June 18
2002

# THE eLEARNING DEVELOPERS' JOURNAL™

Strategies and Techniques for Designers, Developers, and Managers of eLearning

THIS WEEK — DESIGN STRATEGIES

## The New Frontier of Learning Object Design

BY ELLEN D. WAGNER

The learning objects model for creating e-Learning products and services offers real promise for creating learner-centered solutions and tools. Objects — stand-alone data elements holding "content," "learning," and "knowledge" — promise to take e-Learning to the next level of personalization and relevancy. Yet for all the buzz, learning designers and decision-makers continue to wonder how to realize those promises.

Clearly, a viable learning object strategy involves much more than a shared content object resource model and metadata tags. This article takes a look at the current status of learning objects. It also explores some critical issues likely to affect the speed and degree to which the learning object model is adopted.

Learning designers need to play a more visible role in the new world of learning objects. Content creation and distribution are the foundation for engaging, collaborative learning designs, but more is needed in order to realize the power of a fully personalized, interactive-rich online learning experience.

### Learning objects: changing the face of e-Learning

E-Learning's most successful commercial niche is online courseware for corporate training. Its adoption is generally the result of expectations for faster times-to-performance or lower costs. Improved documentation and records and information management functionality are also important payoffs.

Even so, e-Learning vendors are more aware than ever that customers want more out of their e-Learning investments. Buyers want to use their own content to customize e-Learning offerings. The final

*Continued on next page*

***Learning objects appear to have significant potential for creating highly personalized learning programs, easily updated courses, and performance support tools. However, as e-Learning has become heavily dependent on technologists, producers, and funders, learning designers have lost their voice and often seem to drop out of the conversation. Learning designers must think about better ways to conceptualize and create resources and programs. Here are some promising leads.***

A publication of
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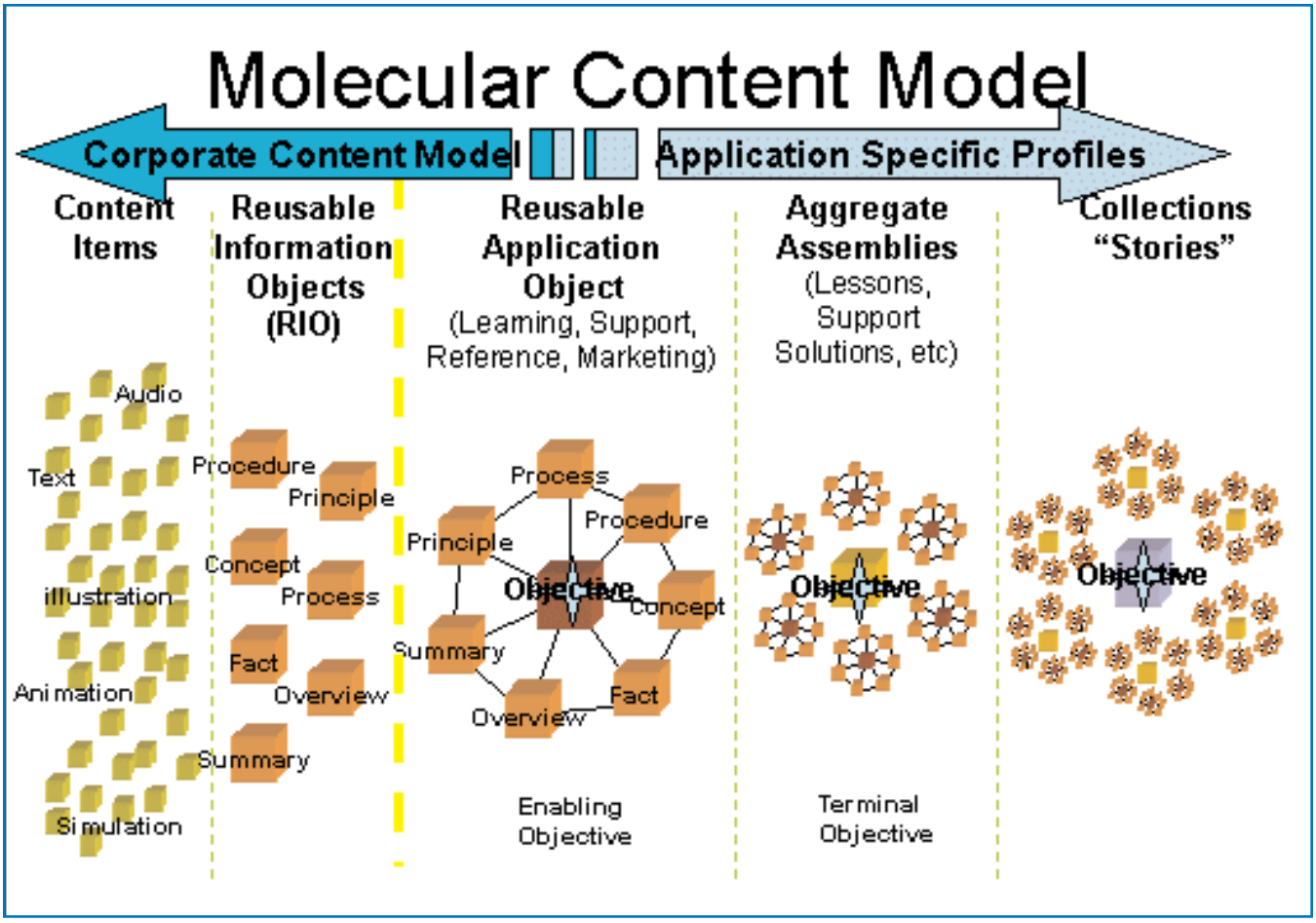


**FIGURE 1** *Objects ensure that complex content can be broken down into smaller, more meaningful chunks that can be assembled and reassembled to meet individual learner requirements. (Used with permission of Wayne Hodgins)*

product may or may not look like conventional courseware. Customers also want to develop their own content, and they want it to play in their chosen Learning Content Management System (LCMS).

Content owners and organizations of all sizes and kinds want assurances that their content will be available to users even if distribution platforms change. This means the content must be in a format that can be reused and moved. These objects may be repurposed for many uses, not limited to training and education.

The education and training community is hungry to know more about learning objects. During the past decade, interest in learning objects has grown slowly but steadily until they have come to represent a "new frontier." Practitioners now expect them to leverage existing information, produce new knowledge, and create new meaning.

Along the way, learning objects have evolved from a computer programming strategy to a metaphor of interoperable content elements. Ideally these elements can be repeatedly assembled and reassembled, creating an unlimited number of forms.

Learning object standards have evolved dramatically in the past several years. There is special interest in accelerating large-scale development of dynamic and cost-effective learning software. The hope is to find a way to build such software with these reusable objects.

The emergence of the Advanced Distributed Learning initiative's Sharable Content Object Reference Model (SCORM) has already altered the face of e-Learning as we've known it. With SCORM and the standards dominating many of today's e-Learning and knowledge management conversations, it looks like objects really are here to stay.

However, in the midst of all the exciting standards developments, more than a few people are feeling confused and left behind in a steady stream of "object technobabble." How do we make sure to keep the "learning" in "learning object?"

## A quick learning objects review

Learning objects are commonly viewed as the smallest element of stand-alone information required for an individual to achieve an enabling performance objective or outcome. Learning object uses include, but are not limited to, online instruction or performance support.

Grounded in the object-oriented paradigm from computer science, learning objects are central to instructional theories offered by such authorities as Dr. M. David Merrill (Professor of Instructional Technology, Utah State University), Dr. Charles Reigeluth (Professor of Education, Indiana University at Bloomington) and others. These theories support breaking down content to constituent parts, then reasse-mbling that content to meet specific learning goals. Many leading practitioners be-lieve that learning objects are a core concept to creating, maintaining, and managing learning content. (See Figure 1.)

**NOTE: Links to all organizations named in this article will be found in the *Guild's* Resource section. — *Editor***

Many writers credit Wayne Hodgins, Director, Worldwide Learning Strategies, Autodesk Inc., for coining the term "learning object." The story goes that in 1992, while watching one of his children playing with Lego™ building blocks, Hodgins realized that his learning design efforts might benefit from plug-and-play interoperable pieces of learning content that could be assembled and reassembled as needed. The rest, as they say, is history.

Peder Jacobsen, Co-Founder and Chief Learning Officer, LogicBay, describes the period from 1992 to 1998 as a time of significant activity in the learning object arena. The Learning Object Metadata Group from the National Institute of Science and Technology and the Computer Education Management Association (CEDMA) began to address learning object issues such as modularity, database centricity and metadata. The Aviation Industry Computer-Based Training Committee (AICC), the International Electrical and Electronics Engineers (IEEE) Learning Technology Standards Committee (LTSC), the Instructional Management Systems (IMS) Global Consortium, and the Alliance of Remote Instructional Authoring and Distribution Networks for Europe (ARIADNE) started their work in the learning object arena, paying particular attention to the development of standards.

Around this same time, Oracle introduced the Oracle Learning Architecture (OLA), an early attempt at an authoring environment using learning objects. Although the OLA never came to fruition at Oracle, Tom Kelly and Chuck Barritts continued their learning object efforts at Cisco Systems. Their efforts culminated with the release of Cisco's white paper on Reusable Learning Objects in 1998.

A number of learning object definitions had been offered by these groups and by individuals. For example, the IEEE LTSC described learning objects as any entity, digital or non-digital, which can be used, re-used or referenced during technology-supported learning. David Wiley, an influential thinker involved in exploring innovative applications, has defined learning objects as any digital resource that can be reused to support learning. Go to http://reusability.org/read.

For vendors of e-Learning products and services, these definitions may be too broad to be functionally useful. E-Learning content and distribution vendors have tended to craft learning object definitions that support the kinds of content development and distribution applications offered by their companies. For example, Asymetrix, Inc. (now Click2learn) once defined learning objects as pre-scripted elements that simplify programming. The Educational Objects Economy (a National Science Foundation funded project) simplified the definition even further, equating learning objects with Java applets. Macromedia's interest in supporting robust interoperable content creation is reflected in its definition, which describes a learning object as instructionally sound content, combined with opportunities for practice, simulation, collaborative interaction and assessment that directly relate to a learning objective or outcome.

Some developers suggest that a typical course should contain a specific number

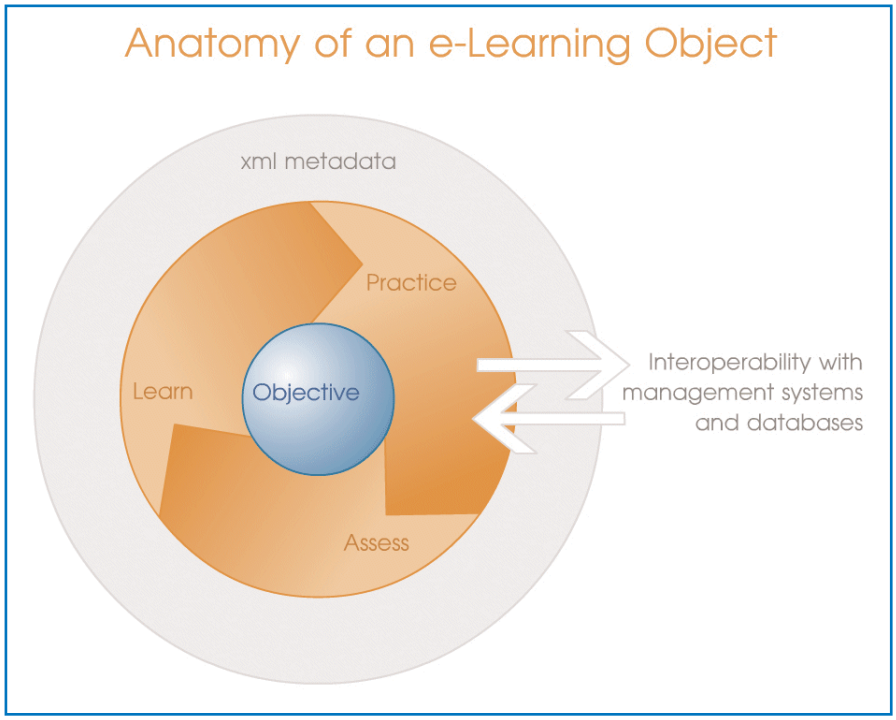


**FIGURE 2** *A learning object is a simple device conceptually, but opinions differ with regard to implementation. (Tanya Heins and Frances Himes. Creating Learning Objects with Macromedia Flash MX. San Francisco, CA; Macromedia, Inc. A Macromedia white paper. http://www.macromedia.com/learning. Released April 2002. Used with permission.)*

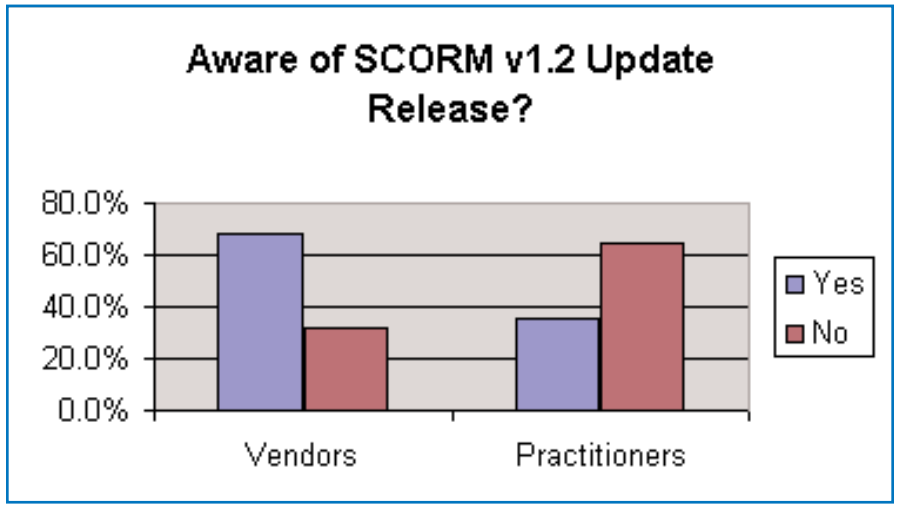


**FIGURE 3** *Fewer than four out of every ten practitioners were aware that the SCORM v1.2 update had been released.*

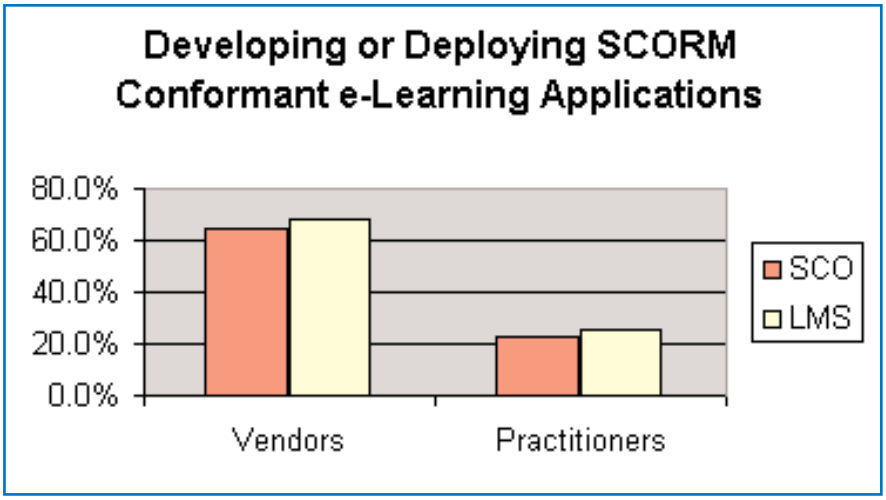


**FIGURE 4** *Most vendors are developing or deploying SCORM-conformant e-Learning applications, while most practitioners have not started any development of such systems.*

of objects, or that objects should be of a certain time duration, or that each learning object must contain a certain number of specific kinds of elements. Those suggestions tend to reflect object requirements for use in specific settings. Wayne Hodgins suggests that there is no set absolute size to a learning object, since the size of the object will be relative to the needs of learners and the requirements of given learning tasks.

While it is likely that definitional debates and discussions will continue, the prevailing views suggest that learning objects have the following attributes:

- They are the smallest element of stand-alone information required for an individual to achieve an enabling performance objective or outcome.
- They are stored and accessed using meta-data attributes and tags.
- They are assembled and contextualized using metafiles that situate meaning and application and facilitate meaningful assembly.

Figure 2 provides a graphic representation of an object in e-Learning.

## Why learning objects?

E-Learning expert Warren Longmire suggests that learning objects 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. (See http://www.learnativity.com/download/LwoL3.pdf) Longmire proposes that other possible benefits of using learning objects are:

**Increased value of content.** The value of content is increased every time it is reused. This is reflected in cost savings by avoiding new design and production efforts. Selling content objects or providing them to partners may offer additional revenue generation opportunities.

**Improved content flexibility.** When content is captured in an object format, it can be reused much more easily than material that has to be rewritten for each new context or application.

**Improved updating, searching, and content management.** Metadata tags describing various attributes of a learning object help organize, identify and locate relevant content. This improves searching, facilitates management and maintenance, and helps filter and select the relevant content for a given purpose.

**Content Customization.** The learning object approach enables a just-in-time approach to customization by allowing designers to select, assemble, and rearrange content according to stakeholder needs.

Not surprisingly, these benefits for using learning objects relate most directly to concerns for content and its modification, utility, value and management. Content is the most tangible asset in an e-Learning design. Improved methods for managing content may, in fact, relate directly to improved learning outcomes for individuals and organizations.

But learning content, no matter how robust, is not the same thing as learning. What are the benefits of using learning objects for learning or performance improvement? In many learning object models relatively little attention is paid to increasing an individual's personal capacity to absorb information and create new knowledge. These days most discussions about learning objects concentrate on standards, metadata and SCORM. While the work involved in creating a shared content object model is important, it is only a part of the total picture.

## What's happening on the object front?

The broad acceptance of SCORM as a de facto standard for content creation and distribution has resulted in a greater awareness of the importance of metadata and object models. But just how broadly accepted is SCORM in the e-Learning marketplace? The March 2002 eLearning Guild (http://www.eLearningGuild.com) SCORM Standards Awareness survey noted several important points. First, awareness of SCORM standards is much higher in the e-Learning vendor community than in the practitioner community. (See Figure 3.)

Given this difference in awareness, it follows that vendors are more likely to be providing SCORM conformant applications. (See Figure 4.)

The primary reason practitioners offered for not doing more with learning object designs is that they lacked the technical knowledge to interpret and apply the technical guidelines in a practice setting. The second most-offered reason was that people are still waiting for useful, widely accepted standards definitions.

## Keeping the learning in learning objects design

What many people don't yet recognize is that a working learning object strategy involves much more than SCORM and metadata tags. Realizing the value of an object strategy will demand a change in the way we value content. Even more important, this change calls for giving learning designers a voice and getting them back in the conversation.

E-Learning has become completely dependent on technology (e.g. Learning Content Management Systems, content creation and authoring tools, XML, metadata, SCORM). As a result, the loudest voices at the e-Learning table are those belonging to the technologists, the producers, and the funders. Learning designers, master teachers, and subject matter experts all need to have a greater say in how e-Learning products and services evolve.

In order to do that, learning designers are going to need to think about better ways to conceptualize and design learning object based resources and programs. In most learning settings, instructional design activities tend to focus on the arrangement of contingencies to elicit specific responses. (See Figure 5.) Developing object-oriented learning designs involves a significant shift from behavioral to cognitive perspectives and from objectivist to constructivist perspectives.

The seemingly algorithmic nature of the process of design ("First you state your goal, then you define your objectives...") almost suggests a stimulus/response relationship ("...and your student will perform certain tasks with 80% accuracy, 90% of the time"). Even in cases where designs are developed for cognitive tasks such as knowing, remembering, thinking creatively, and solving problems, designs tend to reflect an objectivist rather than a constructivist orientation. According to an objectivist:

- The world is completely and correctly structured in terms of entities, properties, and relationships.
- Meaning exists in the world outside the realm of human experience.
- While people have different understandings of meaning based upon their different experiences, these are still only partial understandings.
- The goal of complete and correct understanding is to get people to know the entities, attributes, and relations that exist, unbiased by their prior experience.

Constructivism provides designers with an alternative basis for thinking about instructional experiences. In such a view, there are many ways in which to structure the world. This further suggests that there are many meanings or perspectives for an event or concept.

As a result, there may not be just one correct meaning or understanding for which learners must strive. In this setting, learning is a process of making meaning, rather than a response to a stimulus or a transmission from teacher to student. Human beings interact with other people and with the world. They attempt to make sense of those interactions all of the time.

In their recent book, Theoretical Foundations of Learning Environments, David Jonassen and Susan Land reiterate that learning itself is a dialogue, a process of internal and social negotiation. Communities of practice provide a real-world context for negotiating, evaluating and creating shared meaning. These communities have become the ideal learning environments for the current era.

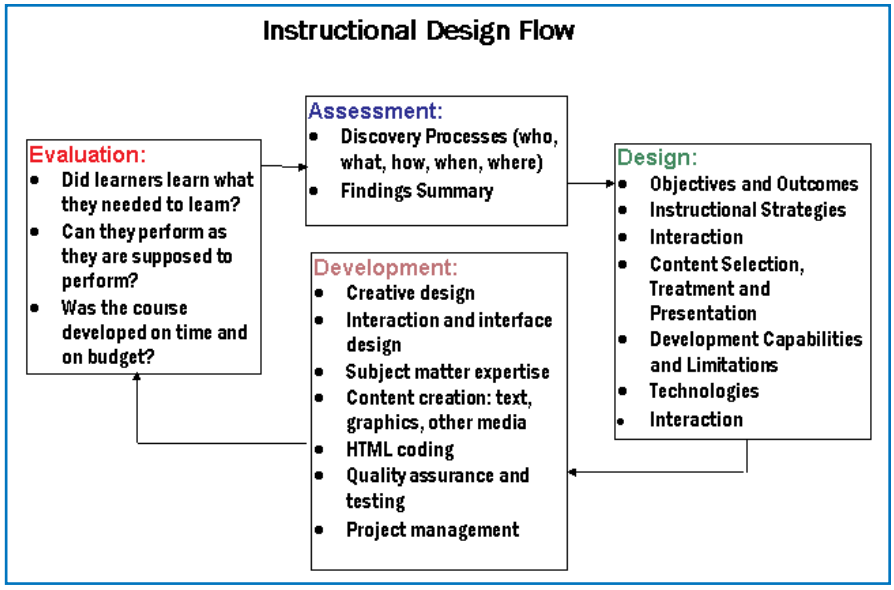


**FIGURE 5** *Most Instructional Design activities tend to promote a behaviorist perspective.*

This differs from the traditional behavioral-cognitive view of learning. The traditional view positions the individual as a medium of learning who processes, stores, retrieves, and applies information. Behavioral principles continue to form the basis for many large-scale training initiatives.

For example, a key behavioral principle holds that a response followed by a reinforcer is strengthened and is therefore more likely to reoccur. This is the basis for much drill-and-practice activity. Cognitive approaches to learning tend to present learners with an objective "right answer" defined by others and presented as true. Each individual compares his or her interpretation of meaning against that statement.

In fact all three approaches to learning and to instructional design — behavioral, cognitive or constructivist — offer solutions for helping learners achieve specific kinds of learning outcomes. It's just important for designers to keep in mind that constructivist learning outcomes such as shared meaning-making will not be particularly well-served by a behavioral instructional design.

While a constructivist perspective makes perfect sense in theory, the notion of "self-determined correct answers" can easily strike fear in the heart of a learning designer. In such an approach, how is one to demonstrate that learners are achieving "world class standards," or that they have achieved specific performance-based outcomes?

To counter such concerns, constructivists emphasize situating new (cognitive) experiences within the context of authentic (learning) activities. Learners draw upon their own experiences, interpretations, and priorities to fit their instruction to their situation. This is a very different approach than the prevailing approach in which learners receive a plan of action, and success is simply a matter of following that plan.

This suggests that the constructivist way may be well suited to learning object design. It also suggests that e-Learning designs built using behavioral or cognitive models are not likely to work as well when the intent of learning involves meaning-making, activity, and social negotiation.

## Other barriers to adoption

There are a number of other common barriers to learning object adoption. The idea of constructing a personalized learning program is still relatively new. It is also a complex job. The designer must select and assemble learning objects to match learning interests, performance gaps, learning style and presentation preferences.

Courses still represent the most familiar way to offer learning content to students, whether the course is a classroom-based, instructor-led course or a web-based, instructor-led course from a virtual

institution. This familiarity goes a long way in establishing the trust between the learner and the e-Learning solutions provider that is necessary for building brand loyalty. Nevertheless, "comfort with the familiar in an unfamiliar virtual space" will increasingly find itself balanced against "improved productivity and competitiveness enabled by leveraging organizational knowledge and personalizing e-Learning programs."

Another challenge to early adoption by most organizations has to do with the way that learning content is valued in organizations. While learning and content management system vendors have begun to embrace the SCORM data model, content providers have not yet created broad libraries of digital content objects for commercial distribution.

Until such objects are more readily available, the ability to construct "open source" e-Learning resources may be compromised. Furthermore, until reusable learning objects are readily available online learning designs will continue to emphasize presenting content in the ready-to-use, familiar form of the course. It will take the combined efforts of internal development groups, commercial content publishers, and content aggregators to overcome this obstacle.

Another possible barrier to learning objects has to do with using assessment to profile learner needs and interests. This is of particular importance if learner profiles are going to be matched to content objects. This is the only way in which the learner is going to directly improve knowledge and skills and demonstrate his or her cognitive gain on a valid, reliable test.

What variety of assessment experiences (e.g. objective tests vs. reflective tests, multiple choice vs. "point and click" graphical response items) are the best measures of the learning gained? Can an objective test be used to quantify learning outcomes that are derived from a learning experience based on shared meaning-making?

If the selection of learning resources is to be based upon individual learner profile criteria, then the validity, reliability and predictability of the profiling instruments must be empirically supported. Knowledge-based and competency-based assessment "instruments" may take a variety of forms. They may range from objective multiple-choice items to online case-based simulation, to skill demonstrations, to the preparation of a professional portfolio, depending upon the learning to be assessed.

Whatever the format of the assessment exercises, the importance of employing

methodological rigor when designing these instruments cannot be overstated. This is especially critical when constructing resources used for assessing integrated, situated problem-based abilities in (simulated) applied settings.

Poorly designed assessments may only scratch the surface of the essential knowledge; skills and abilities needed to function as a highly competent practitioner. In fact, poorly designed assessments can obscure the existing competencies held by the individual being assessed. Learning prescriptions based upon inaccurate diagnoses may themselves be inaccurate. This would invalidate the goal of building a personalized learning plan for each individual.

## Conclusion

Learning objects appear to have significant potential for creating highly personalized learning programs, easily updated courses, and performance support tools. But this may only be true if we can figure out how to bring them to life without completely automating the process of content creation, instructional design and assessment. The current directions of learning design include exciting new ideas such as socially shared cognition, situated learning, problem-based-learning, case-based reasoning, distributed cognition, and activity theory, to name just a few.

The successful adoption of learning objects will require conversations, debates and discussions that bring together all parties. Engineers, programmers, and producers, psychologists, researchers, teachers, and subject matter experts, learners themselves, and senior IT, business development and marketing experts all have a share in the process. Learning content, no matter how robust, is not equivalent to learning. Learning designers, master teachers, and subject matter experts all need to have a greater say in how e-Learning products and services evolve.

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THE eLEARNING DEVELOPERS' JOURNAL

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**The eLearning Developers' Journal** is published weekly by ***The eLearning Guild***, 525 College Avenue, Suite 215, Santa Rosa, CA 95404. Phone: 707.566.8990. ***The eLearning Guild*** is an operating unit of Focuszone Media, Inc., 1030 Beatrice Street, Eagan, MN 55121.

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