Chapter 2
Web–Based Interactive Learning and the Effects of Learner Beliefs, Environmental Preferences, and Cognitive Loads

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ABSTRACT
The objective of this chapter is to present learner characteristics that mediate web-based learning. These characteristics include personal epistemological beliefs, beliefs about web-based learning, social-cultural beliefs, and preferences toward web-based learning environments. In addition to the effects of these affective factors, another factor that is also addressed in the chapter is the cognitive load induced by different web-based curriculum elements. Based on a literature review and the findings of some recent empirical studies, a web-based learning model is proposed to manifest the contributions of learner characteristics on learning in web-based contexts. Educational implications are then drawn corresponding to the web-based learning model.

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INTRODUCTION

Although the development of online technologies provides a new, interactive way of learning, the effectiveness of utilizing these technologies in supporting learning, such as web-based learning, is not universally agreed among educational researchers. Cook (2007) argued that many web-based learning instructional designs fail to incorporate principles of effective learning, and the web-based learning is often used for the wrong reasons. For example, as mentioned by Cook, many instructors employed web-based instruction for the sake of the technology use. Inman et al. (1999) found that while instructors were willing to teach the distance course, they did not rate the quality of such course as high as other types of courses. In classroom contexts, it has been documented that, other than the instructional design, school performances are also affected by students’ environmental preferences and personal beliefs about knowledge and learning (e.g., Chang, Hsiao, & Barufaldi, 2006; Kinchin, 2004; Schommer, 1993; Quan & Alermann, 1995). Nevertheless, these learner factors have not been extensively analyzed in web-based contexts. Thus in this chapter, learner characteristics that are found to mediate students’ web-based learning outcomes are discussed. These characteristics include personal epistemological beliefs, beliefs about web-based learning, social-cultural beliefs and preferences toward web-based learning environments. In addition to the effects of these above-mentioned affective factors, another issue that will be also addressed in the chapter is the effects of cognitive load. The role of cognitive load has been well recognized in research areas concerning multimedia learning. However, questions such as whether similar patterns can be found in the web-based environments, and how it interacts with web-based learning have not been clarified. Thus, an attempt is made in the chapter to explore the issues.

BACKGROUND

In the modern information era, the rapid development of multimedia and Internet technologies has a growing impact on school learning. The creation of web-based learning environments have started a revolution in the transmission of course content through the application of hypermedia-based links that unite text, images, audio, video, animations, exercises, etc., to present concepts in multiple forms. In addition to hyper-linked content presentation, other critical features of web-based learning environments, such as online discussion, instant or asynchronous feedback/communication, database, information search and so forth, provide interactive channels that support knowledge construction. Many scholars have discussed the role of web-based learning environments in enhancing learning. For example, Jonassen (1996) mentioned that web-based learning, compared with the classroom-based teaching and learning, provides external stimuli that gain the attention of sensory organs to enhance learners’ endurance and concentration. Jim (2001) pointed out that the benefits of online learning include the increase of student involvement on learning process and high engagement in collaborative learning and discussion in the online environment. Recently, Kuljis and Lines (2007) demonstrated that the web-based learning environments, when blended with discussion forum, foster collaboration. Although discussions regarding the role of the web-based learning environments in enhancing learning can be found in literature, it is sometimes too easy to assume that multimedia provides a better learning environment, without considering the impacts of learner characteristics and the ways that the organization and distribution of multimedia materials or tools may interact with learning.

The effectiveness of web-based learning is not universally agreed. It has been shown that the advantages of web-based learning are limited for beginners or passive learners in that these students were found to be either cognitively overloaded
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