

# The Role of Learning Objects in Distance Learning

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## OVERVIEW

In the past 10 years, a considerable amount of money and effort has been directed toward distance education, with growth estimated as high as 30%-40% annually (Harper, Chen, & Yen, 2004; Hurst, 2001; Newman, 2003). The popularity of distance learning appears to be founded on personal control over instruction (Burgess & Russell, 2003; Pierrakeas, 2003), the variety of multimedia formats available to students (Hayes & Jamrozik, 2001), and customized support (Harper et al., 2004). However, the success of distance education is anything but a foregone conclusion. Multiple obstacles have impeded acceptance including reluctance to use technology (Harper et al., 2004), time required to develop course resources (Harper et al., 2004; Hayes & Jamrozik, 2001) and to support students (Levine & Sun, 2002), lack of technology skills (Berge & Smith, 2000), and cost (Burgess & Russell, 2003; Levine & Sun, 2002). In addition the promise of interactivity and constructive learning in distance learning has not been realized. Most distance learning offerings resemble traditional classroom courses (Coates & Humpeys, 2003; Levine & Sun, 2002; Navaro, 2000). When interaction does take place, it is usually in the form of online discussion, however, a number of studies have reported that true social interaction leading to cognitive development is rare (e.g., Berge and Muilenburg, 2000; Bisenbach-Lucas, 2003; Garrison, Anderson, and Archer, 2001; Hara, Bonk and Angeli, 1998; Meyer, 2003; Wickstrom, 2003).

Learning objects are promising tools that (a) address a number of the barriers students and teachers experience with distance education and (b) are based on sound learning theory researched over the past 15 years. This chapter will examine the potential role of learning objects in distance education, as well as the challenges in using them effectively.

## THE ROLE OF LEARNING OBJECTS IN DISTANCE EDUCATION

### Definition

In order to evaluate the use of learning objects in distance education, a clear definition is necessary. Considerable effort has been directed toward this goal (Agostinho, Bennett, Lockyear, & Harper, 2004; Butson, 2003; Friesen, 2001; Gibbons, Nelson, & Richards, 2002; Littlejohn, 2003; Metros, 2005; McGreal, 2004; Muzio, Heins, & Mundell, 2002; Parrish, 2004; Polsani, 2003; Wiley, 2000; Wiley, et al. 2004); however there has been no consensus on an acceptable definition. Originally, a learning object was considered any re-usable digital resource that supported learning (e.g., Wiley, 2000), however, a number of researchers (Butson, 2003; Littlejohn, 2003; Wiley et al., 2004) have argued that definition is too broad. Specific qualities of learning objects such as interactivity, instructional augmentation (scaffolding), the presence of cause and effect systems and problem solving are now considered essential in an effective learning object. In this chapter, learning objects are defined as “interactive web-based tools that support learning by enhancing, amplifying, and guiding the cognitive processes of learners”. The following are examples of good quality learning objects:

- Fire and Probability at:  
<http://illuminations.nctm.org/ActivityDetail.aspx?ID=143>
- Physics Education Technology at:  
[http://phet.colorado.edu/new/simulations/sims.php?sim=Circuit\\_Construction\\_Kit\\_DC\\_Only](http://phet.colorado.edu/new/simulations/sims.php?sim=Circuit_Construction_Kit_DC_Only)
- DNA from the beginning at:  
<http://www.dnafb.org/dnafb/>
- National Geographic Hurricanes at:  
<http://www.nationalgeographic.com/forcesofnature/interactive/index.html?section=h>

## **Addressing Barriers to Distance Education**

As stated earlier, a number of barriers have restricted and reduced the effectiveness of distance education including reluctance to use technology (Harper et al., 2004), limited technology skills (Berge & Smith, 2000), time to support students (Levine & Sun, 2002) and develop course resources (Harper et al., 2004; Hayes & Jamrozik, 2001) and cost (Burgess & Russell, 2003; Levine & Sun, 2002). Learning objects partially address these barriers.

With respect to resistance to using technology, each learning object is small in size and focus, easy to learn, and easy to use. While learning objects do not reduce the time an instructor would have to spend with his/her students, they are readily and freely available over the Internet and thereby reduce the cost and time required to create new resources. They are also designed to be reusable and useful for a large audience, particularly when the objects are placed in well organized, searchable databases. Finally, many learning objects often come with a set “instructional wrap,” so instructors have a clear idea of how to use them.

## **Enhancing the Learning Benefits of Distance Education**

With respect to enhancing learning, a number of 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 is well documented (e.g., Albanese & Mitchell, 1993; Bruner, 1983, 1986; Carroll, 1990; Carroll & Mack, 1984; Collins, Bown, & Newman, 1989; Vygotsky, 1978). In addition, many learning objects have a graphical component that helps make abstract concepts more concrete (Gadanidis, Gadanidis, & Schindler, 2003). Furthermore, certain learning objects allow students to explore higher level concepts by reducing cognitive load. They act as perceptual and cognitive supports, permitting students to examine more complex and interesting relationships (Sedig & Liang, 2006). Finally, learning objects are adaptive, allowing users to have a certain degree of control over their learning environments, particularly when they are learning and for how long.

A majority of distance learning courses are based on a more traditional lecture format, and the use of learning objects can help shift the pedagogy to a more interactive, problem solving environment.

## **Characteristics of Good Learning Objects**

Burgess & Russell (2003) note that the materials provided in distance learning courses are the most significant predictors of success. Simply using learning objects, though, does not guarantee a high-quality learning experience. One must be able to separate the proverbial wheat from the chaff. Formal methods to evaluate the quality of learning objects, though, are noticeably absent in the literature. Recently, Kay & Knaack (2007b) have developed and tested an evaluation metric based on key principles of instructional design. The results of this study suggested that students benefit more if the learning object has a well organized layout, is interactive, visual representations are provided that make abstract concepts more concrete, instructions are clear, and the theme is fun or motivating. It should be noted that it is desirable to have all these characteristics and that any single problem area can undermine the effectiveness of the learning experience. This claim is also supported by Harper et al. (2004) who noted that students who perceive specific technological tools as ineffective will be far less receptive to distance education.

## **Finding Learning Objects**

While there are numerous collections of learning objects available, one collection stands out from the rest – MERLOT. Located at [www.merlot.org](http://www.merlot.org) it is a “leading edge, user-centered, searchable collection of peer reviewed, higher education, online learning materials”. Key subject areas include arts, business, education, humanities, mathematics and statistics, science and technology, and social sciences. This database of over 16,000 learning objects is an ideal place to start for a distance education instructor.

## **Evidence to Support the Use of Learning Objects**

In a recent review of 58 articles on learning objects (Kay & Knaack, 2007a), only eight evaluated the actual use of learning objects (Adams, Lubega, Walmsley, & Wil-

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