Chapter 5
An Agent-Based Approach to Process Management in E-Learning Environments

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ABSTRACT
Learning is a process to acquire new knowledge. Ideally, this process is the result of an active interaction of key cognitive processes, such as perception, imagery, organization, and elaboration. Quality learning has emphasized on designing a course curriculum or learning process, which can elicit the cognitive processing of learners. However, most e-learning systems nowadays are resources-oriented instead of process-oriented. These systems were designed without adequate support of pedagogical principles to guide the learning process. They have not explained the sequence of how the knowledge was acquired, which, in fact, is extremely important to the quality of learning. This study aims to develop an e-learning environment that enables students to get engaged in their learning process by guiding and customizing their learning process in an adaptive way. The expected performance of the Agent-based e-learning Process model is also evaluated by comparing with traditional e-learning models.
INTRODUCTION

Learning is a complex interactive process that involves environmental, social, motivational, emotional, and cognitive facts. Most people view learning as a systematic process through which students could gain and output processed knowledge. Based on this assumption, cognitive models of learning can be adopted to describe the learning process.

According to Bloom’s Taxonomy of the Cognitive Domain (Bloom, et al., 1956), educational objectives can be built on a hierarchy from the lowest level of intellectual activities to more complex and abstract mental levels. Vygotsky (1978) mentioned that most students are only willing to take a challenge with their current level of development or slightly above. By experiencing the successful completion of challenging tasks, learners gain confidence and motivation to embark on more complex challenges. Furthermore, according to Von Glasersfeld (1989), sustaining motivation to learn is strongly dependent on the student’s confidence in his or her potential for learning. These feelings of competence and belief in potential to solve new challenges are derived from their past experience in solving similar problems rather than any external acknowledgement and motivation (Prawat & Floden, 1994). These imply that teachers should design the learning process with an appropriate level to students in order to motivate students to learn as well as to strengthen their confidence. In order to deliver good quality of learning, motivation to learn and support of cognitive processing are the major pedagogical concerns. However, most current e-learning systems are designed without these concerns.

Nowadays, both academic and business institutions support learning with technology, such that e-learning has evolved into any learning activity that highly involves technology for its presentation (Shute & Towle, 2003). E-learning can also be defined as activities which take place in front of one or more computers that are connected to the Internet. Since e-learning is maturing in technology-wise—even to the point that more artificial intelligence can be integrated into the e-learning systems—its focus is at the same time shifting from simply providing an infrastructure and delivering information online to supporting pedagogical principles (Shute & Towle, 2003).

It is a fact that recent e-learning research has focused mostly on process-oriented educational technology, i.e., the technology that supports sequencing of learning activities and learning content. Currently, it has two different types of sequencing technologies: SCORM-based and workflow-based learning systems (Marjanovic, 2007). In addition, many adaptive e-learning systems are also available, like Arthur (Gilbert & Han, 1999), iWeaver (Wolf, 2002), CS383 (Carver et al., 1999), and EDUCE (Kelly & Tangney, 2002).

Furthermore, IS researchers have begun investigating an emerging, technology-enabled innovation that involves the use of intelligent software agents in e-learning. The presence of these agents stimulates the human aspects of instruction in a more natural and valid way than other computer-based methods. The representation of knowledge in the agent-based architecture can support students’ learning activities adaptively (Xu & Wang, 2006). Agent-based infrastructure possess reasoning power, such that it can make dynamic decisions on which content and style should be delivered to a particular learner based on the pedagogical practices and the learner’s profile. Such complicated knowledge exchange can then be done in a more efficient and effective way with the support of intelligent agents, rather than manually.

The objective of this study is to develop an e-learning environment that is able to motivate students to learn and make students well engaged in their learning process by guiding and customizing their learning processes in an adaptive way.

In this study, an Agent-based e-learning Process model has been developed using agent