

The Design of Learning Objects by Learners

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Abstract: A new instructional design paradigm has recently emerged due to the technological innovation known as learning objects (LO). Educational professionals anticipate that learning objects can realize the goals of technology-based learning: adaptivity, generativity, and scalability. Reflecting the popularity of the learning objects movement, many development initiatives have focused on the use of this design approach for the creation of instructional programs. However, these efforts have been criticized for a lack of theoretical background to facilitate learning. In response to this criticism, researchers have worked to apply learning theories and rigorous instructional design processes to develop and design learning objects. These efforts toward adding a theoretical background have provided good support for instructional designers and developers to create pedagogically effective learning materials. But, current research needs to pay more attention to what learners can bring to the design and development of learning objects. A learner-centered design strategy could allow learners the potential to create and repurpose learning objects and share them with others, in addition to using existing learning objects for their own educational enhancement. In view of such a possible design strategy, it seems necessary to investigate the feasibility and effectiveness of the design of learning objects by learners. Investigative inquiry could examine the application of a “learners-as-designers” approach, whereby learners design and develop learning objects using a learning object development tool. To explore the effectiveness of this approach, this future research proposes to find how various learners’ characteristics interact with the ability to design learning objects.

Keywords: learning objects, learning objects development tool, learners as designers, learner characteristics

Technology Based Learning and Learning Objects

When new technologies emerge, educational professionals are often eager to apply the innovations to learning. Such eagerness seems to be well supported by some research results of technology-based learning. According to Fletcher (2003), technology-based learning has proven to be effective and efficient toward reaching learning outcomes. More than anything, educators expect that technology will make learning more adaptable, generative, and scalable (Atkinson & Wilson, 1969).

Out of many technologies recently, learning objects have been considered as a way to realize the goals of technology-based learning. Wiley (2002, p.20) mentioned learning objects “...may provide the foundation for an adaptive, generative, scalable learning architecture... [wherein both] teaching and learning as we know them are certain to be revolutionized”. Early results of learning objects research demonstrate great savings in terms of time and cost (Dodds, 2002).

Reflecting increased interest in learning objects, various consortiums have been formed to develop shareable content. These consortiums include the Alliance of Remote Instructional Authoring & Distribution Networks for Europe (ARIADNE), the Aviation Industry CBT Committee (AICC), the Institute for Electrical and Electronics Engineers Learning

Technology Standards Committee (IEEE LTSC) and the IMS Global Learning Consortium. To consolidate the works of these groups, the Advanced Distributed Learning (ADL) of the U.S. Department of Defense has driven an initiative to establish international standards for learning objects. ADL has proposed Sharable Content Object Reference Model (SCORM) and SCORM 2004 has been adopted internationally in industry, government, and education. (ADL, 2006)

Defining Learning Objects

While there are international standards for the development of learning objects, there has been no agreed upon definition of learning objects. Reflecting the differing interests of various stakeholders, each sector has proposed different definitions. From an industrial perspective, CISCO (2003, para.1) states that learning objects are “based on a single learning objective built from a collection of static or interactive contents and instructional practice activities”. From engineering perspective, IEEE (LOM, 2002) defined it as “Any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning” From learning perspective, Wiley (2002, p.6) defined learning objects as “any digital resource that can be reused to support learning”. In this study, based on the repeated terms (learning, technology and reuse) in the aforementioned definitions, learning objects will be defined as any reusable e-Learning element.

Learning objects are reused in different contexts, leveraging the potential to combine with or separate from other learning objects. A conceptual metaphor for learning objects can be found in the popular children’s toy known as Lego blocks (Hodgins, 2002). One Lego block combined together with other Lego blocks can build a horse or a knight. All of these combined Lego blocks (horse, knight, and etc) are used to build a Castle. And, later, these combined Lego blocks can be separated and each Lego block can be re-used in another context, such as the StarWars or Harry Potter series. Likewise, one learning object (content) combined with other learning objects (picture, animation, practice, etc.) build into larger objects (one module). One module together with other modules build into the terminal (largest or larger) objects (one course). And, combined learning objects are separated from each other and each learning object is reused in different contexts (different modules and different courses).

Reusability is the key characteristic of learning objects. The reusability feature helps to make learning more adaptive, generative and scalable. Learning can be adaptive to individual learners by reusing only learning objects appropriate to needs of individual learners out of the repository of learning objects. This is different from the current practice of providing the same course contents and the interface to all learners regardless of learners. Also, currently, to develop a new learning course, instructional designers and developers create learning contents and media from the scratch. However, learning objects enable instructional designers and developers to generate a new course easily by reusing existing content and media for a new learning course. Due to this generative feature, learning can be scalable by reaching greater number of learners in a cost-effective way.

Current Research

As reusability is the key to the efficiency of learning objects, many design and development efforts have been focused on technological issues to make learning objects sharable across various technology-based learning environments. This trend is reflected by the SCORM standards and other related activities. The goals of SCORM are Accessibility, Interoperability, Durability and Reusability. SCORM 2004 provides a SCORM content

aggregation model and a SCORM Run Time Environment. These SCORM efforts are focused on the technical aspects of learning objects. Many organizations have been working to define metadata for learning objects and develop a repository where learning objects are stored.(Schantz, 2004). However, even though these developmental efforts have been widely accepted, they have also been criticized for lacking a foundation based in learning theory (Wiley, 2002).

Wiley (2002) emphasized the consideration of learning theory and instructional design for the development of learning objects. In line with Wiley's emphasis, recently researchers have worked to apply learning theories to develop and design learning objects. Bradley and Boyle (2004) viewed learning objects as reusable micro-contexts and attempted to develop pedagogically rich learning objects. Lim, Lee & Richards (2006) identified interactivity as important pedagogy and developed learning objects accordingly. Kang, Lim & Kim (2004) developed a tool which develops and designs learning objects based on various learning theories and instructional design models. Also, Schantz (2005) based Human Performance Technology and Sensemaking on the development of the metadata sets of learning objects. Based on Behaviorism and Cognitivism, IDXelerator and Interactive Media's Learning Database and Fountain Development Tool were developed (Banna-Ritland, Dabbagh, & Murphy, 2002).

The review of current research shows its focus on designing and developing learning objects for the effective and efficient use by instructional designers and developers. As job aids for instructional designers, various tools have been developed: Learning Designer (Kang, Lim & Kim, 2004), IDXelerator, and Learning Database and Fountain Development Tool (Banna-Ritland, Dabbagh, & Murphy, 2002), Teaching-Material Design Center (Wang & Hsu, 2006). Constructivist learning environments for learning objects were suggested to provide theoretical guidelines for instructional designers (Banna-Ritland, Dabbagh, & Murphy, 2001). Orrill (2001) proposed guidelines for designing learning objects for inquiry-based, online learning for instructional designers.

Shifting Focus to the Learners

Recent efforts toward realizing the potential of learning objects to create adaptive, scalable, and generative instruction have been successful. However, current research seems to neglect another change that learning objects can bring about. The use of learning objects can facilitate a new learning environment where the exchange of instructional content is common among learners. In this new paradigm, learners can have greater control over their learning experiences with the ability to create learning objects and share them with others, in addition to using existing learning objects for their own learning (Collis & Strijker, 2001). In considering the changing role of learners as active creators of learning objects, there is a need to shift the focus from instructional designers and developers to learners.

While most current research focuses on the design of learning objects by instructional designers, there are some efforts to involve learners in the design of learning objects. Schantz (2005) developed metadata for learning objects based on the needs of learners. Recker, Walker & Wiley (2001) developed a system where learners share opinions of quality of learning objects and locate other learners with the same interests. Williams (2001) provided guidelines for including an evaluation process for learners to assess the design of learning objects. In these efforts, however, learners are considered during the design process, but instructional designers still determine how learners will use learning objects.

By focusing on the active role of learners in a new paradigm, this study suggests a “learners as designers” approach as a theoretical background. This approach targets a learner-centered development model by offering learners more control over the use of learning objects, instead of treating learners as passive recipients of ready-made instructional materials.

In addition, this “learners as designers” strategy seems to provide some insights into the effectiveness of learning objects from a new perspective. Current evaluations of learning objects have focused on the efficiency and the effectiveness from the perspective of instructional designers and developers. Wang and Hsu (2006) were interested whether the design of learning objects shortened the development time of a course. Bradley and Boyle (2004) attempted to evaluate the effectiveness of learning objects based on the pass rate of the students who completed a course using learning objects. Kang, Lim & Kim (2004) reported the perceived values of learning objects from instructional designers. Different from these perspectives, a learner-centered model will evaluate the effectiveness of learning objects designed by the students, not by others.

The design of learning objects by learners seems to be well supported by the literature on learners as designers. Learners as designers are traced back to Dewey’s learning by doing (Dewey, 1958). Wiggins (1998) stated the great potential of the design process for learning. The importance of student ownership in learning was stressed by Hannafin, Land & Oliver (1999). The “learners as designers” approach is known to promote the ownership of learning (Carr-Chellman & Savory, 1996). Harel & Papert (as in Honebein, Duffy & Fishman, 1993) showed that learners acquired the knowledge of the instructional content, software design and instructional design via the design of a computer program.

However, there are some challenges to the “learners as designers” paradigm. Driscoll (2005) stated the success of learners as designers depends on the competency and willingness of learners. Carr-Chellman & Savory (1996) mentioned current research efforts have lacked the consideration of learner characteristics. To deal with the challenge of the “learners as designers” approach, this proposed study will focus on investigating the interaction between the design of learning objects by learners and various learner characteristics (self-efficacy, motivation, metacognitive capabilities, technical skills, locus of control, etc).

Selecting a Learner-Centered Development Tool

As a tool for learners to design and develop learning objects, this study proposes the use of an existing developmental tool commonly used by instructional designers and developers. There are no learning objects development tools designed specifically for learners. However, the use of a currently available authoring scheme seems appropriate, as learners are considered as instructional designers and developers in this study. Also, the result of the suggested study will be able to provide the valuable input for the future development of learning objects tool for learners.

There are many learning objects development tools currently available and commonly used. From the variety of possible programs, an open source development tool will be used considering the rapid adoption of open systems. Some possible open source development tools include XML SCORM, Reload Editor 2004, Aloha, ATutor, Burroket, Claroline, ILIAS, Mine Labs, Melete, and Moodle (ADL, 2006). These tools are user-friendly and have many useful features that can facilitate the design and development of learning objects for users who do not have technical knowledge. Some features of open source learning objects development tools can be explained referencing an example of one such tool - Reload 2004

(ADL, 2006). Reload 2004 was developed by Bolton Institute in the UK. Reload is SCORM 2004 compliant and develops the metadata of learning objects. Reload 2004 imports existing files and creates the instructional organization easily through “drag and drop” functionality, as shown in the Figure 1. And, after creating learning objects, Reload provides a preview in a web browser, as in Figure 2. (Reload, 2006).

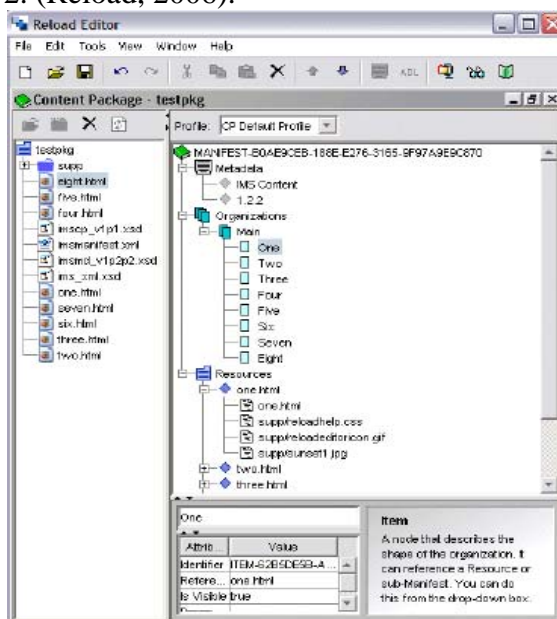


Figure 1: Reload 2004

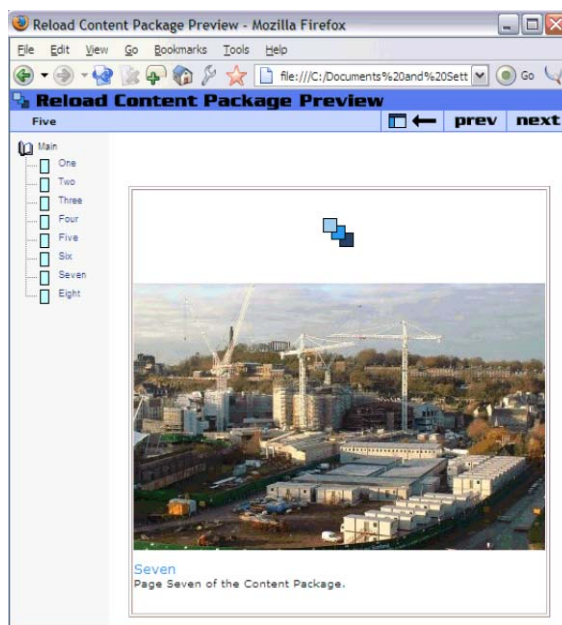


Figure 2: Reload 2004

Conclusion

In this overview, we have examined some trends of current research related to learning objects. Researchers have examined the feasibility and effectiveness of the use of learning objects within current instructional design processes and models. By adopting a learner-centered design paradigm, this study proposes the design of learning objects by learners. This developmental research will be conducted and empirically tested at Virginia Tech.

For this study, the features of various open-source learning object tools need to be more thoroughly analyzed in order to choose an appropriate development tool. According to the principles of the “learners as designers” approach, a learning environment will be created in which learners will use this tool to design learning objects for their own instructional purposes. Various learner characteristics will be surveyed before the learners participate in the design of learning objects. After learners complete the self-designed instruction, statistical analysis will be conducted to see how various characteristics interact with design of learning objects. The results of this empirical study are expected to provide valuable insight into the evolution of the learning objects movement.

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