Chapter V

A Hybrid Method for the Analysis of Learner Behavior in Active Learning Environments

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Abstract

Software-mediated learning requires adjustments in the teaching and learning process. In particular active learning facilitated through interactive learning software differs from traditional instructor-oriented, classroom-based teaching. We present behavior analysis techniques for Web-mediated learning. Motivation, acceptance of the learning approach and technology, learning organization, and actual tool usage are aspects of behavior that require different analysis techniques to be used. A hybrid method based on a combination of survey methods and Web usage mining techniques can provide accurate and comprehensive analysis results. These techniques allow us to evaluate active learning approaches implemented in the form of Web tutorials.
Introduction

Since its inception, the Web has been widely and successfully used as a platform for teaching and learning. Technology-mediated learning, however, requires adjustments in the teaching and learning process for both instructors and students (Abdelraheem, 2003). The complexity of the symbiotic relationship between learning and instructional design on one hand, and technology and tool mediation on the other, needs to be understood. Rose (1999) observes that the words ‘interaction’ and ‘interactivity’ proliferate in texts on educational computing, despite their apparent lack of denotative value. However, it seems to be understood widely that interactive instruction is learner controlled, an opportunity for students to engage in active, hands-on exploration (Northrup, 2001). Interactive tools can enable active learning in a constructivist style if they create a representation of reality in which learning is relevant. According to Ravenscroft, Tait, and Hughes (1998), students integrate the use of computer-based learning resources into their study habits in an incremental fashion. Instructors need to carefully analyze the learning behavior with new educational technologies in order to support new student learning processes through an incremental instructional design approach.

The Web-mediated interactive tutorial system that we are going to analyze is part of an undergraduate course in computing. This tutorial allows students to construct programming knowledge and acquire programming skills in the database language SQL through engaging and interactive exercises based on meaningful problems (Pahl, Barrett, & Kenny, 2004). At the core of the tutorial is an interactive submission feature that allows students to execute programs and that gives feedback on those submissions. Engagement in the learning process is, according to Northrup (2001), a key objective in interactive instruction. In self-controlled environments, students actively construct meaning to determine how to proceed in the learning activity.

The goal of this investigation is the behavior analysis of tool-mediated active learning. We demonstrate a hybrid analysis technique for the evaluation of learning behavior in tool-mediated, interactive environments that combines classical survey-based techniques with Web usage mining technology. The motivation to analyze and evaluate the students’ learning behavior and learning processes is to gain an understanding of student learning in interactive learner-controlled environments. This is a prerequisite for the successful and effective implementation of instructional design for active learning and for the empirical evaluation of the implementations.
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