

Chapter XXVII

Understanding Factors that Influence the Effectiveness of Learning Objects in Secondary School Classrooms

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ABSTRACT

The design, development, reuse, and accessibility of learning objects has been examined in some detail for almost 10 years (Kay & Knaack, 2007c, 2007d), however, research on the effectiveness of learning objects is limited (Kay & Knaack, 2005; Nurmi & Jaakkola, 2006a, 2006b, Sosteric & Hesemeirer, 2004), particularly in the K-12 environment. Until recently, learning objects were solely used in higher education (Haughey & Muirhead, 2005; Kay & Knaack, 2005, 2007c). The purpose of the current chapter is to examine factors that influence the effectiveness of learning objects in secondary school classrooms. These factors will include learning object qualities, gender, self-efficacy, grade, subject area, and teaching strategies.

INTRODUCTION

Definition of Learning Objects

It is important to establish a clear definition of a “learning object” in order to assess effectiveness. Unfortunately, consensus regarding a definition has yet to be attained (e.g., Bennett & McGee, P.,

2005; Metros, 2005; Muzio, Heins, & Mundell 2002; Parrish, 2004; Wiley, et al. 2004). Part of the problem rests in the values and needs of learning object developers and designers. The majority of researchers have emphasized technological issues such accessibility, adaptability, the effective use of metadata, reusability, and standardization (e.g., Downes, 2003; Koppi, Bogle, & Bogle, 2005;

Muzio et al., 2002; Siqueira, Melo, & Braz, 2004). However, a second “learning focussed” pathway to defining learning objects has emerged as a reaction to the overemphasis of technological characteristics (Baruque & Melo, 2004; Bradley & Boyle, 2004; Cochrane, 2005; Wiley et al., 2004).

While both technical and learning-based definitions offer important qualities that can contribute to the success of learning objects, research on the latter is noticeably absent (Kay and Knaack, 2007b, 2007d). Agostinho, Bennett, Lockyear & Harper (2004) note that we are at risk of having digital libraries full of easy to find learning objects we do not know how to use in the classroom.

In order to address a clear gap in the literature on evaluating learning objects, a pedagogically focussed definition of learning objects has been adopted for the current chapter. Learning objects are as defined as “interactive Web-based tools that support the learning of specific concepts by enhancing, amplifying, and guiding the cognitive processes of learners”. See Kay & Knaack (2008a) for concrete examples of the learning objects examined.

Benefits of Learning Objects

Over the past 10 years, a substantial effort has been made to increase the use of technology in the classroom (Compton & Harwood, 2003; McRobbie, Ginns, & Stein, 2000; Plante & Beattie, 2004; US Department of Education, National Center for Education Statistics, 2002). In spite of these efforts, a number of researchers have argued that technology has had a minor or negative impact on student learning (e.g., Cuban, 2001; Roberston, 2003; Russell, Bebell, O’Dwyer, & O’Connor, 2003; Waxman, Connell, & Gray, 2002). Part of the problem stems from a considerable list of obstacles that have prevented successful implementation of technology including a lack of time (Eifler, Greene, & Carroll, 2001; Wepner, Ziomek, & Tao, 2003), limited technological skill (Eifler

et al., 2001; Strudler, Archambault, Bendixen, Anderson & Weiss, 2003; Thompson, Schmidt, & Davis, 2003), fear of technology (Bullock, 2004; Doering Hughes, & Huffman, 2003), a clear lack of understanding about how to integrate technology into teaching (Cuban, 2001), and insufficient access (e.g., Bartlett, 2002; Brush et al., 2003; Russell et al., 2003).

Learning objects offer a number of key components that can reduce the impact of potential obstacles observed in the past (accessibility, ease of use, reusability) and enhance student learning (interactivity, graphics, reduction of cognitive load, adaptive).

In contrast to former learning technologies burdened with barriers to development and implementation, learning objects are *readily accessible* over the Internet and users need not worry about excessive costs or not having the latest version (Wiley, 2000). Well over 90% of all public schools in North America and Europe now have access to the Internet (and therefore learning objects) with most having high-speed broadband connections (Compton & Harwood, 2003; McRobbie, Ginns, & Stein, 2000; Plante & Beattie, 2004; US Department of Education, National Center for Education Statistics, 2002). In addition, because of their limited size and focus, learning objects are relatively *easy to learn and use*, making them much more attractive to busy educators who have little time to learn more complex, advanced software packages (Gadanidis et al., 2003). Finally, *reusability* permits learning objects to be useful for a large audience, particularly when the objects are placed in well organized, searchable databases (e.g., Agostinho et al., 2004; Duval, Hodgins, Rehak & Robson, 2004; Rehak & Mason, 2003).

With respect to enhancing learning, many learning objects are interactive tools that support exploration, investigation, constructing solutions, and manipulating parameters instead of memorizing and retaining a series of facts. The success of this constructivist based model

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