-learning in 2016, with students using email or discussion boards as the medium of communication. This is because technology has 'moved on' with the advent of smartphones and 3G/4G standards, which have made synchronous learning and communication more commonplace around the world, including in Thailand. Discussion boards are being replaced with real-time, interactive learning management systems (LMS) such as Schoology and Moodle, or social networking tools such as Line.

While technological differences abound, social network sites (such as Line, WhatsApp) are 'web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system' (Boyd & Ellison, 2008).

In this new social era, learning and innovation skills are vital. Learners must seek self-training and development in an effort to enhance their skills. This 'learning by doing' technique prepares learners for their future careers (Sun & Kang, 2015). The skills comprise the 4Cs: Critical Thinking, Communication, Collaboration, and Creativity.

The Thailand National Education Act of B.E. 2542 (1999) stipulates that education should be focused on all aspects

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