Encyclopedia of Distance Learning
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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 (Bur- gess & 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
- DNA from the beginning at: http://www.dnaftb.org/dnaftb/
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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; Caroll & 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.

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 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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Various methods of evaluation were used including informal or qualitative feedback (Adams et al., 2004; Bradley & Boyle, 2004; Cochrane, 2005; Kenny, et al., 1999; Krauss & Ally, 2005; Macdonald et al., 2005; Nesbit, Belfer, & Vargo, 2002; Van Zele, Vandeaele, Botteldooren, Lenaerts & 2003). Various methods of evaluation were used including informal or qualitative feedback (Adams et al., 2004; Bradley & Boyle, 2004; Cochrane, 2005; Macdonald et al., 2005), descriptive analysis (Krauss & Ally, 2005; Macdonald et al., 2005), convergent participation (Nesbit et al., 2002), formal surveys (Cochrane, 2005; Krauss & Ally, 2005), and learning outcomes (Adams et al., 2005; Bradley & Boyle, 2004; Macdonald et al., 2005; Van Zele et al., 2003).

In all eight studies, students and/or professors reported that learning objects had a positive impact. Learning objects that offered clear instructions, engaging activities, and interactivity (Cochrane, 2005; Krauss & Ally, 2005; Macdonald et al., 2005) were rated as most successful. Clearly more research on broader populations is needed (Duval, Hodgins, Rehak, & Robson, 2004), however the preliminary results are promising.

CHALLENGES

Finding What You Want

A big challenge for distance education instructors will be finding learning objects that cover the desired concepts. While MERLOT makes the search process easier, testing and evaluating a series of possible learning objects takes time. Therefore time saved in not having to create learning objects is partially offset by “search” time.

Instructional Wrap

One characteristic that has not been formally examined is “instructional wrap” or specific instructions and strategies for teachers on how to use a particular learning object effectively. It is speculated that this guidance would be appreciated and perhaps essential for integrating learning objects into distance education courses. One cannot expect a typical learning object to stand on its own – scaffolding and leading questions are necessary for a student to investigate and construct meaning. Developing effective “instructional” wrap can take considerable time depending on the goal of the instructor. A number of very good learning objects in MERLOT, for example, do not provide this critical guidance. However, one could argue that this kind of course preparation would take no longer to develop than a traditional lecture and that it could be used repeatedly in future courses.

Evaluating Learning Objects in Distance Education

A number of authors note that the “learning object” revolution will never take place unless instructional use and pedagogy is explored and evaluated (Maclaren, 2004; Muzio et al., 2002; Richards, 2002; Wiley, 2000). Agostinho et al. (2004) and Wiley (2000) add that the learning object research agenda must begin to investigate how learning objects can be used to create a high quality instruction or “we will find ourselves with digital libraries full of easy to find learning objects we don’t know how to use” (p.2, Agostinho et al., 2004). Finally, Duval et al., (2004) note that while many groups seem to be grappling with issues that are related to the pedagogy and learning objects, few papers include a detailed analysis of specific learning object features that affect learning. Clearly, there is a need for empirical research that focuses on the pedagogical qualities of learning objects. The evolution of learning objects in distance education will be short indeed, unless educators and researchers assess learning effectiveness.

CONCLUSION

Distance education, despite a list of real obstacles, has grown rapidly over the past ten years. Nonetheless, the pedagogy behind most distance education courses is largely based on a traditional lecture format coupled with online discussion. In order to address some of the obstacles and to promote interactivity, problem solving and constructivism, learning objects offer a possible solution. Defined as “interactive web-based tools that support learning by enhancing, amplifying, and guiding the cognitive processes of learners”, they are relatively easy to learn and use and are readily and freely available. If a learning object is well organized, interactive, provides visual representations that make abstract concepts more concrete, and offers a clear “instructional wrap”, it is likely that students of distance education course will benefit. Finding effective learning
objects with appropriate guidance for teachers is time consuming, but potentially a worthwhile process.

REFERENCES


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**KEY TERMS**

Constructivism: An approach to learning where student is required to construct or develop meaning. Typically, students work with tools and/or open end problems. One could also think of this philosophy as learning by doing or student-centered learning.

Instructional Wrap: Instructions or guiding questions that help a user effectively explore a learning object.

Learning Object: An interactive web-based tool that supports learning by enhancing, amplifying, and guiding the cognitive processes of a learner

MERLOT: Multimedia Educational Resource for Learning and Online Teaching

Pedagogy: The strategies, techniques, and approaches that teachers can use to facilitate learning.

Scaffolding: An approach to learning where students are given hints, leading questions, or a basic cognitive structure to guide their learning.