Learning Objects
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Learning objects are small chunks of learning or individual digital resources which provide a new way of thinking about learning content and delivery. Attempts to define this elusive concept have created controversy and vivid metaphors, ranging from Legos to atoms to snacking. Learning objects promise to make the design and development of instructional material streamlined and cost-effective. They promise to make customized learning experiences available to every student. Once created and catalogued, learning objects are placed in a learning management system (LMS) and it is here that students engage with the material. However, the definitions and roles learning objects play in education continue to be controversial. To fulfill these promises of engaging and effective learning activities, learning objects must be portable, durable, and reusable. When they meet these criteria, learning objects play a key role in this shift of focus. They promise:

- Cost effective development
- High quality materials
- Customization of the actual material for each learner
- Competitive edge in distance learning market

> "We are on the verge of being able to provide learning customized for each specific learner at a specific time, taking into account, their learning styles, experience, knowledge and learning goals." (Schatz, 2000)

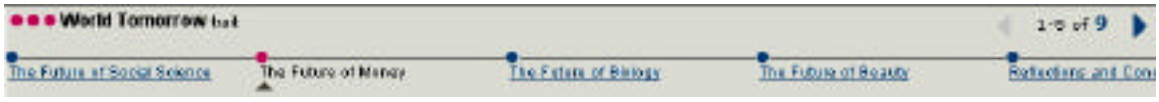
But creating "just-in-time" and "just-enough" learning experiences for a diverse audience poses new challenges to education and the business world.

Ongoing attempts to define learning objects are both imaginative and informative. A formal, foundational definition emerged in 2000 from the Learning Technology Standards Committee (LTSC), a sub-committee of the standards body known as the IEEE. "Learning objects are defined here as any entity, digital or non-digital, which can be use, reused or referenced during technology-supported learning" (LOM, 2000). This definition was quickly challenged as being too broad to be of significance by David Wiley, a key scholar in the learning objects debate. He proposed a briefer definition, "Any digital resource that can be used to support learning" and insisted that the discussion must include instructional design theory with its focus on how these objects would be integrated in a learning scenario. A metaphor found frequently in popular literature compared learning objects with Lego blocks. The colorful, familiar child's toy succeeds because it is portable, durable, and sharable. An imaginative child can assemble diverse structures with Lego blocks. As the metaphor was applied to learning objects, they were seen as exhibiting the same characteristics: digital "bits" could easily be combined into a larger learning unit and shared across computer platforms and course management systems. An imaginative child could do it, suggests the metaphor. Wiley insists that the comparison implies many things about the

design and development of quality education that are simply not true. Though any child may be able to create a colorful structure from Lego blocks, not just anyone can quickly assemble a quality learning experience by cobbling together bits of this and that. He proposed the more sophisticated metaphor of the atom, believing that it honors the true complexity of developing quality instructional experiences.

The creators of two digital collections of learning materials have designed imaginative techniques to create custom paths or journeys through complex, non-linear subjects. Two new metaphors emerged with the introduction of these two collections. The first is the Harvey Project, an open access, world-wide collaboration in the fields of physiology, medicine and related disciplines. Beyond simply collecting rich content, the Harvey Project creators designed a "beads & string" tool as a mechanism for allowing individual instructors to create a custom learning experience for the student. The instructor strings together learning objects with a clear scope and sequence, which can be followed in a non-linear fashion by the individual learner. Figure 1 shows the navigational panel with a drop-down menu that allows non-linear access to related learning objects.


Fathom, a commercial, consortium effort which includes the British Library, British Museum, Columbia University, RAND, and the University of Chicago among others, assembled a broad collection of online learning materials. The architects of Fathom designed the "trail" as a mechanism to assist the online learner in navigating the non-linear wealth of their collection. Figure 2 shows a trail that allows the learner to gather and then navigate the material efficiently.




In both instances, the learner's path through the material is facilitated by an organizing mechanism. The learning objects are presented in a structured, intuitive way which honors the learner's individual needs. The Harvey Project is open-access and discipline-specific. Fathom is a commercial educational enterprise, and both use databases populated with high quality learning objects.

Businesses with a global reach and thousands of employees began an early investigation of learning objects, seeing in the concept of modularity an effective way to streamline training costs and keep employee knowledge up-to-date. From these investigations, several new variants of the learning object concept emerged. In 1998, Cisco launched an initiative to control the costs of its global training system. Their white paper, "Reusable Learning Object Strategy," defines the field clearly for global businesses with steep training costs. The company's motivation was cost control: "Training departments were among the first groups to understand how reusable chunks of content could increase efficiency in course development and delivery, thereby reducing costs" (Cisco, 1998). Their work is important because they outlined a content development and delivery system which could impact higher education as institutions moved into the distance learning market. As businesses began to create corporate

universities, another metaphor emerged, that of “snacking,” which suggests “on-demand” learning. As defined by John Cone, VP of Dell University, on-demand refers to a learning event, defined as one 5-10 minute event which takes place within ten minutes of recognizing the need. The necessary information is provided:

- Just-in-time
- Just-enough
- Just-for you

On order to use learning objects, they must be stored so they can be located, sequenced and delivered to the student.

Learning objects can more efficiently provide this customized, learner-driven content if the information is available within a learning management system (LMS). Such systems use powerful databases to profile learners first to determine such factors as learning style and previous knowledge. A sophisticated LMS will then offer the student units of learning, instructional modules, or courses that integrate well with previous knowledge. Embedded assessments will track student’s progress and facilitate later re-entry into the learning material. The learner won’t have to repeat four modules to get to the desired module five. In order for learning objects to function this way and to succeed in impacting education, these systems must meet the four criteria which have marked Lego’s commercial success: portability, durability, and reusability.

**Portability**: learning objects works across computer platforms and across LMS products from various vendors.

**Durability**: the learning object is stable and available over time, unlike many web resources which change and vanish unpredictably.

**Reusability**: cost savings are achieved when a costly but effective item is able to be reused in multiple contexts. To be used in many contexts, a learning object must be accurately tagged so that it can be located quickly and aggregated with other learning objects. The smaller a learning object is, the more often it can be used, but tagging small or granular learning objects is costly. So designers of systems and institutions wishing to break courses down into reusable chunks face a trade-off.

The acceptance of learning objects as a key component of instructional design and delivery in the information age raises questions. Certain technical issues must be resolved before learning objects can impact education in the way their promoters envision. These issues include:

- Quality assurance for each learning object
- Tagging of learning objects to achieve efficient and effective searches
- Portability of learning objects across computer platforms and course management systems
- Hosting: determining who or what institution or government will host and/or store all these resources
- Intellectual copyright and compensation for individual or institutional creators

See also: Intelligent tutoring systems, just-in-time learning, self-regulated learning, web-based instruction

For Further Reading:

Reusable Learning Object Strategy: Definition, Creation Process, and Guidelines for Building. Cisco Systems, Inc. April 2000. http://www.cisco.com/warp/public/10/wwtraining/elearning/implement/rlo_strategy_v3-1.pdf

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