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## Chapter XX

# Quality of Online Learning Applications:
## Impact on Student Enjoyment, Motivation, and Anxiety

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## Abstract

*The purpose of this study was to explore the influence of the design-quality of current online K-12 learning applications on student learning via three learning-related variables (student enjoyment, motivation and anxiety level when using those online applications). Nine hundred online K-12 applications (WebQuests, online drills, games, tests and other applications) were evaluated in terms of four design factors (quality of information, design of information, quality of technology use and design of technology use) in relation to the three learning-related variables. Three prediction models were generated and tested in this study. An intermediate effect was found between the design of online application and student learning, which may provide some insights for teachers when they integrate online applications into teaching and learning. The target audience of this chapter may be school teachers, designers or professionals who use online applications for educational purposes.*

# Introduction

The Internet has been used in many ways to promote teaching and learning (Aviv & Golan, 1998; Barnard, 1997; Berge, 1997; Coombs & Rodd, 2001; Lengel & Lengel, 2006; Thorsen, 2006), from the use of Web-based resource to the employment of Web-based instruction (Berge, Collins, & Dougherty, 2000; Bonk, Cummings, Hara, Fischler, & Lee, 2000; Cunningham & Billingsley, 2006; Fishman, 1997; Miller & Miller, 2000; Riel, 1992; Trentin, 2001).  In the literature, one common use of the Web in K-12 teaching and learning appeared to be the utilization of existing online learning applications, such as tutorials, drills, games or video products developed and posted onto the Web by other educators or designers (Clark & Jorde, 2004; Glazer, 2004; Hillman & Moore, 2004; Liu, 2001; Lombard, 2004; Murphy, 2004; Perkins & McKnight, 2005; Shelly, Cashman, Gunter, & Gunter, 2003; Stvan, 2005). It is hard to imagine and estimate the number of learning applications available on the Web today: A Google search on "math game" resulted in 691,735 items; and a random exploration on 10 links found that on average, 25 to 35 online math games were under each link.

Unfortunately, the effectiveness of using those online learning applications on student learning achievement was ambiguous (Maddux, Ewing-Taylor, & Johnson, 2002). In a study that consisted of 102 technology integration cases, Johnson and Liu (2000) found that the use of existing Web activity did not significantly contribute to either the success of the technology integration or student learning outcome. The issue is that if the use of those online applications could not effectively improve learning, such tremendous amount of resources would be a huge waste, and sometimes may cause confusion.

Many studies have explored the possible causes of such unsatisfied use of the Web, and suggested that a lack of design was one common weakness in educational applications, such as online communication, online course and online instructional content or activity (Liu & Maddux, 2003; Liu, 2003; Schweizer, Whipp, & Hayslett, 2002; Boer & Collis, 2001). The purpose of this study is to explore the influence of the design quality of current K-12 online learning applications on student learning.

In this chapter, first, the definitions and major types of K-12 online learning applications are introduced. Next, variables examined in this study are identified, including four design-related variables that are derived from a technology integration model (Liu & Velasques-Bryant, 2003; Liu & Johnson, 2003a, 2003b), and three learning-related variables that have been found to have direct impact on learning achievement (Liu & Johnson, 1998; Liu, Maddux, & Johnson, 2004). The four design-related variables are then used to evaluate the quality of 900 online K-12 learning applications in relation to the three learning-related variables. At the end, a set of quality-related models that illustrate the relationships are generated and tested.

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