Re-purposeable Learning Objects Based on Teaching and Learning Styles

Abtar Kaur, Open University of Malaysia
Jalan Tun Ismail
Kuala Lumpur, Malaysia
Tel: 03 - 2773 2002
Fax: 03 - 2697 8824
abtar@oum.edu

Jeremy Dunning, Indiana University, Arjuna Multimedia, and Open University of Malaysia
Geology Department Indiana University
Bloomington, IN 47401, USA
Tel: (812) 336-3166
FAX: (812) 855-9982
dunning@indiana.edu

Sunand Bhattacharya, ITT Educational Services Inc.
105 E. 126th Street
Indianapolis, IN 46203, USA
bhattacharya@itt.edu
Tel: (317) 456-2100
Fax: (317) 456-7899

Ansary Ahmed, Open University of Malaysia
Jalan Tun Ismail
Kuala Lumpur, Malaysia
Tel: 03 - 2773 2002
Fax: 03 - 2697 8824
ansary@oum.edu

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Abtar Kaur, Open University of Malaysia; Jeremy Dunning, Indiana University, Arjuna Multimedia, and Open University of Malaysia; Sunand Bhattacharya, ITT Educational Services Inc.; and Ansary Ahmed, Open University of Malaysia

ABSTRACT

Interactive multimedia learning objects are becoming and important part of high quality online education. The cost of producing such learning objects can be prohibitive. Re-purposeable learning objects made with the TALON learning object templates allow instructors with little or no programming experience to produce highly interactive and immersive learning objects. The learning object templates are based on key styles of teaching and learning and can be used to create new learning objects within those styles, without creating new source code. The 39 templates allow instructors to create learning objects simply by inserting text, and media (images, movies, etc.) because they closely mimic specific teaching strategies.

INTRODUCTION

Web-based distance learning is hampered in many cases by a failure to deliver material in a manner consistent with the ways in which students learn and instructors teach best in traditional environments (Samorski, 2002). Excellent teachers are successful because of the ways in which they mediate content and place the content within the context of the subject matter. It is not the specific content or images the successful teacher presents, but

rather the manner in which they are presented and framed within the scope of the topic area. Excellent teachers teach by presenting the content and then providing the students with substantive opportunities to apply the content to real-world problems in an effort to promote critical thinking on the part of the student. This is a highly interactive process with much information being transmitted between the student and the instructor. The interchange between the instructor and the student helps the student build a knowledge base with the assistance of the instructor's experience and expertise in the topic area. The exact nature of the interchange is not predetermined and depends to a great extent on the creativity and breadth of experience of the instructor. The successful instructor adjusts his or her interaction with the student to the learning styles best suited to the students. How do we provide the learner with this important component of traditional classroom education in asynchronous distance education or technology-mediated traditional classes? Web-based instruction is rapidly becoming the preferred mode of distance education and we must adapt our instructional interaction styles to this medium. Our students now expect more interactive and immersive materials in web-based learning than that typically provided in the traditional classroom or correspondence distance education (Samoriski, 2002)

The TALON learning object system is a series of re-purposeable learning object templates based on styles of teaching and learning as described by (Dunning et al 2002). These Flash-based templates allow instructors to design and execute interactive learning objects in approximately 10% of the time required to create them from first principles, because the use of them requires little or no alteration of existing source code or writing

of additional code (Abtar et al 2004, Dunning et al 2004). The fact that the learning objects are based on the successful learning styles experienced in the traditional classroom ensures that the student is both engaged and allowed to build a knowledge base about the content being covered.

BACKGROUND

The overall online course design process can be broadly classified into three phases: Development, delivery and results. The development phase is collaborative in nature where the actual course gets designed and constructed, the delivery phase is where the instructor interacts with the students via the online course, and the third phase is where outcomes translate into learning competencies.

Retention and attrition issues in an online course are often attributed to the level of interest the course generates. The immersive nature of a course depends on its engaging features. Often, complex concepts or phenomena can be better taught through interactive models that encourage the student to explore and learn. Appropriate design of a distance education course delivered through suitable media and using befitting strategies enhances learning (Fennema, 2003). Designers of effective distance courses delivered through the Internet must consider the interactivity of the medium and employ it to enhance the instruction of the distance learner (Hirumi and Bemudez, 1996: Starr, 1997).

Learning Objects. Learning objects have been defined in a number of ways by many researchers. Some define learning objects as any visual feature that engages the student's attention (Wiley, 2000). Others require a certain degree of interactivity for material to be considered a learning object (Wisconsin Online Resource Center, 2003). For the purposes of this discussion it will be assumed that learning objects must be interactive to be considered true learning objects. The National Learning Infrastructure Initiative defines learning objects as "modular digital resources, uniquely identified and metatagged, that can be used to support learning. " The common threads in all of these definitions are summarized in the table below.

Table 1: Attributes of Learning Objects

Learning objects help students:	Identify features and processes interactively through visual learning.
Learning objects allow students:	To solve real-world problems by immersion in an interactive scenario, based on the content they are covering.
Learning objects provide students:	With the opportunity to make and interpret empirical observations in a digital environment that simulates a real-world situation.
Learning objects help students:	Develop critical thinking skills and in some cases verbal skills.
Learning objects help students:	Realize that they have achieved certain learning benchmarks and build confidence in their mastery of the content.

Learning Styles. Although most educational researchers agree that individual differences in the ways in which students learn play a role in learning, there is little agreement on the nature of the different ways students learn. There is little agreement even on the terminology applied to ways in which students learn. Terms such as learning styles, cognitive styles, learning preference, learning strategies, and learning modalities are all used to describe the same basic phenomenon; the manner in which students learn. Researchers use these terms almost interchangeably however, learning styles is the most commonly used term and will be used here. Learning style is generally accepted to be a student's existing learning strengths or preferred manner of learning (Kaplan and Kies, 1995).

Marineti (2003) and De Bello (1990) among others have classified learning style as a subset of cognitive style. Others (Morse, 2003) feel that learning style encompasses cognitive style. The majority of researchers agree that individuals have different learning styles and that an individual modality of learning is not as effective for all learners (Sims and Sims, 1995). Sadler-Smith (1997) identified four categories of learning styles: cognitive personality elements, information processing style, instructional preferences, and approaches to study.

A number of assessment tools and "quantitative" indices have been developed to define an individual's learning and cognitive styles. The early, seminal work includes the Myers-Briggs Type Indicator, the Cognitive Preference Test (Messick, 1984), the

Cognitive Style Profile (Kuckinskas, 1979), and the Learning Style Inventory (Kolb, 1976). More recent review of learning and cognitive styles includes Dunn (2003) and Fennema (2003)

Collaborative learning is an important learning style that has so far been restricted for the most part to the traditional classroom, where it has been a successful learning strategy. Recent work by Hislop, Hassell, and Wiedenbeck (2003) and Hildebrandt (2003) has demonstrated that collaborative learning can be effectively executed in an online environment.

RE-PURPOSEABLE LEARNING OBJECT TEMPLATES

One of the struggles faced in distance education and technology-mediated instruction is providing interactive and highly experiential learning exercises. Learning objects are useful in this setting because they allow the student to use the content learned in a particular part of a course and; (1) demonstrate mastery of the content, (2) apply that knowledge to solving a problem, and (3) use the content in a critical thinking exercise that allows the student to place the content within the context of the larger course topic.

Learning Objects may be problematic in several ways. First, they require some multimedia programming and they are therefore beyond the abilities of typical instructors, who may only be capable of creating course support materials within simple authoring tools such as PowerPoint. Additionally, these objects are usually created from

first principles each time, and the cost of providing substantive interactive learning objects may be prohibitive. In part the cost is related to the fact that the programmers and instructional designers may not know a great deal about the subject matter and the instructors may know little about multimedia design and programming. Both groups therefore operate within their own areas of comfort and there is little real communication outside of those areas.

It is clearly impractical to teach each instructor about multimedia programming and teach each programmer about specific subject matter areas. What is practical is to define learning objects in terms of the styles in which we teach and learn. All of us understand how we learn, and there are a finite number of learning styles. Educators tend to teach to those learning styles, consciously or not, because they know from experience that teaching styles that are linked to the ways in which students learn are most effective**. If we were to define learning objects more in terms of the teaching and learning styles the objects utilize and less in terms of the specific content or programming strategy, programmers and instructors could more clearly understand each other and the role each plays in the design process. The instructor can be more involved in the design of the learning objects if the objects are defined in terms of a context (teaching and learning styles) that he or she can understand. Developing a common language of design cuts the cost of developing individual learning objects because it reduces the number of modification cycles between the subject matter expert and the programmer. The cost remains high however if each object is designed from scratch. It also allows designers

and programmers to move from content area to content area using the same nomenclature and design principles because teaching and learning styles are independent of topic area.

If learning objects are defined in terms of a limited number of teaching and learning styles, they are independent of content area to a great extent. We should therefore be able to create templates for learning objects that are based on learning or teaching styles. The templates would be designed so that they could be reprogrammed for any content area at minimal expense. This would allow instructors to design learning objects for their courses using most of the existing code for the template. A multimedia programmer would then insert the graphic and text elements required to complete the learning object in the design executed by the instructor. In most cases less than 5% of the code for the template would need to be rewritten each time the learning object is reconfigured.

The TALON/ learning object suite, developed by Arjuna Multimedia and further developed in conjunction with Open University of Malaysia, is a set of 39 re-purposeable learning object templates based on styles of teaching and learning that are designed to allow instructors and designers to create substantive learning objects without changing any of the source code. The instructor or designer can use the templates to design a new learning object without writing or changing any source code. The templates are simple enough that instructors with little or no programming experience can create their own learning objects. For more information about the TALON Learning Object Suite, please visit:

http://www.arjunamultimedia.com/Website/encycl.htm

The TALON system does not rigorously follow any single model, described previously, of learning styles and is based on the learning styles and strategies as defined by a group of over 30 university and high school instructors. These strategies are based more on the instructors' experiences than on any particular theoretical model of teaching styles and strategies. Because of this, they combine the features of many of the models described previously.

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TERMS AND DEFINITIONS

Distance learning is learning in which the instructor and students are separated by time, distance or both.

Flash is a multimedia authoring tool in which interactive learning objects may be created.

Interactivity occurs when a student works within a multimedia exercise in which the student and the program interchange information in order to complete the exercise.

Learning Objects are interactive computer-based exercises in which a student utilizes critical thinking skills, achieves learning benchmarks, and displays mastery of content.

Learning Style is generally accepted to be a student's existing learning strengths or preferred manner of learning.

Re-purposeable Learning Objects are learning objects that are designed as templates that can be reconstructed to serve new learning objectives.

Technology-mediated Instruction is learning that is aided or entirely accomplished through the use of computer-based technology.