

# Preface

Learning objects have been a major topic of discussion for the past several years with most heated debates focusing on data standardization, interoperability, meta-data, SCORM, and the LOM. Most absent in this discussion are those responsible for designing instruction using learning objects. As a result, many of the objects and attributes that have been placed in massive learning object repositories are infrequently used by designers or instructors. This may be attributed to the lack of common features available in the collections or just the lack of understanding by designers and instructors on how these granular objects can be used in larger chunks of instruction. Or there may be bigger issues of context or lack of intellectual property policies. This text will focus on discussing learning objects from the view of learning and instruction with key sections highlighting design standardization using a theoretical approach, use of repositories for sharing, tools for classifying and capturing learning objects, a context for evaluating learning objects, and examples of learning objects in action.

## Design Standardization

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With all of the definition focused on standards, little time has been spent on standardization or optimization of instructional elements that may be included. One framework representing standardization of learning objects is the model developed by Cisco (Barritt & Alderman, 2004). Cisco has defined instruction by lessons and

topics with lessons representing reusable learning objects (RLOs) and content associated with that RLO defined as a reusable information object (RIO). Although Barritt and Alderman are very specific that this model is not intended to be a cookie cutter approach, it does provide for common attributes, common design elements, and specifications on granularity. In using this framework, designers are intended to develop solid objectives, tie RLOs and RIOs to those objectives, and content topics, practice and assessments for each RIO. Advantages to using this process include standardization of content that can be used and reused across designers, it can be clustered into complete lessons or units of instruction by capturing five to nine RIOs, and it can be more easily evaluated with tangible standard assessment techniques such as true/false, multiple choice, and matching. What isn't easily evident is how to extend this metaphor into instructional strategies that may not follow the RLO/RIO approach like problem-based learning, Webquests, and other more constructivist learning approaches. Likely, there will be many approaches to develop content for storage in repositories, but until more consistency, definition of granularity, and grappling with context are solved, there will still be missing puzzle pieces.

## Repositories

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With massive repositories available, it is anticipated that sharing and re-use would become commonplace and be an efficient way to organize instruction. Some well-known repositories such as MERLOT are expanding daily through its community members. Merlot is a peer reviewed repository intended to be used by higher education faculty and students to improve the quality of teaching and learning by increasing the number of easily available learning resources. Other notable repositories include The National Science Digital Library that houses thousands of learning objects for K-12 students and teachers and the Maricopa Learning Exchange for Community Colleges. The list of public repositories is expanding frequently. See the Academic ADL Co-Lab for ongoing updates. (<http://www.academiccolab.org/>).

With these and other repositories available for digital content sharing, users of repositories still appear to be most interested in interoperability and content management. Metadata management is still a major issue as inconsistent tagging may occur, thus making it difficult to classify specific objects consistently. Some research is underway to establish a workflow process for the human creation of metadata or automatic metadata creation and indexing. Either strategy would assist greatly with consistency. Whether developed by individuals or automated, there are many examples of taxonomies that have been generated to further describe the objects, to better assist the end user in searching and locating specific learning objects. For example, in *QuickScience*<sup>TM</sup> (Northrup, Rasmussen, & Dawson, 2004) metadata were further classified by Bloom's Taxonomy and by state and national standards to

assist in keyword searching. Another example of taxonomy generation was a project called *Metasoft* generated by a consortium of school districts called Digital Districts Online. *Metasoft* enabled a similar taxonomy with classification around Bloom's Taxonomy. In addition, a taxonomy for professional development materials was also developed to further explain the objects. For final reviews, a team of cataloger's entered the final metadata into *Metasoft* before going live. Both examples provide a strategy for cataloging that will enable easier search and retrieval of learning objects (Peebles, Bunnow, & Holden, 2005).

Many organizations are struggling with how to create and share their learning objects in a manageable, stable environment. Additional issues remain in sharing and versioning of specific learning objects, which presents issues of intellectual property and copyright management.

## **Tools for Aiding in the Development and Implementation of Learning Objects**

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Tools that aid in the development of learning objects are beginning to become more commonplace through learning content management systems and stand-alone tools that can hook into repositories or even export to the end learning device such as the Web, a PDA, or other digital delivery device. Blackboard's Learning Object catalog (2004) can now assist faculty members in storing, retrieving and sharing its digital content at various user levels across courses, faculty, and institutions. Blackboard is in the process of expanding its workflow features for a more automated and scalable process. Desire2Learn and WebCT have similar tools that allow users to create and share content. In addition, both WebCT and Blackboard are delivering MERLOT learning objects through constant RSS feeds in several subject areas. Although these features dramatically include the potential for sharing and re-use, still missing is a structure for creating content and packaging as a learning object. Most faculty members developing instructional content do not have foundational knowledge in learning theory, instructional strategies, or techniques for building instruction. The advent of a tool, eLON™ created by the University of West Florida provides a structure for creating learning objects shaped around common instructional strategies tied to learning outcome. This tool assists non-designers and designers alike in structuring content for export into a range of LMS tools, repositories, and portals (Academic Technology Center, 2005).

In addition to the higher education view of learning objects, K-12 schools are beginning to engage in resource sharing through industry standard portals and digital dashboards to push information needed to the teachers or students desktop using predefined possible routines. For example, if a student diagnostic test score is low

on specific standards, digital dashboards and portals can push targeted content, strategies, and even teacher professional development to the desktop in response to the need. Learning objects tagged to standard play a key role for use and re-use in this type of an environment.

## **Evaluating Learning Objects**

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Evaluating learning objects is a difficult task but must be taken into account if the expectation is for large-scale use. MERLOT's repository is a peer-reviewed system that requires all objects be reviewed before going live. This sometimes causes a massive bottleneck for new objects becoming available as communities continue to submit objects. However, peer-reviewed objects provide much merit to the academic community as a whole. A new repository being populated in Florida, The Orange Grove, requires several layers of evaluation and peer-review, starting with the home institution. Each Community College and University in Florida participating in the Orange Grove peer-reviews objects onsite, then forwards them to the Orange Grove for final analysis and public access. The system is intended to reduce bottleneck while ensuring ongoing quality.

On the other side of evaluation, it is important for those searching for and selecting objects to evaluate objects to meet instructional need. Evaluative questions may include (1) Does it align to stated goals and objectives? (2) Will it fit into the context of my lesson or course? (3) Is it of high quality? (4) Is it accurate and free of bias? (5) It is usable by my students, are plug-ins or additional software required to run? (6) Is the file size too large to download? (7) Do I download the object or point to it? (8) Do I have confidence that it will continue to be located in its designated link?

## **Conclusion**

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Overall, each area under investigation in the text provides a view of the issues still surrounding the successful use of learning objects for instruction. From the perspective of the designer, faculty member, or student who may be searching large repositories for matching content or those who are creating new content to align to the requirements of export to a repository. A myriad of issues exist, beginning with those involved in teaching and learning beginning to shape the direction that is being directed by the programmers and others in definition of metadata, interoperability, and standards. Both sides of the story should be considered for successful development, use, and re-use of learning objects for instruction.

## Contribution and Scholarly Value

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This text will tie together practical issues surrounding the instructional use of learning objects with real examples and case studies of how implementation of objects has occurred in a variety of settings. Designers, faculty, trainers, and teachers are beginning to partake of learning object repositories, but still fall short on how to develop instructional learning objects or the issues surrounding the objects into a repository in terms of tagging, designing in chunks, determining layers of granularity, and determining the need for contextualization.

There are many issues to consider, with this text providing a forum for experts in this newly emerging area to provide their scholarly view of each of the areas of emphasis. Simply defining learning objects from an instructional perspective still remains an issue. With only one leading definition from Wiley (2002), there is still more to discuss. The notion of designing instruction using learning objects located in repositories garners the question of metadata, tagging to a conventional standard, emphasizing the levels of granularity, and hoping that some common features exist among the unique pieces of the puzzle. Designing learning objects for re-use through repositories presents another unique set of challenges including serious change management and professional development for instructional designers and faculty. Many examples of learning objects in action across areas of K-12, higher education, community colleges, industry, and the military will be depicted through the chapters of this text.

Overall, this text will lay a foundation for areas currently being debated with designers of learning objects and provide some much needed guidance to the community of designers, faculty members, and developers.

## Organization of the Book

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The book is organized into fifteen chapters. A brief description of each of the chapters follows:

### Introduction to Learning Objects

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**Chapter I** provides a short history of learning objects in both the academic, governmental and corporate sectors. The origin of the term will be traced from 1992, as Wayne Hodgins coined it, to the present.

**Chapter II** presents an overview of the use of digital repositories in the field of education. The authors' purpose in writing this chapter is not only to provide their

readers with general knowledge about educational repositories, but to give them some idea of the various issues and processes involved in launching a digital repository.

**Chapter III** provides a survey of 59 well-known repositories with learning resources and presents initial results from their analysis. The most important characteristics of these LORs are examined and useful conclusions made about the current status of development. A discussion of future trends in the LORs field is also included.

**Chapter IV** provides a theoretically grounded discussion of the creation of a reusable learning object that is effective from instructional and system perspective. A combination of frameworks, the Cisco model and the grounded instructional systems design model, have been integrated to develop a set of templates that can be used to help developers efficiently create RLOs and the reusable information objects that comprise them. The integration of psychological foundations into learning object creation is critical to a successful implementation of RLO architecture.

**Chapter V** describes the adaptation of the object-oriented software engineering design methodology for software objects to engineering reusable learning objects. The approach extends design principles for reusable learning objects with the design of learning object lessons being independent of, and complementary to, instructional design theory underlying the learning object design process, and metadata standards adopted by the IEEE for learning object packaging.

## **Developing Instruction Using Learning Objects**

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**Chapter VI** presents a background on learning objects including the use of American Sign Language learning objects in three higher education settings. Recommendations for the use of learning objects for multiple higher education disciplines and insights into future and emerging trends related to the use of learning objects in higher education will be provided.

**Chapter VII** discusses the lessons learned while designing a SCORM-conformant Web-based courseware product using an iterative instructional design process. In particular, it describes some of the design trade-offs between instruction that is highly modular vs. situational and instruction that is highly interactive vs. highly contextualized. Organizational issues, such as metatagging and asset naming procedures, and the challenge of designing realistic and motivating e-learning assessments are presented as well.

**Chapter VIII** proposes a category of tools called design objects that can be used by instructors to integrate existing content sources, including but not limited to learning objects, within teaching frameworks that engage learners with content in meaningful ways. Emphasis is on tools to support the K-12 instructor, although related issues are applicable across educational levels.

**Chapter IX** introduces the use of a learning objects content development tool, the eLearning Objects Navigator, (eLON™) as a strategy for creating, classifying and retrieving reusable learning objects and reusable information objects. Presented in this chapter is the underlying theoretical framework for the development of eLON™ as well as the specific design decisions made regarding the deployment of PDA mobile learning devices to military personnel.

**Chapter X** presents learning objects utilization in the corporate training world. The acceptance by corporate training can be attributed in part to the fact that learning objects provided those departments with a system and tools that they could present to their decision makers—a system that aligned with corporate goals. Some of the goals included the need to train a global workforce and the need to do it in an effective, competitive and efficient manner.

**Chapter XI** examines the issues and concerns of faculty regarding the development and use of learning objects as instructional resources. It describes the characteristics and benefits of learning objects, barriers to adoption, and strategies to increase learning object use.

**Chapter XII** presents a case study of a teacher education faculty member as she researches learning objects and integrates the concepts into her curriculum. The author provides examples of how to create an awareness of learning objects among her students and provides an experience where students are afforded opportunities to determine the value of using learning objects as an instructional tool.

**Chapter XIII** presents a collaborative development model that accomplishes the goal of bridging the academic environment and industry, specifically relating to the production of self-paced, Web-based learning objects, catalogued within workforce development curricula. The model provides a roadmap that maximizes the expertise of college faculty, industry managers, and multimedia production specialists to meet the needs of government sponsors, commercial corporations, non-profit postsecondary institutions, and individual learners.

## **Tool-Based Solutions for the Development and Implementation of Learning Objects**

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**Chapter XIV** discusses the reasoning behind the lack of the expected authoring of digital learning objects while presenting a tool, Pachyderm 2.0. The Pachyderm 2.0 software is discussed as a tool for faculty to utilize while creating engaging learning objects in an easy to use environment. The author hopes that discussing and enumerating the obstacles to learning object authoring and dissemination, combined with the proposal of using the Pachyderm software along with a model of working with organizational information technology (IT) staff, will assist all involved in circulating successful digital learning objects.



**Chapter XV** presents a support tool for teachers, QuickScience™, to assist teachers and students improve performance in science. QuickScience™ is designed using Cisco's approach with six unique classifications of reusable learning objects, including five types of instructional resources aligned to Bloom's Taxonomy, are used by teachers to help students improve their performance in science.

**Chapter XVI** explores the use of learning objects within the context of teacher education. The authors argue that learning objects can be useful in teacher education if we both create *and* code learning objects appropriately to the needs of the teacher education community. The chapter begins with framing the teaching and learning issues associated with the use of learning objects in higher education. Next, the chapter introduces a method for generating and marking up learning objects; examples are described where learning objects are created and coded to address the teaching and learning needs of teacher educators and teachers. The authors conclude with a discussion of the issues and prospects for the use of learning objects in teacher education.

## References

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- Academic Technology Center. (2006). *What is eLON™?* Retrieved September 1, 2006, from <http://uwf.edu/atc/projects/eLON.html>
- Barritt, C. & Alderman, F. L. (2004). *Creating a reusable learning objects strategy: Leveraging information and learning in a knowledge economy*. San Francisco: Pfeiffer.
- Blackboard Media Center. (2004). *Blackboard launches enterprise wide learning objects repository*. Retrieved October 26, 2006, from <http://www.blackboard.com/company/press/release.aspx?id=604710>
- Northrup, P. T., Rasmussen, K. L. & Dawson, D. B. (2004). *QuickScience research model*. University of West Florida. Retrieved October 26, 2006, from <http://cops.uwf.edu/itc/itc-research/OverviewofResearch.pdf>
- Peeples, J., Bunnaw, D., & Holden, C. (2005). *Learning objects across boundaries: A report from digital district's online K-20 learning objects community*. Paper presented at the 21<sup>st</sup> conference on Distance Teaching and Learning. Madison, WI. Retrieved October 15, 2006, from [http://www.uwex.edu/disted/conference/Resource\\_library/proceedings/05\\_1992.pdf](http://www.uwex.edu/disted/conference/Resource_library/proceedings/05_1992.pdf)
- Wiley, D. A. (2002). Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy. In D. A. Wiley (Ed.), *The instructional use of learning objects*. Retrieved May 02, 2002, from <http://reusability.org/read/chapters/wiley.doc>