Chapter 8

Applying Learning Theories and Animation in OSiMM:
A Multimedia Computer Science Learning Courseware

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ABSTRACT

Learning and instruction in higher education may be primarily concerned in most cases with the content of their academic lessons, and not very much with their instructional delivery. However, effective instructional delivery with technology and based on sound learning theories has been known to have an impact on student performance. With the rapid development in the computer and multimedia technologies, it has become feasible to integrate multimedia technologies into the teaching and learning process. What has been the conventional teacher-centered teaching approach is now seeing a shift into one which emphasises on student-centered learning approach. There is a body of evidence that supports the benefit of using animations to assist learning. The domain knowledge applied in this study was on a Computer Science subject, for the topic of memory management. Memory management is one of the topics taught in the course on Operating Systems in Computer Science and Information Technology programmes. This chapter discusses the design and development of a courseware based on Mayer's Cognitive theory of Multimedia learning, and the use of animation in the teaching and learning of a computer science subject. An instructional design model based on the theories discussed was then constructed and prototypes were developed in 3-D animation. A survey was then conducted on users' instructional value and overall satisfaction and the results are reported.

APPLYING LEARNING THEORIES AND TECHNOLOGY IN COMPUTER SCIENCE EDUCATION

Education is important; whether it is at the primary, secondary or even at the tertiary/ university level. The government of Malaysia has put in a great deal of emphasis on educating the population, at least at the primary and early secondary level. It is now an undisputed fact that many learning institutions are finding new means to traditional methods in order to bridge learning efficiency with technology. "Universities today are in transition. Much of the change we see is driven by economic pressures and demand for graduates who will be able to function in a knowledge society" (Franklin & Peat, 2001). The growing awareness amongst educators has resulted in the diversification of learning and teaching processes in these changing times. In Malaysia, the institutes of higher learning are currently moving towards a more multimedia oriented classroom (Teo & Tse, 2006).

Traditional educational content can now be transformed into interactive multimedia content by using authoring packages (Roselli et al., 2003). This fact has enabled the teacher to innovate their instructional designs by presenting the education content in an interactive and multi-sensory manner rather than the traditional single media format. This infusion of multimedia into teaching and learning has altered instructional strategies in educational institutions and many colleges and universities, including those in Malaysia are currently gearing their teaching and learning towards one which uses multimedia technology to enhance the student's learning process (Teo & Tse, 2006).

Developing effective materials (in any medium) that facilitates learning requires an understanding and appreciation of the principles underlying how people learn. Just as engineering is the application of basic principles from physics and chemistry, and as medicine is the application of basic principles of biology, instruction is the application of basic principles of learning (Alessi

& Trollip, 2001).When a developer plans to develop an educational courseware or an e-learning application, the principles of learning to apply to the application should be thought about first.

The subject that was chosen to be the domain of this study was a topic in computer science education, which is Operating Systems, specifically on Memory Management Concepts. Operating Systems (OS) is a field studied in Computer Science, Information Science and Computer Engineering. Some of its topics require a careful and detailed explanation from the lecturer, as they often involve many theoretical concepts and somewhat complex calculations, demanding a certain degree of abstraction from the students if they are to gain full understanding. The traditional course model, in which the lecturer follows a text book, prepares and exhibits slides and presents some theoretical exercises, is not enough to assure a precise comprehension of what is being taught (Maia et al., 2005). And without a practical vision the students tend to lose touch of the introduced concepts and therefore face difficulties when it comes to solving problems in tests and exams.

A sample prototype was developed in 3-D animation and was given the name OSIMM (Operating Systems in Memory Management).

This paper first looks at some literature on the learning theories applied in this study, then Mayer's Cognitive theory of multimedia learning is explained, thirdly, the use of animation is discussed, followed by the construction of an instructional design model for the computer science subject (topic on Memory Management in OS) and screen design of the prototype (OSIMM) is shown. Finally a student assessment is conducted to test users' instructional value and overall satisfaction.

LEARNING THEORIES

In today's scenario, computer-based education has become popular as students want to learn on their own with the computer and thus the teacher

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