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A Primer on Learning Objects
By Warren Longmire

Designers and developers of electronic learning today are being presented with a new content development landscape. Learning technology standards organizations are quickly moving towards open and industry-wide standards for learning objects. As learning content developers look at these initiatives that focus on packaging, identifying, and exchanging content, they are bound to ask, "What does this mean for me? How will my work be different in the future?" This article describes some of the challenges and opportunities that reusable learning objects (RLOs) present to content developers as the object-oriented approach is adopted in more learning interventions.

Why develop content as learning objects?

Most electronic learning content is currently developed for a specific purpose such as a course or a situational performance intervention, and not for the sake of populating an objectbase (a collection of learning objects, typically contained or referenced in a relational database). However, as object content increasingly becomes a valuable commodity, we will see more content developed specifically to be deployed as learning objects in multiple settings. Why would designers wish to add a layer of complexity to their work by including object capability in their design? The reason is that their content gains a "value-add" that in most cases will pay off many times over (in terms of costs, development time, and learning effectiveness).

The object approach can satisfy both immediate learning needs--such as a knowledge-based or skills-based course--and current and future learning needs that are not course-based. There are several arguments for designing and developing material to be reused as learning objects, including the following:

- **Flexibility.** If material is designed to be used in multiple contexts, it can be reused much more easily than material that has to be rewritten for each new context. It's much harder to uncouple an object from the context of its parent course and then recontextualize it than it is to contextualize as part of design and development.

- **Ease of updates, searches, and content management.** Metadata tags facilitate rapid updating, searching, and management of content by filtering and selecting only the relevant content for a given purpose.

- **Customization.** When individual or organizational needs require customization of content, the learning object approach facilitates a just-in-time approach to customization. Modular learning objects maximize the potential of software that personalizes content by permitting the delivery and recombination of material at the level of granularity desired.

- **Interoperability.** The object approach allows organizations to set specifications regarding the design, development, and presentation of learning objects based on

organizational needs, while retaining interoperability with other learning systems and contexts.

- **Facilitation of competency-based learning.** Competency-based approaches to learning focus on the intersection of skills, knowledge, and attitudes within the rubric of core competency models rather than the course model. While this approach has gained a great deal of interest among employers and educators, a perennial challenge in implementing competency-based learning is the lack of appropriate content that is sufficiently modular to be truly adaptive. The tagging of granular learning objects allow for an adaptive competency-based approach by matching object metadata with individual competency gaps.

- **Increased value of content.** From a business standpoint, the value of content is increased every time it is reused. This is reflected not only in the costs saved by avoiding new design and development time, but also in the possibility of selling content objects or providing them to partners in more than one context.

Ideal attributes of RLO content

There are two requisite components of a learning object: the object content and its metadata tag. Descriptions and keywords provide some degree of context, yet ideally there are additional contextualizing options. As software developers race to produce authoring and tagging tools, it remains to be seen what various context-enriching options will be available. The most desirable tools will permit scalable contextualization so that learners can control the extent to which context is presented with content.

In an environment in which context is scalable and adaptive, the ideal RLO content is
- modular, free-standing, and transportable among applications and environments

- nonsequential

- able to satisfy a single learning objective

- accessible to broad audiences (such that it can be adapted to audiences beyond the original target audience)

- coherent and unitary within a predetermined schema so that a limited number of metatags can capture the main idea or essence of the content

- not embedded within formatting so that it can be repurposed within a different visual schema without losing the essential value or meaning of the text, data, or images.

Creating specifications

When learning content is created both for immediate purposes and for use as RLOs, designers and developers must enlist a sort of "double vision." This entails conceptualizing content as part of a larger whole (such as a course) and as stand-alone information at the desired level of granularity. These do not have to be conflicting activities, though to accomplish both successfully and efficiently requires thoughtful planning. RLO content needs to be grounded in solid

instructional design, so the new landscape of learning objects will welcome the efforts of experienced instructional designers.

The key planning activity in the design phase is the creation and articulation of specifications for content development. Specifications need to cover the range of development concerns, including technologies to be used, document templates, markup definitions (for example, the Document Type Definition in SGML-based software), editorial standards, modularity requirements, structural rules, and the level of granularity desired. If these components are not decided in advance, developers may waste time re-creating content to meet the needs of either the project at hand or reusability requirements.

Once specifications are established, they can be reused or tailored for individual projects. Some broad content development specifications that we've developed as part of learning-object templates include

- Consistent use of language and terminology within a topic area. Consistent terminology allows discrete objects to be easily disassembled and reassembled, retaining consistent meanings that are reflected in contextualizing reference documents. For example, in an "objectized" course on e-commerce, the decision was made to consistently refer to online shoppers as "consumers," instead of using "customers" and "consumers" interchangeably. This helps prevent potential learner confusion in the event of adaptive re-assembly of the lessons.

- Presentation of information in easily accessible and comprehensible formats. For example, detailed or technical information may be better presented in tables, bullets, or columns rather than in sentences and paragraphs.

- Presentation of information for onscreen consumption. As RLOs will most frequently be accessed and used onscreen, standard techniques of Web content design should be followed. For example, dense text should be chunked into smaller units.

- Nonsequentiality of information across objects. Information needs to be free-standing and easily adapted to multiple contexts. This means there should be no backward-forward referencing across objects (such as references to previous chapters). There are a number of techniques for handling this requirement, such as the use of mini summaries that provide just enough context to introduce a concept, and the use of tagged context "wrappers." Of course, within an object it may be necessary to present information sequentially. For this reason, it is necessary to determine the granularity, or size, of the smallest object before beginning development.

- Uniformity of editorial tone across objects. Unless an object is specifically tagged as an introduction or conclusion, it should not have the editorial tone of an opening or a conclusion.

- Use of keywords in searchable elements. If certain keywords will be used to link specific content areas, searching capabilities will be improved by actually using the keywords in titles and searchable elements, such as tables of content and indexes.

- Use of language and content appropriate for a broad audience. For an object to be reused with minimal manual customization, the content needs to be appropriate for a broad audience. Regional terminology or audience-specific humor may not be appropriate. If colorful language or humor are desired when delivering the object as part

of an engaging learning experience, these components are better added at the contextual level (and can be part of the personalization of learning content).

Challenges for developers

In some ways, developing in the learning object environment goes against the hallmarks of good technical or expository writing that developers and writers learned in writing class. Object content doesn't "flow" across objects either as an argument or as cumulative knowledge. Within the object itself, colorful writing should be avoided. Yet one might argue that there is an art--or at least a distinct skill--to writing within such an environment. Complicated, nuanced, or chronological content present challenges that need to be negotiated either by the writer or via template-based solutions. Likewise, a writer needs to be able to reference information in other objects without violating modularity, but also without making the learning experience tedious for learners.

Alongside these challenges, there are also numerous opportunities for content developers in an object-oriented environment. The greatest benefit for developers is the reusability of existing content. With appropriate tagging and knowledge management practices, RLOs can reduce time spent researching and accessing content, thus facilitating rapid creation of new electronic learning content. A positive by-product of the object approach is that emphasis on planning and modularity requires the purpose and main idea of content to be very clear before beginning development, thus reducing the need for rethinking of content.

Creating context

The key for deploying learning objects effectively is to provide ways for the learner to contextualize the information. Without context, learning objects can be confusing, misleading, or utterly meaningless. Context is the second path for personalization of objects (after adaptive selection of appropriate objects based on individual needs). Providing the original context of an object will often be inappropriate (and in many cases defeats the adaptive purposes of breaking instructional material down into smaller objects). Yet how much context is enough? Perhaps a better question would be: How can context be scalable in expanse and type, so that the learner can decide how much is needed?

Constructivist theories and active learning theories have helped educators understand the way learners actively create meaning by exploring, experimenting, testing, and applying knowledge in self-directed and collaborative fashions (rather than in a predetermined course of study). Use of learning objects will empower online learners in unprecedented ways by enabling them to participate more actively in the contextualization of information. In this paradigm, context is not something that is simply provided to a learner. Instead, contextual information has two functions: to orient objects to their original or most likely contexts, and to provide cues for learners to apply their own meanings and contexts to the information.

Context strategies

There are many ways to enable contextualization of learning objects, depending on the systems and technologies available and on the extent to which the learning content needs to be adapted to individual needs. Following are some possible approaches.

- **Tailored wrappers.** Context wrappers consist of information that is associated with a

learning object. One object can have multiple wrappers, each providing a different way of contextualizing the object. In a learning environment, an instructional designer might generate multiple context wrappers (some using audience-specific data). When a learner accesses the RLO, the context of the object will be a function of the correlation between learner attributes and content object attributes (described with metadata tags).

- **Tailored context frames.** As noted earlier, ideal RLO content is not addressed to one small audience. However, on the level of context, an object can be personalized with such techniques as humor, visual or linguistic themes, or explanations that relate it to a specific body of knowledge. Object framing and instructional activities can be specific to an organization or group of people, as long as they can be divorced from the object. Context frames can be designed to match learner profile characteristics such as interests, needs, level, knowledge, and performance gaps.

- **Adding context links to objects.** If a development environment allows for editing of learning objects themselves (not just metadata wrappers or context frames), then links can be added to the learning object that point to outside context. This way, developers may spend very little time changing the object and provide links to context that the learner can choose to follow or not. The linked context can be updated and can provide context for multiple objects.

- **Pattern templates.** Pattern templates provide a data structure based on metadata attributes defined by users. For learners (and instructional designers), these templates provide opportunities to contextualize information in a variety of meaningful ways according to variables defined by users. One application of pattern templates is the use of competency models to contextualize learning objects in relation to abilities, knowledge, and attributes of excellent performers in an organization (a performance-based approach to using learning objects).

Whatever development environment and tools are used, sound instructional design will remain important both for customized development and for template-based development. The combination of thoughtful planning with intelligent deployment of advanced authoring tools will result in myriad benefits for both content producers and learners. The most successful learning object delivery systems will be able to provide not only learning object content, but relevant and meaningful context, as well.

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