

Certificated Course in Online Education and Training

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Will Learning Objects Change Higher Education?

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Creating an online course is a complex undertaking. On the technological side, from low-tech solutions to highly sophisticated learning solutions, each available technology has its dedicated guru. Vendors of Learning Management Systems compete using a variety of marketing techniques to convince institutional representatives, as well as teachers and developers, that their product is more reliable, easier to use and worth the money. Sometimes local programmers impose their preferred languages, tools or even operating systems, in addition to constraints based on security considerations or learners authentication procedures. On the pedagogical side, teachers are obliged to design their course in a much more systematic and detailed way to what they are used to do in their face-to-face classes. They also have to adapt their own views to new teaching situations.

Consequently, at least in those countries where the academic culture is still predominantly traditional, it does not come as a surprise that online teaching and learning is often regarded with suspicion. Considering that University teachers are hired as content experts and researchers, even if teaching this content is also expected, the motivation has to be great to balance the burden of acquiring all the technology-related skills. Some institutions provide professional help for educational material production, but even in such cases, designing a high quality learning experience remains a time consuming operation, always more demanding than expected, and sometimes even exhausting.

This being so, an online course cannot be thought of as a disposable production. The commitment and money involved does not allow for short-lived products. More importantly, no University teacher would be happy to teach years on end with the same material: in face-to-face and online teaching alike, they will modify their reading lists and sets of exercises, complement their own writings with that of authorities in the field and integrate new research findings into their presentations. Sustainability, as far as eLearning is concerned, means designing in ways that allow for re-usability, wide accessibility and flexible use. In the digital world, such educational materials are called Learning Objects (LOs).

Teachers make intensive use of scientific libraries and research journals for interesting papers. Publishing, bookselling, librarian techniques and the usage of these techniques developed along centuries, well before the discovery of modern technology, and computer-enhanced librarian practices. In the world of eLearning, however, the pace is incomparable: in no more than fifty years, the field went from nothing to an explosion of possibilities, with all the

related issues and technical challenges. Along with textbooks, articles, reading lists, slides, diagrams, etc., students will be taught with all sorts of digitally formatted artefacts. As teachers could not imagine producing all written material used in teaching on their own, they could browse digital repositories of educational material for stimulating units to be used in a course, and add their own contributions. If it were not for the practical difficulties, this could even represent a relatively natural and straightforward work practice.

Before reaching this banal situation though, a large number of people have to come to grips with an impressive number of issues and difficulties. The purpose of this paper is to examine these challenges from the Higher Education (HE) teacher's point of view. Forming an adequate opinion requires a lot of information and I hope to provide background knowledge and arguments to deal with questions such as: Am I concerned by Learning Objects? Which are the implications if I use them? In which technological context are they transferable? Will I ever be able to write / design a Learning object? Will I be able to import them into the VLE used in my institution? But it is not my aim to provide a practical guide to Learning Objects production, which would be beyond the scope of these few pages.

LOs and HE teachers work habits

As pointed out by Tuiren et alii (2002):

"Learning Objects are not a recent innovation. However, the way in which educators create and categorize them is changing. The term "Learning object" originates from "object-oriented programming" and essentially describes an object that is designed for a specific purpose (to facilitate learning, in this case) and can be categorized by using metadata (i.e., data about data) (Watson, 2001). This categorization enables users to search for, access, and reuse objects as needed."

There are many definitions of Learning Objects around. Some are very vague, admitting as Learning Objects any kind of resource used to support learning. Others limit their scope to digital resources made of three components: presentation, practice and assessment. For the sake of this discussion, let us endorse the following definition:

Learning Objects are instructional components designed to be re-used a number of times in different teaching and learning contexts. They are usually understood to be

digital and deliverable over the Internet or some other transferable electronic format.

As a matter of fact, the term "Learning object" sounds like a legacy of an already dated Knowledge Management conception, according to which the reassembly of Learning Objects could be automated so as to suit any individual needs. Such neglect of the teacher's role gave the Learning Objects a flavour of suspicion in the teaching profession. If it were not too late to change the trend, a more complex approach could be advocated. Mark Nichols, for example, differentiates between objects designed to teach ("Teaching objects" - primarily presentation-based, with a cognitive bent) and those that are predominantly designed to facilitate student learning through experiment and activity ("Learning Objects" - providing some level of reciprocity and encouraging constructivist forms of learning). The two of them being frequently used together, they result in an umbrella concept called "Education object" (NICHOLS, ret. 2003).

If we assume that eLearning cannot escape becoming "sustainable" and that Higher Education cannot afford to ignore this trend, the creation and manipulation of Learning Objects is likely to become part of teachers daily routine. Of course, in the particular context of HE where content expertise happens to be the main focus, teachers might be reluctant to change their work habits and to adopt the design skills necessary for Learning Objects production. But where institutional leaders take a clear stance in favour of eLearning, teachers have to take up this professional challenge. Some analysts like Allison Littlejohn predict that "a Learning object economy might not seem so far-fetched 10 years from now (2003b: 5).

One of the issues of these next 10 years in eLearning is the role the teaching community elaborates for its members: will teachers keep instructional design in their hands, with or without pedagogical and technical support, or will they leave it to the economy to regulate the Learning Objects business, like some signs are already indicating? There is a real risk here, since eLearning and the more business-oriented Knowledge Management technologies seem to become reciprocally beneficial, though this risk can be seen as a chance for both sectors (BARRON, 2000: 1).

At this early stage, however, teachers can build on their knowledge of formal learning procedures and play an active role in shaping the future of eLearning. To do so, they need to have a clear picture of their own strategic position and increase their awareness of the issues now shaping technological developments. As synthesised in the diagram below, teachers can

put themselves at the heart of the Learning object movement. In HE, they are the primary authors and users of Learning Objects, as they currently are the ones who provide students with lectures, readings and learning activities of various sorts. If they keep control of two major structuring activities of learning, namely Course Design and Learning object Design, higher education will retain quality and creativity as its most important assets, even though flexibility, individualization and globalisation of learning are also coming along the way.

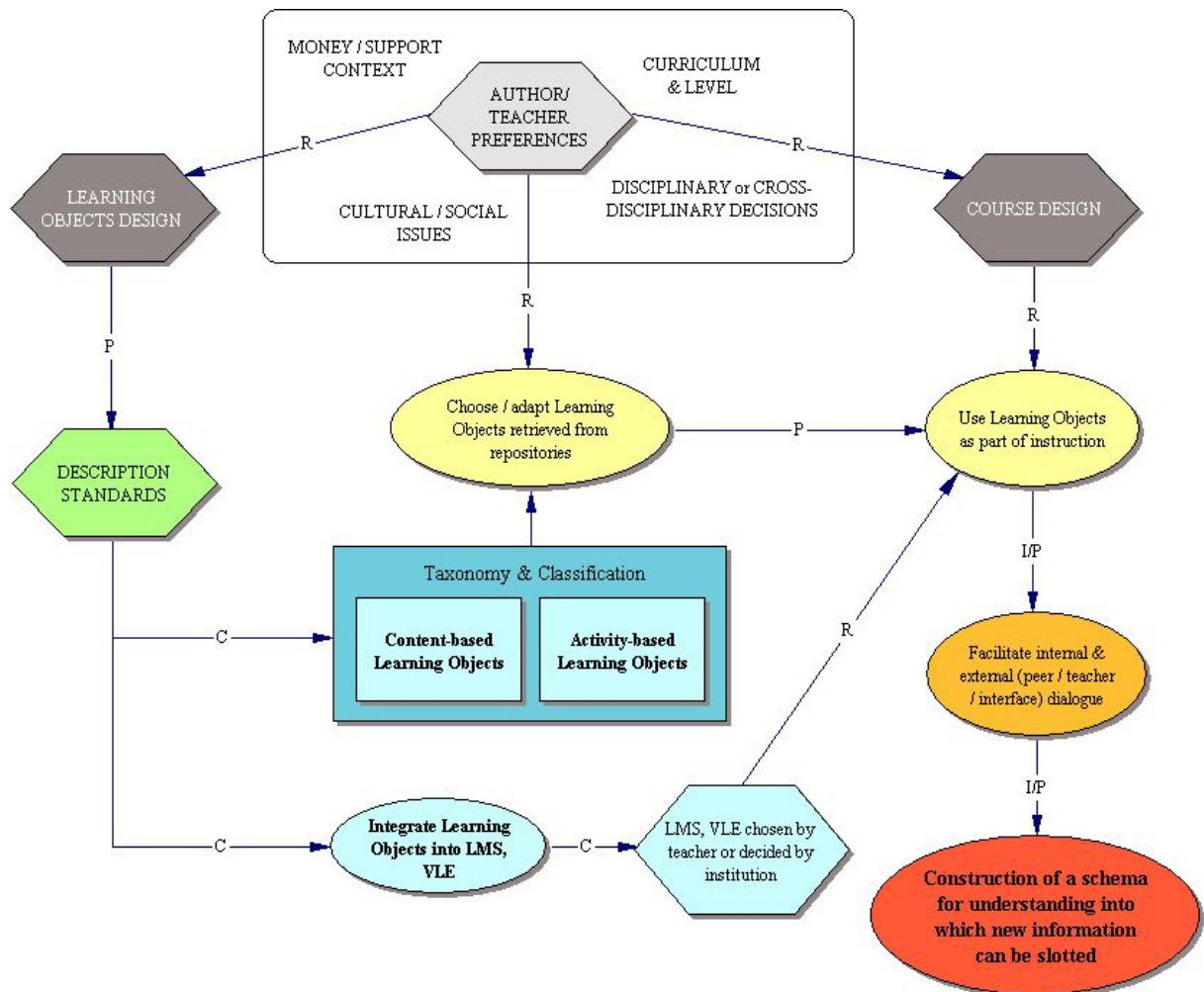


Diagram 1: Teachers working with Learning Objects

To keep it short, while considering Learning Objects as similar to other teaching resources, teachers navigate in familiar waters: once they know what they want to teach, which learning outcomes they want to achieve and how to proceed, they are able to decide which Learning Objects to use and how to bind them together in the appropriate way. Their personal

preferences and contextual constraints (financial and technical context, curriculum and students level needs, disciplinary and cultural specificities, etc.) will then refine the principles ruling both the production and the use of the required Learning Objects. Though the daily practice of teachers is likely to undergo transformations, the nature of their role need not.

It is my personal conviction that complex learning situations like the ones encountered in Higher Education will always be handled more successfully by human beings than by artificial intelligence agents, as sophisticated as those can be. The just-in-time, just-as-needed delivery of Learning Objects might have a bright future in other spheres, especially in corporate and performance support contexts, but it is not likely to supersede the intellectual skills necessary to facilitate the construction of a schema for understanding in which new information takes sense and can be slotted. Neither can it be expected to provide meaningful sequences of learning activities, taking into account the broadness of a university cursus.

However, once accepted that authoring and using Learning Objects does by no means represent the end of teaching, a number of issues are still to be considered. Along with the library analogy, some of them immediately come to one's mind: to be retrieved, books and articles need to be marked with references and keywords, sophisticated databases and loan systems have to be developed, librarians need an efficient and universal classification method, etc. Similar issues have to be tackled in the world of Learning Objects; this is what the still uncommented part of my diagram is about.

Learning Objects can come in countless formats and sizes, their content can be of any kind, the ways they will be integrated into learning activities or sequencing are unlimited. If not assorted with precise descriptors of technical, instructional, knowledge, contextual types, they would be irretrievable. In other words, undescribed Learning Objects would be as limited in use as books with no authorship, title, subject and ISBN reference, stored in an unclassified library with no loan slips available. Therefore, various international bodies have decided to bring some order in Learning Objects potential chaos and thus began developing reference models and standards.

Reusability, accessibility, interoperability, durability¹ are the core issues that organizations such as ADL (Advanced Distributed Learning), IMS Global Learning Consortium, or the

¹ **Reusability** - The flexibility to deploy content in multiple applications and/or contexts.

Accessibility - The ability to locate learning content in multiple locations and to deliver it to multiple locations.

Foundation for the European Knowledge Pool ARIADNE, have set on their agenda. They provide the educational community and all related actors with standardized ways to describe digital learning resources in order to increase their retrievability and reusability in various contexts. Of course, Higher Education is only one of their target sectors, but it has its importance and potential market opportunities, as the spread of Virtual Learning Environments has shown in recent years.

LOs and VLEs

The Learning object movement is not the only attempt to overcome the cost and complexities of developing good quality digital learning experiences. Virtual Learning Environments (VLEs) and Learning Management Systems (LMSs) were early responses to a tremendous problem of eLearning: the unacceptable loss of time and resources in the programming of interface, communication tools and tracking systems, with the additional limitations of multiple teams working in proprietary formats. VLEs, beyond their limitations, provided HE with tools allowing teachers to get used to teaching online and to authoring simple digital resources. They gave them the chance to innovate while retaining their main function, teaching, instead of limiting access to those with programming skills. They also permitted the creation of support teams and new learning technologies (NLT) structural positions. As such, the spread of VLEs in the academic world was a great chance.

But, as anyone who attempted to migrate a course from one VLE to another would have realized: VLEs do not solve all problems. They might even create a few additional difficulties, when encapsulating resources within the tools themselves, thus making exportation almost impossible. Moreover, although transferring entire courses is sometimes necessary, access to smaller entities might be even more important. Ideally, any kind of digital learning material, be it content-based or activity-based, needs to be retrieved, re-imported in different formats and re-implemented in various settings. That is why, in collaboration with the standardization bodies, various VLEs are becoming standards-compliant, both for Learning Objects importation and exportation.

Interoperability - The ability to deliver content developed on one system or platform with a particular set of tools on another system or platform.

Durability - The ability to withstand technological changes.

Teachers should nonetheless be aware that working with a compliant VLE will not leave them free from description issues. In fact, although VLEs will be programmed to automatically generate some of the standardized descriptors needed for interoperability (re-implementation in other compliant environments), they will not be able to provide other types of information, such as precise keywords, content descriptions, intended instructional use, etc. Surely, some human being will have to provide very precise data about the Learning object (metadata), the same way librarian and information officers do for printed resources². Rather than discussing the usefulness of metadata, the question is: "Who is going to write the metadata?" Is it reasonable to expect teachers to master classification techniques and metadata writing practicalities –not to mention conformance testing-, or will we see the appearance of yet another specialty in librarianship? On the long-term, indeed, retrieval issues will be too important to be left in the hands of authors alone, with our potential spelling mistakes and ego-driven selection of descriptors (see DOCTOROW, 2002).

As just shown, using VLEs and using Learning Objects are two separate debates. When they get connected, it is for technical reasons, which VLE vendors do their best to alleviate, or so we hope... Whatever the delivery option, even if only embedded in an open website, Learning Objects have to be given specific attention. Not only do they need to be described and classified on a whole set of axis but, still more importantly, they must be designed so as to create a meaningful learning situation, with an adequate outcome. Therefore, again for retrieval reasons, they should refer to a shared instructional taxonomy (WILEY, 2000a and b).

Content-based LOs

Higher Education teachers have to be aware that they will need to design activity-based Learning Objects as well as content-based Learning Objects. Hitherto, emphasis has been put on content-based Learning Objects production. Content-orientation followed a natural line along the development of the Internet, with countless resources being stored, for better or for worse.

Capture, presentation and visualization techniques for transmitting explicit knowledge are now widely used, though not always mastered by individual teachers. Many authoring tools can ease the creation of content-based Learning Objects, as well as local support teams. For

² A similar argumentation is develop by David NICOL in LITTLEJOHN, BUCKHINGHAM SHUM (2003).

more sophisticated presentations, such as animated movies, videos or applets, a range of options are available and skilled developers may be called upon.

How to help students integrating content and making significant use of it is the major challenge faced by Higher Education teachers, though. Content itself can be considered as relatively difficult to re-use in formal teaching, since it does not easily match the learning outcomes planned by someone else. To date, teachers seem to be more inclined to donate or share their production than to re-use that of others because of their own content-related expertise and authoring capabilities. Exchanging carefully designed learning activities, assorted with precisely described learning outcomes, might offer an interesting chance for exploring teachers' creativity and inspiration.

Activity-based LOs

Activity-based Learning Objects (or Units of Learning as they were recently defined in the IMS Learning Design Information Model³) are probably an equivalent to what is described as tacit knowledge in Knowledge Management circles, to which we owe the development of collaborative and eCommunity tools. As we all know, the aggregation of content units alone does not guarantee a good quality course. Teacher's inspiration for designing attractive learning activities facilitating both memorization and reflexivity is what makes the difference.

Teachers are used to design activities using all sorts of instructional techniques. The same strategies, though enhanced with the new opportunities brought about by technology, will work as a basis for producing interesting activity-based Learning Objects. The challenge here is not so much the creation of new instructional situations, since teachers supposedly know how to do it, but to improve their portability and durability. Sustainable eLearning will not be achieved unless the production and reuse of activity-based Learning Objects becomes a daily practice.

While complex interactivity will constitute a real educational advantage in some cases, learning activities do not necessarily require highly sophisticated technology and even simple VLEs can offer a framework for building and using them. Therefore, from the teacher's point of view, designing learning activities for commonly used tools remains a sound strategy. In

³ The final specification (version 1.0) was issued in January 2003. It adds an integrating "layer" in Educational materials metadata files, describing the learning process in which a Learning Object is used.

the future, it is likely that technologists will provide us with pieces of software which integrate instructional functions in future times, but for the time being it is on the side of our imagination that efforts are needed. As far as teachers are concerned, capturing learning activities through VLEs standards-compliant exporting and converting utilities might be sufficient, combined with internal metadata editing facilities. This is not current practice though and VLEs vendors are still working at it.

LOs practicalities

How to practically create Learning Objects remains an abstract notion for teachers not directly involved with a repository project such as MERLOT⁴ in the USA or JORUM⁵ in the UK. Learning Objects, to be admitted as such and deposited in repositories, need to be packaged according to international standards rules. Since providing production guidelines would be beyond the reach of this paper, explanations will be limited to general notions. Teachers interested in making practical attempts should definitely locate suitable repositories and consult the corresponding websites. Those open to technical reading can browse the standardization bodies' Websites or related literature.

When not described through a repository, a typical Learning Object would be made up of several files of various formats (texts, images, audio files, movies, etc. providing content and/or learning activities, and additional files for metadata). Various sets of standards can be used, some defined according to national preference. In the UK, it is generally agreed that LOs should make use of the IMS specifications and that their metadata should be compliant. As not all of them are necessary, a subset has been devised: the UK Common Metadata Framework Draft X4L Application Profile⁶.

The most popular set of standards is developed by the already mentioned ADL organisation and is called SCORM (Shareable Content Object Reference Model). ADL is composed of several Co-Labs, one of which –the Academic Co-Lab, located in Madison (USA)- is devoted to Higher Education. Its main endeavour is to bring together the best achievements of smaller-range organizations: the SCORM Content Aggregation Model includes a Metadata dictionary

⁴ <http://www.merlot.org>

⁵ <http://www.jorum.ac.uk>

⁶ Available from <http://www.jorum.ac.uk/support/metadata.html>

(from IEEE⁷), Content packaging (from IMS⁸), Content Structure (derived from AICC⁹), Meta-data XML Binding and best Practice (from IMS). Thus, the resulting content model incorporates various types of metadata characterised by a wide acceptance in the industry of eLearning:

General: describes the resource as a whole.

Lifecycle: describes the history and current state of the resource and the persons involved in the development.

Metametadata: describes the information about the metadata itself, like who created the metadata, when, and using what resources.

Technical: describes the technical requirements and characteristics of the learning resource.

Educational: describes the type and purpose of the educational experience provided by the resource.

Rights: describes the intellectual property rights and conditions of use.

Relation: describes the relationship of the learning resource to other learning resources.

Annotation: describes any annotations of the learning resource.

Classification: describes the characteristic of the resource.

The writing of metadata files can be partly automated, though still requiring a fair amount of technical knowledge, by using an IMS-compliant editing software. However, though essential for retrieval, metadata are not sufficient to ensure interoperability. More sophisticated descriptions need to be written to fully integrate Learning Objects into courses delivered through VLEs and take advantage of their various tools. For those interested, XML files templates can be found on the ADL site (<http://www.adlnet.org>) as well as detailed courses and implementation guides. It has to be mentioned, though, that the packaging of Learning Objects is not trivial, especially when they are activity-based.

Will LOs affect HE teachers' life?

Turning back to the current practice of Higher Education teachers, there is no more reason to expect teachers to master all the practicalities of Learning Object production than those of

⁷ IEEE: Institute of Electrical and Electronics Engineers (IEEE) Learning Technology Standards Committee (LTSC).

⁸ IMS: IMS Global Learning Consortium

⁹ AICC: Aviation Industry CBT (Computer-Based Training) Committee

book binding, printing techniques, photography reproduction or ink conservation. Everyone knows, though, that teachers do use some of these techniques to produce their course material. They create and reproduce their own texts and diagrams, build their own indexes and documentation retrieval systems and write PowerPoint presentations. All the same, they will slowly be led to integrate simplified Learning Objects retrieval and production procedures.

However, it would come as a surprise if teachers became Learning Objects activists, if only because of the lack of reward teaching gets in most institutions. Why would teachers produce and take up the burden of writing metadata for high quality learning material in the first place, when their research records remain their principal professional assets? Why would they then spend time in retrieving material that would never exactly suit their needs? These questions are really shaping the debate that is taking place around Learning Objects in academic circles and cannot be ignored.

Having said that, there are several reasons why teachers might be interested in getting involved. Assuming that high level learning experiences do not equate to the simple aggregation of content entities, the art of teaching might be strengthened by new practices. In this context, teachers might want to:

- use more complex or creative presentation / quizzing / discussion ... techniques
- create re-usable activities, with or without automated assessment, for their own use
- re-use their own course material on other VLEs or navigation systems
- find existing material and adapt it to their own instructional preference
- get external recognition for their production, create or participate in disciplinary or teachers communities
- teach or work in teams
- work in chunks, progressively integrating digital resources into their teaching
- improve their design, instructional and technical skills
- understand current developments and issues in eLearning
- contribute to commercial repositories
- get acquainted with business eLearning practice
- ...

Obviously, Learning Objects are not devoid of shortcomings. Retrieval issues are far from being solved, artificial chunking of content as well as lack of context might hamper their usability, interoperability is only in its early days, and so on. But their potential for renewing teaching and bridging formal education with the more business-oriented delivery of expertise is high. As far as Higher Education is concerned, the fate of Learning Objects is largely in teachers' hands.

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