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Learning Objects in Higher Education: The Sequel

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Overview

In October of 2002, ECAR published a research bulletin titled “Learning Objects in Higher Education.”¹ At that time, learning object use in higher education was in its infancy and more theoretical than pragmatic. Much has changed in a year and a half. Today, universities are struggling with the larger issue of managing an abundance of knowledge across very decentralized organizations. As information proliferates and education budgets decline nationwide, the concept of sharing high-quality content digitally looks more and more promising. In this context, learning objects have proven useful for packaging unwieldy educational content in ways that are accessible and, ideally, cost-effective. However, while instructional technologists sing the praises of learning objects, educators have been slow to accept the change and reticent to adopt a new model.

This bulletin reports on the state of learning objects’ use in higher education over the last year and a half and identifies future directions and current challenges. It describes advances in the field, elaborates on new partnerships, and debates the lack of acceptance by the end user audience. Conclusions are based on a review of the literature, close tracking of use in the field, and examination of a set of surveys gauging acceptance across both corporate and academic sectors.

Highlights of the Adoption of Learning Objects

In the 2002 ECAR bulletin on learning objects, a 10-question survey with approximately 100 higher education respondents provided an environmental scan indicating a limited awareness of learning object issues and an unfamiliarity with both potential and cost. That same year both the American Society for Training and Development (ASTD)² and the eLearning Guild³ published learning object survey results. These two professional organizations surveyed the corporate sector, and results revealed a deeper awareness of the issues in business than in higher education, based on businesses’ tight focus on staff professional development and training efficiency. Surveyors in both industry and education were particularly interested in who would create the content, catalogue the objects, and facilitate reuse. Many instructional technologists assumed that faculty would welcome the opportunity to remain active creators as new educational paradigms emerged; however, survey results indicated that this was not the case.

Learning Objects Defined

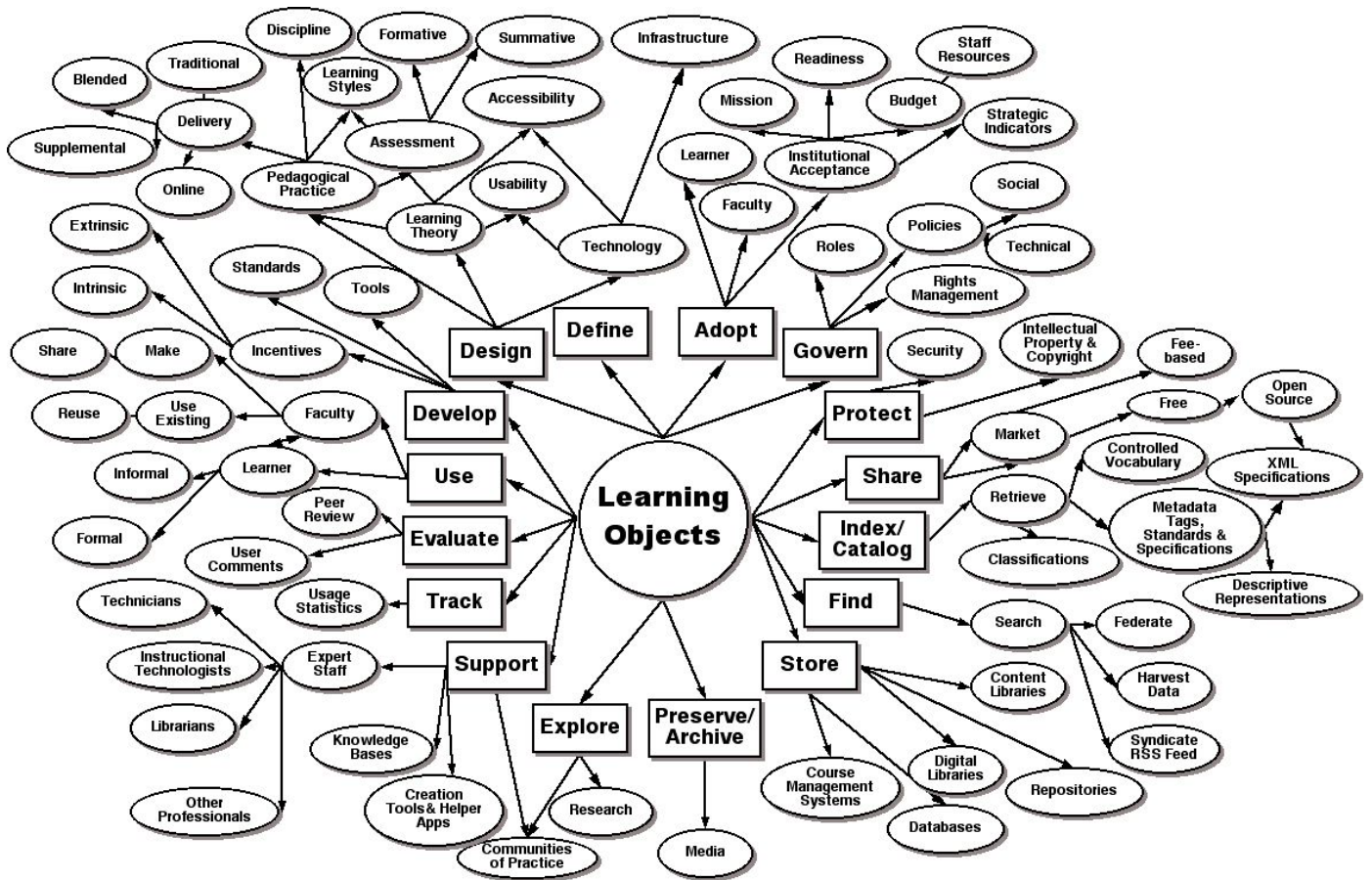
The search for a single definition to describe a learning object continues to force reexamination among educational technology practitioners and visionaries. The Wiley and Edwards definition provides a clear starting point: “Any digital resource that can be reused to mediate learning.”⁴ While the philosophical debate continues, these same practitioners and visionaries have moved on to the larger, emerging issues of designing effective learning and creating and enhancing a culture of sharing and reuse. Thought leaders, such as Norm Friesen, call for more research to move the dialogue deeper into the realm of learning principles and articulated pedagogies.⁵ Regardless of the higher education community’s inability to settle on a definition, all agree that a repository chock full of digital assets cannot, by its simple existence, create dynamic learning. The discussion rapidly has progressed to expand the anatomy of a learning object to include components that must be present in order for the digital asset to facilitate learning: a learning objective, a practice activity, and an assessment.

From industry’s adoption of a comprehensive knowledge management strategy comes another provocative distinction—raw data must be transformed into information, which must morph into knowledge. Since the quest for knowledge and wisdom has always been a primary mission of higher education, this transformation has become the focus of new university explorations such as

- creating strategies for using repositories effectively;
- designing with learning objects for deeper learning; and
- facilitating reuse, with its critical ancillary issues such as intellectual property, compensation policies, interoperability, and faculty development.

The emerging complexity of the learning object landscape has called for a visual mapping. As a deliverable for the Learning Object Workgroup of the National Learning Information Infrastructure (NLII),⁶ a leading-edge program of EDUCAUSE, Metros developed an ontology, diagramming the functions and activities surrounding learning objects and the hierarchy of connecting threads, layers, and levels comprising an institutional framework (Figure 1).

Figure 1. NLII Learning Object Ontology



Source: <http://people.cohums.ohio-state.edu/dagfoerde2/NLII_LO/ontology/ontology.htm>.

New Partners

In 2003, several high-profile professional organizations focused their attention on learning objects. Their members discussed issues, initiated projects, and disseminated findings with the intended purpose of enriching the academic community and moving the dialogue forward. These discussions lead to productive partnerships between organizations and their member communities and cross-fertilization of ideas.

The NLII selected learning objects as a 2003 key theme. It convened a workgroup of education technologists with international as well as corporate participants, facilitated a virtual community of practice, and sponsored an NLII focus session on learning objects at The Ohio State University in October 2003. Issues related to theory, pedagogy, standards, tools, funding, and policy topped the agenda. Examining similar issues, but from the learning object developers perspective, the New Media Consortium (NMC)⁷ hosted a learning object summit in San Francisco in 2003 and pioneered a parallel online conference in 2004. Lastly, the Coalition for Networked Information (CNI),⁸ an organization dedicated to supporting the transformative promise of networked

information technology for the advancement of scholarly communication, published several white papers framing the larger cross-institutional issues as they impact the evolution of academic libraries. These papers collectively stressed a need to move beyond the technical issues of standards and architecture to a “reassessment of broader questions of organizational culture and of roles and responsibilities within higher education institutions.”⁹

However, there is a worrisome disconnect between the research disseminating from the major professional educational technology organizations that sponsor conferences brimming with sessions on learning objects and their use and the everyday teaching practice of faculty. For the most part, the academic community remains unaware of and unmotivated to adopt the new paradigms and pedagogy that accompany the practical use of digital repositories. A flip through the most recent conference proceedings of the major educational research and information science organizations such as American Educational Research Association and the Association of Research Libraries reveals that learning objects, by whatever name they are identified, are not on the radar screen. In their article on interoperability, McLean and Lynch point out that one reason for this gap is that the measure of the value of a university’s library has not yet adapted to the realities of electronic publishing.¹⁰ A second reason may be that librarians and educators are slow to assess and identify the needs of their academic stakeholders.

Industry Prevails

Unlike education’s more gradual adoption of a learning object model, the use of learning objects in industry continues to proliferate. Industry constantly seeks to remain competitive by supporting a knowledgeable workforce. Using economic benchmarks, corporations have worked with vendors to create suites of tools to serve the corporate need for efficiencies of scale in training and knowledge management. The vendors who lead the way have developed sophisticated learning content management systems, which are scaled to the client’s customized needs. Some crossover between business and education does exist. One key example is a recent partnership between the Department of Defense and Blackboard, Inc., whose course management system (CMS) has been adopted by eArmyU.¹¹ Through a consortium of 29 universities, soldiers are offered a wide choice of online degrees and certificates. Higher education provides the content and the pedagogy; Blackboard’s CMS provides the delivery vehicle.

Policies Take a Back Seat

Intellectual property ownership, once the Achilles’s heel of a faculty member’s reluctance to post and share teaching materials, appears to be less of an issue to both educators and institutions. The demise of many university-sponsored for-profit e-learning organizations forced university administrators and their general counsels to realize that there was little chance of getting rich off their faculty’s learning object intellectual property. As a result, many have relaxed their policies. MIT’s OpenCourseWare (OCW) Initiative¹² has set a new standard by freely distributing their faculty members’ online course materials. OCW’s goal is to improve the overall quality of online educational content and to democratize learning by reaching audiences who otherwise would not be able to afford higher education opportunities.

One note of promise revolving around policy is that numerous rich and varied projects are emerging from newly formed institutional consortia across the globe. Educational leaders are working out cross-institutional policy issues along with the economics of funding and building open-source digital asset and learning object collections. Of particular interest is the new genre of open source tools being developed to support development and dissemination of digital assets and learning objects. One promising technical advance is the MIT Libraries and HP partnership to create the DSpace Federation.¹³ DSpace is an open-source digital library system that can be customized and extended to store, index, preserve, and redistribute faculty research and intellectual output, and it is freely available to research institutions worldwide. The Sakai Project¹⁴ and LON-CAPA¹⁵ are both led by higher education consortia to develop modular, open-source learning content management and assessment systems. In addition, the University of Virginia and Cornell University have jointly developed Fedora,¹⁶ a general-purpose digital-object repository system that can be used in whole or in part to support a variety of use cases, including institutional repositories, digital libraries, content management, digital asset management, scholarly publishing, and digital preservation.

Although policy arguments have died down, the debate on metadata and tag sets continues. It is generally accepted that for the goals of federated searching and global interoperability, each learning object and all digital content must be identified with as much detail as is economically feasible. Diaz and McGee stated: "Metadata specifications are proving to be a key and critical area of repository population. Without a clearly articulated system, objects cannot be readily or appropriately accessed."¹⁷ To address this need, the IMS Global Learning Consortium, Inc.¹⁸ has recently reached out to the other standards groups to form working alliances to coordinate efforts and further development.

What It Means to Higher Education

When a new technology is introduced, it almost always emulates its time-honored predecessor. Film follows theater, television copies film, and educational technology applications imitate the book. Textbook publishers carve up learning into distinct disciplines known in the business as "vertical markets." Learning objects, with their inherent capabilities to be navigated nonlinearly, to incorporate multimedia, and to be interactive and customizable, exist in a virtual world that can be accessed within and across disciplines, both vertically and horizontally. Restated, books segregate knowledge, whereas learning objects have the potential to unify disciplines. This shift from the printed textbook model to an online environment has the potential to contribute to a culture of sharing. Although institutions of higher education are far from disassembling their long-established discipline silos, there is a renewed interest in multi-, inter-, and cross-disciplinary studies. This can be attributed, in part, to instant, online access to a broad range of knowledge from a multiplicity of subjects and today's students' quest for information framed within a broader knowledge context.

Ironically, the most successful digital repositories are initiated within disciplines or are cohort based. Faculty members simply are more comfortable keeping their research and

teaching resources closer to their vests rather than uploading them to a universally accessible repository located offsite. This is not a bad thing. A digital asset or learning object that exists locally but is shared universally has a better chance of being revised, updated, and reused.

The real power of sharing knowledge and reducing redundancy will be evident when technologists perfect a way to federate individual collections so that, while “homegrown,” they can easily be searched globally. Instead of having to search each collection separately, a federated search allows the user to search for learning materials across multiple collections, obtaining integrated results. Programmers also are researching ways to harvest and share metadata and are examining the plausibility of “subscribing” to selected repositories using rich site summary or really simple syndication (RSS), a lightweight XML format originally designed for syndicating news and the content of news-like sites. Currently MERLOT,¹⁹ the Multimedia Educational Resource for Learning and Online Teaching, is experimenting with both federated searches and the RSS Web content syndication format.

Another genre of digital asset collections has emerged and is available to educators from media sources where the currency and historical archiving of knowledge are paramount. National Public Radio²⁰ is a good example of a medium that documents current events and provides free access to the audio files (written transcripts can be purchased). The ResearchChannel,²¹ a consortium of research universities and corporate research divisions, explores the relationship between television and the Internet by providing a video library of on-demand multimedia research activity offerings. The Library of Congress's American Memory²² project is gateway to a rich primary source of multimedia materials relating to the history and culture of the United States. The site offers more than seven million digital items federated across more than a hundred historical collections. And Wikipedia,²³ managed and operated by the nonprofit Wikimedia Foundation, is a multilingual, free, open-content encyclopedia that includes almanac and gazetteer-like information. In Wiki style, it is collaboratively developed and edited by its user population. As of March 2004, it contained more than 230,000 articles in English and more than 300,000 articles in other languages.

The Challenge of Digital Assets and Learning Objects

Over the past year and a half, digital asset collections have grown in number and breadth, but the metamorphosis of digital assets into learning objects is still in its infancy. Part of the problem lies in the pedagogical model that describes a learning object as comprised of one or more learning outcomes, an activity, and an assessment all revolving around a digital asset. While this model is second nature to educational designers and technologists, the concept of learning outcomes can be less familiar to many instructors in higher education. As a result, what is often mistaken for the totality of a learning object is no more than just the digital asset—a movie clip, a simulation, a photograph, or, perhaps, the text of an article—without the added support of a pedagogical framework.

Who Will Create Learning Objects?

It has been argued that instructors may not be the best choice to design and develop learning objects. While experts in their fields of study, few have the pedagogical background, the technical skill, or the desire to sidetrack their research to devote themselves to time-consuming instructional technology projects. A more plausible solution is to partner these individuals with teams of instructional technologists, programmers, visual designers, and other resource development experts. These professionals, in concert with the instructor, can translate a traditional course's learning objectives into learning outcomes. They can convert analogue resources to digital assets, design interactive online activities, and build meaningful assessments.

Another model of support that is gaining popularity is to build faculty-staff-student partnerships for producing learning objects. Collis and Strijker identified a strategy they call "contribution-oriented pedagogy." Instructors create opportunities for students to co-create and co-extend the knowledge base of their disciplines by contributing resources (learning objects) for use in courses within a CMS framework.²⁴

Who Will Catalogue Them?

In the environmental scan completed by the authors for the 2002 ECAR bulletin, they reported that it was unclear who would catalogue and tag objects so that they could be easily retrieved. Faculty members pointed to librarians, librarians volunteered instructional technologists, and instructional technologists looked to the faculty. Librarians, who index and catalogue published resources, are the natural choice to work with unpublished learning objects. However, this is a big job, and one that librarians have yet to willingly accept. In response, the Online Computer Library Center (OCLC),²⁵ a nonprofit consortia of libraries worldwide, is examining business models to decide if it is within their purview to provide these types of services, along with identifying who will serve as future knowledge brokers and strategists, consulting on securing the right kinds of information, and helping clients to sift and navigate through dense collections of information and knowledge.

Building Critical Mass

A critical mass of learning objects is still not available to meet the needs of educators searching for reusable resources. The educational technology landscape is littered with small, stand-alone learning object projects that are stagnating from lack of use due to gaps in the knowledge base and not being readily available to the broader academic community. A common way for universities to build collections is for academic leadership to award faculty incentive grants to develop learning objects. While well meaning, most awardees have succeeded in building only a smattering of learning resources that are available to a small segment of learners. Only when these individual attempts can be conjoined with other individual attempts or added to existing, public collections will reusability be evident. A year and a half ago, one of the biggest criticisms of MERLOT was that there was not enough content to make it worthwhile to use, let alone reuse. Since then, MERLOT contributors have added more than 3,000 new objects, a portion of which are peer reviewed, and usage has doubled.

Funding Initiatives

Very few sources of funding are available to education to build and support nonproprietary, open-source learning object collections and to promote their use. As a result, the commercial sector is looking at ways to fill the gap. Publishers are testing the market by offering their intellectual assets à la carte instead of bundled with textbooks. New-genre companies such as XanEdu²⁶ are repackaging database collections into value-added, online coursepacks marketed directly to faculty and students, even though most university libraries already have purchased and make freely available the very same database products. CMS vendors are partnering with publishers and other content providers to channel their proprietary products directly into course Web sites. Even MERLOT is reconceptualizing its business plan in order to support its open-access mission while funding its operation.

The most successful learning object repository initiatives reside in countries where the federal government has supported national efforts. The Canadian Network for the Advancement of Research in Industry and Education (CANARIE)²⁷ is a not-for-profit corporation partially supported by the federal government. It has subsidized Campus Alberta Repository of Educational Objects (CAREO),²⁸ a project to create Web-based, searchable, multidisciplinary teaching materials for educators across Alberta and beyond; and Portal for Online Objects in Learning (POOL),²⁹ a project to develop a prototype national repository and portal for postsecondary, workplace training, and continuing education learning objects.

In the United States, the Digital Library Initiative of the National Science Foundation (NSF) has provided universities and their partners with grants to build digital asset collections. Realizing that collections of digital assets, in themselves, exhibit shortcomings, the NSF Digital Library's (NSDL) FY 2004 request for proposals is targeting enhancing its collections with new understandings about pedagogy and the processes of learning. Lastly, movements such as the Digital Promise³⁰ are proposing that the U.S. government create the Digital Opportunity Investment Trust (DO IT) to transform learning and training for the next century. Championed by former presidents of major public and commercial broadcasting industries, they recommend that the fund be financed by revenue from auctions of unused, publicly owned telecommunications spectrum.

Technical Hurdles

Many of the same technical obstacles exist that were problematic a year and a half ago. Universal standards do not exist, nor is there an easy or automated way to tag objects. Interoperability is not yet a reality, even though the commercial sector is beginning to update its applications to be compliant with the Sharable Content Object Reference Model (SCORM).³¹ Only a few off-the-shelf, commercial repository solutions are available for the educational market, although all of the major CMS vendors have plans for add-on or internal learning content repositories in their next enterprise-level software updates. As more instructors incorporate multimedia into their learning objects and as more members of the academic community contribute their intellectual capital to knowledge repositories, file storage is becoming a problem. It is not unusual to talk in

two- and three-figure terabytes³² when planning storage capacity. While storage capacity and network throughput is no longer a technical barrier, the ongoing financial cost for purchasing or leasing disk space can be significant.

On a positive note, based on what educators have learned from businesses' examination of knowledge management and data warehousing, higher education leadership has gained a better understanding of the technical, cultural, managerial, and financial requirements for hosting a learning object repository. Lastly, as more collections federate, users will want to move seamlessly among them without having to reauthenticate at each "border." Shibboleth,³³ a project sponsored by Internet2/Middleware Architecture Committee for Education (MACE) to support inter-institutional sharing of Web resources subject to access controls, addresses the need for single sign-on authentication.

Conclusion

In the 2002 ECAR bulletin on learning objects, the authors argued that academic culture was not ready for this paradigm shift in course design—from the current teacher-centric, complete course construct to the newer model where instructors team up with information and instructional technology professionals and even their students to create modular learning objects that can be delivered in multiple modes and reused in many contexts. In 2004, progress is apparent. Educational technologists are letting go of the comfort of the book metaphor and are taking advantage of the inherent capabilities of technology to provide learner-centered, nonlinear, customizable, media-rich educational content. Standards organizations are further along in defining ways to identify and tag objects for easy retrieval and sharing. More faculty and students are able to access multimedia content through broadband access at school and in their homes. However, the question of whether educators are willing to change their age-old teaching practice to develop, use, and share with their colleagues knowledge in the form of learning objects still begs to be answered.

Key Questions to Ask

- How will academic leaders manage and capitalize upon the abundance of data, information, and knowledge (and wisdom) that is propagating within their own decentralized organizations?
- What is the best way for educational institutions to make use of existing digital assets to build pedagogically sound learning objects?
- How can champions of learning objects motivate traditionally oriented university librarians and educational researchers and practitioners to identify and respond to the shifting needs of a technology-savvy academic community?
- How can institutions of higher education traverse the turf-bound, discipline-based silos for the purpose of developing, sharing, and reusing educational content?

- What role can students play in collaborating with their teachers to develop and vet high-quality learning objects?
- What role should the faculty member play in designing the delivery of educational content? Who should be tasked with creating, tagging, and preserving learning objects; managing and maintaining the repositories; and promoting and assessing use?

Where to Learn More

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31. To learn about SCORM, see the Web site of Advanced Distributed Learning (ADL) <<http://www.adlnet.org>> and click on the SCORM focus area tab.
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