

Digital Natives in Your Midst? Give them LEGOs to play with....

Jennie L. Mitchell, Ph.D., CPA, CMA
Department of Business
Saint Mary-of-the-Woods College
Saint Mary-of-the-Woods, Indiana
jmitchel@smwc.edu

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Abstract:

The advent of instructional standards (SCORM) and Extensible Markup Language (XML) based Learning Management Systems and Learning Center Management Systems, including blogging and open source applications have provided a virtual “buffet” of reasons to take the plunge into online teaching. Why should we do it? Because the “digital natives” have spent all of their lives immersed in computers, videogames, digital music players, mobile phones, text messaging, instant messaging, PDA’s and similar tools (Prensky, 2000). Yet, it is important to anticipate the hours of investment required for an online component or online course. Be smart about it – create sections that are “timeless.” In other words, take another look at “learning objects.” According to the Learning Technology Standards Committee, the definition of a “learning object is “any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning” (Wiley, 2000). A metaphor often used for describing learning objects is LEGO. In effect a LEGO block can build on any other block in any manner you choose and are fun and easy to use. The key terms considered for this presentation is digital, reusable, supports learning (instructional), and fun. Using these criteria, the presenter will share examples of “learning objects” from a variety of disciplines. The learning objects include some of the best and some of the worst (i.e., the good, the bad, and the ugly). In addition, the presenter will demonstrate some of the tools available for making learning objects. The variety of tools and techniques demonstrated that support learning object creation include: Lectora, Flash, CamStudio (a lite version of Camtasia), eBooks and blogs.

Introduction and background

Education is not the filling of a pail, but the lighting of a fire.

William Butler Yeats (1865–1939)

When scholars assemble for conferences, it is apparent that they are creating a hurricane of experiments with a variety of software and system tools. According to the Dean of International Center for Computer-Enhanced Learning, “At no time during my 40 years in the profession have I seen so many professors undertaking fundamental remodeling of their teaching approaches” (Brown, 2000, p 3). The testimony given by the GAO, states “In the 1999-2000 school year, an estimated 1.5 million postsecondary students, or about 1 in 13 students, enrolled in at least one distance education course, and the Department of Education (Education) estimates that the number of students involved in distance education has tripled in just 4 years. (Distance Education: Challenges for Minority Serving Institutions and Implications for Federal Education Policy, October 6, 2003). The **eye of the hurricane** appears to be the Web.

The impact of the web for both campus and distance learning is profound when you consider, “It will take three to five times as long for a teacher to prepare a top quality distance learning course as a traditional course” (Cyrs, Cyrs, & Conway, 2003). Many faculty find that in addition to expected preparatory time for traditional classes, they now feel compelled to create an online environment for blended classes (campus + online), or tackle a new market of distance education learners.

The concern is that many of the active learning techniques used in a traditional classroom could be somewhat duplicated in a web-based learning environment, but will they? Since it takes three to five times longer to develop a web-based learning environment, just how much time is spent considering an outcome-based model or is more effort made to transfer what is known to a new delivery format? The bigger question may be the willingness of faculty to create learning objects (learning objects in the broadest sense) that are “reusable, accessible, interoperable, and durable” and that meet a specification known as the Sharable Object Content Reference Model (SCORM) (Jones, 2002). SCORM is stimulating the rapid development of some interesting partnerships. Course management systems (CMS) like WebCT and Blackboard, Inc. are partnering with industry as well as known repositories. For example, Blackboard, Inc. partnered with the Department of Defense and 29 universities to form eArmyU providing online degrees and certificates to soldiers. In addition, Blackboard released an “enterprise Learning Object Catalog as part of the newest release of its Blackboard Content System™ (Release 2.0)” (Press Release, August 17, 2004) WebCT commitment to “PowerLinks” (the term used to describe a partnership) allow institutions to customize the e-learning environment through the use of a PowerLinks Software Development Kit (SDK). Many of the partners are developing products that allow a faculty member to easily make learning objects,

organize learning objects, and customize the e-learning environment to work with other key systems.

In all of the active learning techniques shown, literature focuses on outcome-based models to intentionally caution faculty to structure their course with a plan toward outcomes. *It is easy to find the technology fascinating and be drawn to include things that don't really fit the course objectives. Don't.* Instead, set your plan, and choose the techniques that fit both you and the course objectives. Once technologists perfect a way to share individual repositories (and this may be closer than you think), a faculty member may find themselves using a multitude of learning objects from around the globe. A research bulletin, *Learning Objects in Higher Education: The Sequel* (2004), reports a movement to federate collections allowing users to “move seamlessly among them without have to reauthenticate at each ‘border.’” Shibboleth, 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” (Metros & Bennett, p. 10).

What is a learning object?

If you were to ask, “What does a learning object look like?” you’d get a variety of answers. The definition of a learning object is not focused on what they look like, or even how they are created or stored. According to the National Learning Infrastructure Initiative (NLII),

“learning objects are digital resources, modular in nature, that are used to support learning. They include, but are not limited to, simulations, electronic calculators, animations, tutorials, text entries, Web sites, bibliographies, audio and video clips, quizzes, photographs, illustrations, diagrams, graphs, maps, charts, and assessments. They vary in size, scope, and level of granularity ranging from a small chunk of instruction to a series of resources combined to provide a more complex learning experience”

Learning Objects (NLII 2002-2003 Key Theme, 2003, p. 1)

A metaphor introduced by Hodgins & Conner (2000), is a comparison of learning objects to LEGO™ building blocks, small units that can be fitted together any number of ways (with many courses) to produce dynamic learning experiences. This is a simple example that incorporates a strict adherence to an absolute standard (as in LEGOs pin size) but with an opportunity to “create, deconstruct, and reconstruct LEGO structures easily and into most any form” (p. 1). It is easy to see why this metaphor seems applicable to software vendors and standards bodies when you consider that a standard “six eight-stud LEGO™ bricks can be combined 102,981,500 different ways” (LEGO Fun Facts, 2004). Wiley (2000) finds the LEGO metaphor simplistic and restrictive with an implication that the

LEGO metaphor leads others to “treat learning objects like components of a knowledge management system” (p. 18) To clarify, Wiley adds, “Rather than thinking about LEGOs, or Lincoln Logs, perhaps our minds should be pointed toward something like a “learning crystal,” in which individual learning objects are combined into an instructionally useful, and to some degree *inherent*, structure” (p. 20). Wiley developed a taxonomy of five types of learning objects that has been adopted by EDUCAUSE NLII. These types with an example include:

- 1) “Fundamental (a JPEG of a hand playing a chord on a piano keyboard);
- 2) Combined-closed (video of a hand playing a chord on a piano keyboard with accompanying audio;
- 3) Combined-open (a web page dynamically combining the previously mentioned JPEG and Quick Time file together with textual material ‘on the fly’;
- 4) Generative-presentation (a JAVA applet capable of graphically generating a set of staff, clef, and notes, and then positioning them appropriately to present a chord identification problem to a student);
- 5) Generative-instructional (an EXECUTE instructional transaction shell (Merrill, 1999), which both instructs and provides practice for any type of procedure)”

Wiley, 2000, p. 26-27.

Wiley chooses to use the following definition: “any digital resource that can be reused to support learning” (p.7) Wiley may find the LEGO metaphor too restrictive, but his definition is too broad. Broader yet is the definition from IEEE as “any entity, **digital or non-digital**, which can be used, reused or referenced during technology supported learning” (Position Statement on 1484.12.1-2002 Learning Object Metadata 2002, p. 1). Dozens of repositories provide their own definition that best serves the needs or interest at the time the repository was born. Although Wiley’s definition from 2000 provided a starting point, a lot has happened in the four years to conceptualize the place that learning objects play in sound pedagogical practices. For example, some proponents of learning objects include a definition that depends on the form of the learning object. Flowers (2003) works with a technique called “*repurposeable HTML Learning Objects or RLOs*.” According to Flowers, “An HTML learning object is a Web page that provides instruction, guiding a learner in meeting a learning objective. A **repurposeable** HTML learning object is one that can easily be used in different settings or classes. These are sometimes called “Reusable Learning Objects,” but the term, “repurposeable,” is used here to indicate that the objects may be used for multiple purposes or with different target audiences” (p. 1).

“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” (Metros & Bennett, 2004). Intellectual property ownership, although still an issue, is less prevalent at many institutions.


Examples include MIT's OpenCourseWare (OCW) Initiative, which now provides educational materials for 900 MIT courses with a "plan to publish virtually all of MIT's courses by the year 2007" (MIT OpenCourseWare, 2004). Although a federated collection may depend on standardized metadata tagging, there are still thousands of learning objects housed in a variety of repositories that are easily accessed with easy-to-use search tools.

Where can I find learning objects?

In order to gain a better grip on how "learning objects" will impact you, it makes sense to visit some of the repositories and perform a search in your discipline. Keep in mind that not all learning objects are created equal. The following list of repositories (although not conclusive) is a good start.

- Multimedia Educational Resources for Learning and Online Teaching (MERLOT). URL: <http://www.merlot.org/Home.po>
- Campus Alberta Repository of Educational Objects (CAREO)
URL: <http://careo.netera.ca>
- Wisconsin Online Resource Center – Wisc-Online Learning Object Project
URL: <http://www.wisc-online.com/>
- Splash –Portal for Online Objects in Learning (POOL) Project of Canada
URL: <http://www.edusplash.net/>
- AShareNet (Required to license but many free)
URL: <http://www.aesharenet.com.au/>
- Academic Advanced Distributed Learning (Academic ADL)
URL: <http://www.academiccolab.org/> Repository List URL: http://projects.aadlcolab.org/repository-directory/repository_listing.asp
- ARIADNE Foundation for the European Knowledge Pool
URL: <http://www.ariadne-eu.org/>
- SMETE Digital Library (more than learning objects)
URL: <http://www.smete.org/smete/>
- Learning Matrix (Mostly science, math, engineering & technology)
Digital resources, but not always a learning object
URL: <http://thelearningmatrix.enc.org/>
- iLumina: Educational Resources for Science & Mathematics (highly granular)
URL: <http://turing.bear.uncw.edu/iLumina/index.asp>
- Health Education Assets Library (HEAL)
URL: <http://www.healcentral.org/index.jsp>
- Education Network - Australia (EdNA Online) – Domain is education
URL: <http://www.edna.edu.au/edna/page1.html>
LYDIAINC: (Only SCORM compliant) A license model based with possible fees attached for developers and distributors.
URL: <http://www.lydialearn.com/>

Many of these repositories are providing a way to connect through Rich Site Summary (RSS). RSS was originally used in the newspaper industry to distribute

abstracts, but more generally, it is a method for distributing content of web pages. If you have explored blogging, you may have noticed an XML tag (usually bright orange ). RSS uses XML format so that web pages, blogs, etc. can easily be integrated into your browser and show a title, summary, and a link of the latest editions to the repository. Other information may be shown depending on the sophistication of the RSS Reader. This type of innovation is made possible by the metadata used in the description. In general, the metadata uses an XML schema. The user subscribes to the feed and uses an aggregator (just a feed reader) to check the site for new information and downloads it to your browser.

Some repositories are offering an RSS channel as well. In this case, you can insert an HTML fragment into a web page to pull from a repository a specific subject area including the description posted with it.

Creating Your Own Learning Objects

If you did not find a collection of learning objects that work for your course, you may be faced with creating your own learning objects. An excellent resource to get started is *Guidelines for Authors of Learning Objects* by Rachel S. Smith. This publication provided by The New Media Consortium provides practical advice for designs that enable learning, designs for accessibility and reusability, and interoperability. This guide is available at <http://www.nmc.net/guidelines/>. Once you envision what you want your learning object to look like there are many resources available to reach that goal. If you envision your learning object supported by animation, complete with assessment branching, it will be necessary to apply for release time or schedule your learning object creation over the summer. Even if you have instructional technologists or a design support team on campus, consider partnering with other faculty in your discipline at other institutions. This provides some additional perspective as well as additional resources. When you meet, the first pertinent question should be “What concept or technique is troublesome for the learner when using traditional methods? (Smith, p. 4) Once the learning goal is identified, write it down and use it to help make all subsequent decisions. There are various worksheets and checklists that help in this process.

- Worksheets for Planning
 - Worksheets for Planning Your Learning Objects
URL: http://www.nmc.org/guidelines/LO_Plan.doc (Word document)
URL: http://www.nmc.org/guidelines/LO_Plan.pdf (PDF format)
 - Instructional Design for Education & Its Assessment (IDEA)
URL: <http://www.cogsim.com/idea/>

The planning stage should consider many issues and The New Media Consortium has a list of resources available at <http://www.nmc.org/guidelines/companion/>.

What tools do I need to create a Learning Object?

In this section, the answer to “What tools do I need?” depends on the learning object. Several tools will be demonstrated, but in an effort to provide as much information as possible, what transpires in this section looks more like a list than a paper.

PowerPoint Related:

- **PowerPoint Animation** – Parade of Games: Buzz Word Bingo, Correct Order, Diagram It, Flash Cards, Jeopardy, etc This site includes completed games as well as templates to create your own games. URL: <http://facstaff.uww.edu/jonesd/games/index.html>
- **Microsoft Producer™** – a free download if you own PowerPoint – a familiar product but can add multimedia to existing PowerPoint files
- **PowerPoint to Flash Conversion Tools:** Free: Powerbullet, OpenOffice (convert any files to Flash but transitions and animations not supported)
- **Impatica™** – animates PowerPoint and compresses for internet delivery, Also check **TalkingSlide**

Video/ScreenCapture:

- **CamStudia™** - a free product that records screen activity that can be narrated.
- **Camtasia Studio:** The upgrade of CamStudio. Lots more options (can convert to Flash), easy to learn and easy to produce, reasonable but only Windows
- **RoboDemo™:** produces flash format films from screen activity, SCORM support, quizzing. A little pricy, but premier product. Other animated applications – not just screen capture
- **Wink** – freeware, exports presentation to macromedia Flash, EXE, PDF, or HTML. Excellent product for creating tutorials on how to use software.
- **Visual Communicator™** by Serious Magic (minimal learning curve but produces a television quality broadcast using on-screen teleprompter, dynamic style TV transitions, comes with hundreds of templates and graphics. High quality for CD, Good quality product for web.
- **Authorware™**, Macromedia (high learning curve and fairly expensive)
- **Video Editors:** iMovie (for the mac), Adobe Premiere (an Adobe product – easy to use Windows and Mac), Windows Movie Maker,
- **Screen Capture** – still images: SnagIt!, HardCopy Pro

Audio:

- **Sound Forge™** – digital audio editor – can create your own sounds – includes tons of loops
- **Acid Pro 4.0™** (good at arranging audio loops)
- **WavePad** (free sound editing software)
- **Sound Recorder** (contained in Windows, a similar product in Mac's OS)

Quizzing/Games:

- **StudyMate™** (a product of Respondus®) – creates nine Flash games, import files from Word, easy to use, just out of the beta stage and less than \$100 for educators
- **WordJunction 1.0** – free, creates Crossword and Word Puzzles
- **ExamView Pro™ Test Builder** (often comes as part of textbook with test banks built into the test generator software) Can create Internet, LAN, and print tests in just minutes
- **Hot Potatoes** (free for educational use at K-12) The suite allows you to create games that are interactive
- **Respondus™** works with SCORM compliant CMS, will even work with Word documents in a standard format. This is a must have
- **Game Show Presenter™** – Funny, TV-Style quiz show, music, funny game show hosts, sound effects, scorekeeping and up to 10 players (also check out The Quiz Show)
- **Team Play Learning Dynamics:** A game designed to help students learn to work as a team,
- **TaskMagic™:** Create 13 games and exercises (like Invaders, Asteroids, Packman, Millionaire) that work with a whiteboard or on a PC – not web-based, but a great product
- **Case Creator** (A Video-based case creation tool) – Mac, OSX and Windows - Free

Animation:

- **Anim-FX Splashscreen** -builder – shareware that creates a splashscreen with animated text and sound effects. Contains 34 great templates.
- **Flash™** – a Macromedia product that is considered a premier animation tool. Can incorporate video, images, narration, sound effects
- **Swish** – an inexpensive clone of Flash.

Mobility:

- **eBook Creation** (a three step process that work with Word 2002) You need to download three files (MSReaderSetupUSA.exe, ReaderTTSInstallENG.exe, and WordRMR.exe – follow instructions to the letter
- **Flash Player for Pocket PC**
http://www.macromedia.com/devnet/devices/articles/sap_ppc_03.html

Complete Solution for authoring Multimedia (especially to CD, single file (.exe), etc.

- **Lectora** by Trivantis® - an authoring and publishing software – uses a chapter metaphor to design – hundreds of templates, easy to use with drag and drop, can add assessment – many using it for portfolio. Integrates with Blackboard & WebCT

Editor Software:

- **HTML/CSS Software:** Dreamweaver, GoLive (does dynamic HTML), FrontPage by Microsoft
- **XML Editors:** Morphone XML-Editor, XML Spy
- **Office Products** can use hyperlinks – a manipulation of Multiple Choice links

Special Collection:

- **Math:** Geonext (free, dynamic math software for geometry, analysis and algebra, WebEQ – an easy to use math formula editor
- **Blender** – for 3D Modeling, animation, and rendering – open source
- **Mindmap** Mindmap & Inspiration: both support mind mapping
- **Offline Browsing Software:** Zip Up the Web, WebCopier Pro (one version works for PocketPC)
- **Format Converters:** Adobe Acrobat (convert documents to PDF), Also Convert Doc to PDF for Word V1.0 -\$29), FlashPaper (a Macromedia product, converts files to web-ready Flash document or PDFs), a Macromedia product (converts printable documents to Flash or PDF)

Other Resources

- Learning Commons – Communities of Inquiry – University of Calgary – Featured objects that can be viewed and used, with a chance to discuss (a discussion board) or wiki
- Learning Objects Worksheet from Lake Land College (a Word Document)
- EduResources Weblog – Higher Education Resources Online - <http://radio.weblogs.com/0114870/>
- Adobe® Acrobat 6.0 Curriculum Guide – Using eBooks at http://www.adobe.com/education/pdf/acrobat_curriculum/acrobat6_lesson12.pdf
Adobe Acrobat Reader for Pocket PC
- e-Packs (Almost all publishers are supporting a range of e-packs, but be careful – a cost can be passed to your students!)
- Faciliplay - <http://www.fullcirc.com/community/faciliplay.htm>
- Seedwiki - Grow your own web – free collaboration tool at <http://www.seedwiki.com/>
- Zwiki- run your own WIKI at <http://www.zwiki.org/InstallationGuide>
- Online books: *Reusing Online Resources: A Sustainable Approach to eLearning* at <http://www-jime.open.ac.uk/2003/1/>; *Learning Objects* at http://www.downes.ca/files/Learning_Objects.htm Lots of articles at Journal of Interactive Media in Education – all open <http://www-jime.open.ac.uk/index.html>
- You add to articles: *Learning Objects Explained, Learning Objects and Constructivist Thought*, etc at <http://www.reusability.org/read/#1>

- Games – already created resource list:
http://facstaff.uww.edu/jonesd/games/authors_favorite_sites.html
- Maricopa Learning Exchange (browse by subject, topic, special collection (like for Blackboard, writing across the curriculum, etc) – Not just learning objects
- CISCO System Inc.'s – *Reusable Learning Object Strategy: Definition, Creation Process and Guidelines for Building* (go to site and search on title – URL is huge.
- Pachyderm 2.0 – a creation tool for museum curators to build engaging web, CD-ROM, and kiosk exhibits. Now explored for Learning Objects. Will be free to educational institutions and worth a review. URL at <http://www.mcli.dist.maricopa.edu/dd/pachyderm04/>
- *Inspired Technologies/Support Inspirational Teaching*, by Jennie Mitchell, (eBook and print) Arranged by the seven principles for good practice in undergraduate education by Chickering and Gamson. Seven chapters of related research based on the seven principles with a review of the technologies that support the seven principles. Should be out by Spring 2005, email author at jmitchel@smwc.edu for more information.

Learning Object Metadata (LOM)Categories: General, Lifecycle, Meta-Metadata, Technical, Educational, Rights, Relation, Annotation, Classification

- **Programs that create metadata:** Reload Editor, Metadata Generator Pro, Aloha (free to educational institutions)

Conclusion

This paper has attempted to present an overview of learning objects, including where existing learning objects are housed and how they are organized. The development of your own learning object requires several tools depending on the needs of your students as well as the definition that you choose to meet. An extensive list of tools was provided (although not conclusive) to develop learning objects. In conclusion, “Learning objects are digital resources, pedagogically sound in small chunks, meet interoperability standards, and are reusable, self-contained (but can be aggregated), durable, and shared through metadata tagging” (Mitchell, 2004) This definition is clearly in line with research bulletins published by the Center for Applied Research at Educause Metros & Bennett (2002) indicated that the that true learning objects should include learning objectives and outcomes, assessments, and other instructional components, as well as the information object itself. (p. 4). These truly are exciting times to teach!

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