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Learning objects: Features and categories

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Abstract

In the past few years there have been considerable efforts in the computer-mediated learning field. Internet has increased the possibilities with respect to education. Learning objects have become the hype of the e-learning industry, which was first coined by ***Wayne Hodgins****. They provide a new world of easily accessible and individualized learning, made possible by the flexible deployment over networks of small, reusable components from multiple sources. The objective of this paper is to discuss the concepts of learning objects with the help of definitions and examples. The paper also highlights types of learning objects and their features. A brief description of learning content management system has been also included in this paper.*

1. Introduction

The advent of the Internet has increased the possibilities with respect to education. Educational theory has begun to examine the effect of the Internet on teaching and learning processes. Much promise has revolved around curriculum development and content creation. The question becomes one of how. How should curriculum be developed and content created in the new digital world?

There is a new way of looking at curriculum in which content is broken up into discrete pieces (knowledge bits) or "learning objects". Teachers and learners, then, go about the process of creating linkages between "chunks" (learning objects) in order to construct understanding. The term *Learning Object*, first popularized by Wayne Hodgins in 1994, has become the Holy Grail of content creation and aggregation in the computer-mediated learning field.

2. What is a Learning Object?

"Learning objects" is a term that originated from the object-oriented paradigm of computer science. The idea behind object-orientation is that components ("objects") can be reused in multiple contexts.

2.1 Definitions

(1) A learning object is ‘any digital resource that can be reused to support learning’.(1)

(2) Learning objects are interactive, online, multimedia resources that are accessible from digital repositories and are re-usable in multiple settings for multiple purposes. They are usable in classrooms as units of work, usually accompanied by digital and non-digital materials. (7)

(3) According to the Learning Technology Standards Committee, learning objects are defined as:

Any entity, digital or non-digital, that can be used, re-used or referenced during technology-supported learning.

Examples of technology-supported learning applications include computer-based training systems, interactive learning environments, intelligent computer-aided instruction systems, distance learning systems, web-based learning systems and collaborative learning environments. (14)

Thus we can say that Learning objects are:

- smallest units of learning, education and training
- reusable
- able to be aggregated or sequenced
- tagged with metadata so that they can be easily found by a search

Examples of smaller reusable digital resources include digital images or photos, live data feeds (like stock tickers), live or prerecorded video or audio snippets, small bits of text, animations, and smaller web-delivered applications, like a Java calculator. Examples of larger reusable digital resources include entire web pages that combine text, images and other media or applications to deliver complete experiences, such as a complete instructional event.

2.2 Principles of learning objects:

Learning objects were developed around four principles:

- Learner focus,
- Integrity,
- Usability and
- Accessibility.

In order to be implemented successfully, learning objects needed to be integrated into overall curriculum goals, learning objectives and desired learning outcomes.

3. Features of learning objects (2)

- *A new way of thinking about learning content*- Traditionally, content comes in a several hour chunk. Learning objects are **much smaller**

units of learning than courses, modules, or units. Interactive objects typically require from 2 to 15 minutes for completion.

- *Small, independent chunks of knowledge or interactions stored in a database*– can be presented as components of instruction or as reference information.
- *Based on a clear instructional strategy*– intended to cause learning through internal processing and/or action.
- *Self-contained*– each learning object can be completed independently.
- *Usable in different conditions*- Learning objects can be used in face-to-face classrooms and in online learning situations.
- *Interactive*– this type of learning object requires that students view, listen, respond or interact with the content in some way.
- *Non-interactive*- this type of learning object supports reading or classroom discussion lead by an instructor; it serves as an additional reference and/or review component of learning.
- *Reusable*– this type of learning object may be used in multiple contexts for multiple purposes.
- *Disposable*– this type of learning object is context-dependent and may expire as new information and knowledge changes the content of the field it represents.
- *Able to be aggregated*– some learning objects can be grouped into larger collections of content, including traditional course structures.
- Built to meet the Wisconsin Online Resource Center Quality Standards.
- *Learning objects let you have learning that is:*
    - Just enough – if you need only part of a course, you can use the learning objects you need.
    - Just in time – learning objects are searchable, you can instantly find and take the content you need.
    - Just for you – learning objects allow for easy customization of courses for a whole organization or even for each individual.

4. What advantages do learning objects bring?

Learning objects have a number of advantages including (3):

- *economic* – useful resources can be shared and reused by students and educators all over the globe.
- *flexibility* – the same learning object can be used in many different ways, in different learning contexts, within different curriculum frameworks and even for completely different learning purposes.
- *customisation* – the context around the learning object, and often the learning object itself, can be customised by each user to suit their needs (e.g. literacy levels, focus of inquiry, level of expertise in the content, take into account prior learning etc).
- *give the users experiences that they could not access because of the nature of the experience* – e.g. real life problem solving situations that students cannot easily access, science experiments that may be too dangerous or expensive, experiments that might need to be carried out over a long time frame, variables/conditions in experiments that can be set and controlled easily, resources that cannot be accessed easily can be brought together, etc.
- *high quality resources* – using multimedia allows for simulations, animations or use of video and sound to improve the quality of the learning experience offered to students.
- *access* – students and teachers can access resources from many different places, at different times and for their own purposes e.g. for problem-solving, consolidation of a skill etc.

This means that learning objects can be anything from a PDF or Word documents to complex multimedia simulations and learning sequences that use, for example, video and audio. They can include:

- ***tools*** - something which allows students to create something new e.g. an application that allows a student to prepare a graph.
- ***instructional objects*** - a 'tutorial' that provides guidance on how to do something e.g. an application that demonstrates how to graph and how a graph might be used.

- ***exploration objects*** - something that allows students to explore an idea or concept e.g. an object that allowed students to explore how data looks when presented in different ways.
- ***problem-solving objects*** - something that might combine elements of each of the other types of objects described above with a context for using them eg an environmental simulation in which students are confronted with a problem, take some environmental measurements, collect and graph a range of data and use that data to solve the initial problem.

5. What can be done with learning objects?

Learning objects can be used to (3):

- introduce a new concept or idea
- give students practice with something they are learning
- give students a new experience of a familiar idea
- pose problems for students to solve
- provide a backup resource
- give students practice at something they are having difficulty with
- provide students with a variety of experiences in a learning sequence
- assess student knowledge and / or understanding

6. What do learning objects look like? (3)

Some examples of learning objects from the The Learning Federation (TLF) and Tasmanian Open-IT Online Materials Development Projects are shown below.

To assist users in understanding the importance of context and a meaningful purpose for using a learning object, each is shown by itself and then in the context of a learning experience.

Example 1 is a PDF or Word file that contains some information that can be used by different audiences for different purposes. It can be updated,

reworded, or used for different literacy levels. The learning experience designed for the learning object determines how it is used.
PDF learning object

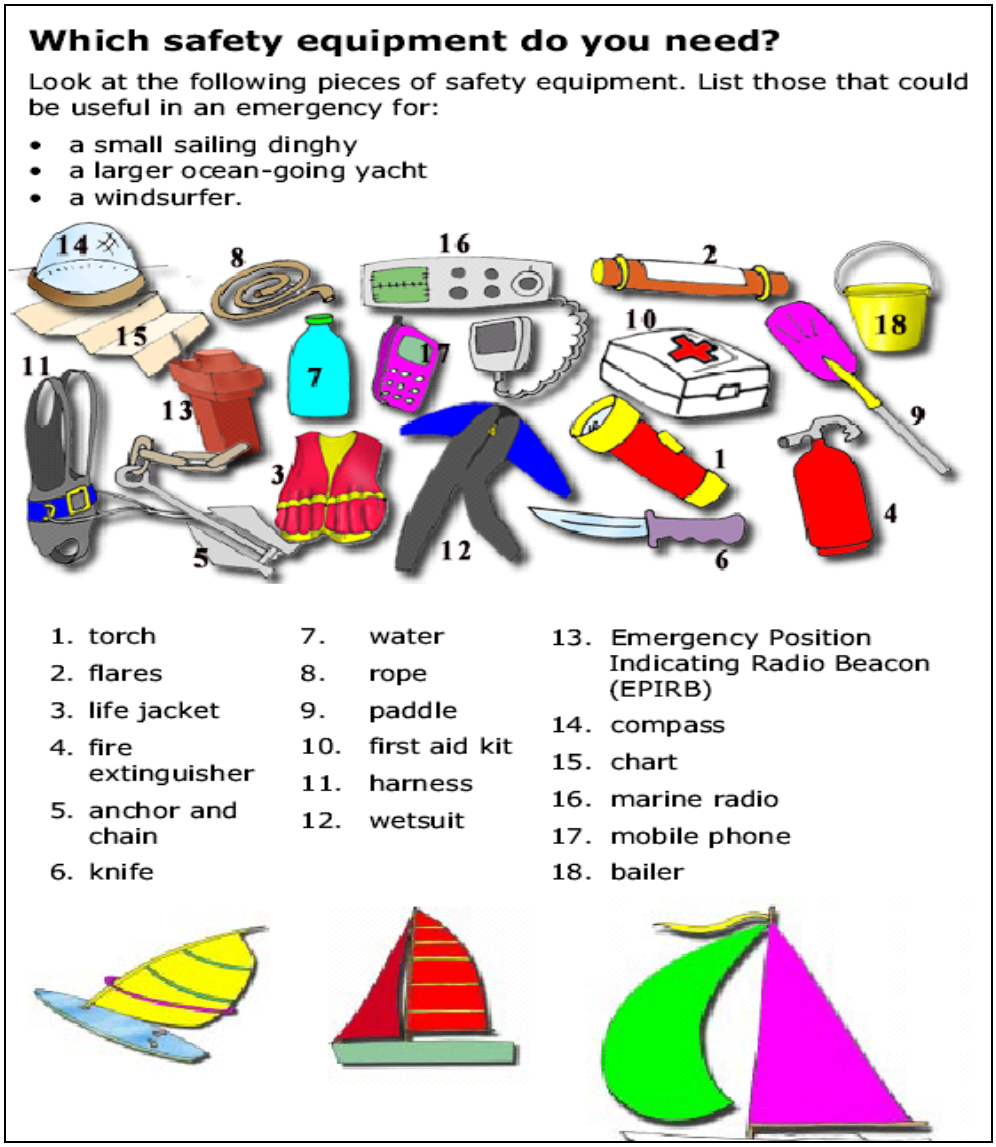
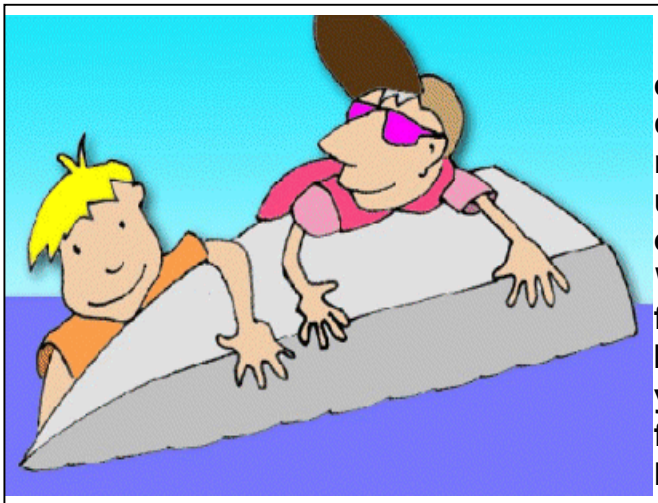


Figure 1: Source from (8)

PDF learning object in the context of a learning experience



Look at the list of safety equipment that is recommended for use when you are on the water. Work with a friend to make a list of the items you would need for a trip on the Derwent River in a dinghy.

List of safety equipment.

Compare your list with the lists of others. Discuss any differences between the lists and explain why you made your choices.

Work as a group or as a class to refine your lists and make one recommended list.

Figure 2
Source: from (9)

Figure 1 shows an example of learning objects while the figure 2 shows how the learning object is being used in teaching the swimming. When the student clicks on the link “List of safety equipment” it takes to the figure 1.

7. Types of learning objects

According to Wiley [1], there are different types of learning objects. Wiley created a taxonomy for use in instructional design that differentiates these types of learning objects. What separates each type is "the manner in which the object to be classified exhibits certain characteristics”. These

characteristics are the same across environments, no matter where the learning objects reside.

Table 1 provides a preliminary taxonomy of learning object types based on Wiley's description.

Learning Object Characteristic	Fundamental Learning Object	Combined - closed Learning Object	Combined - open Learning Object	Generative-presentation Learning Object	Generative-instructional Learning Object
Number of elements combined	One	Few	Many	Few - Many	Few - Many
Type of objects contained	Single	Single, Combined-closed	All	Single, Combined-closed	Single, Combined-closed, Generative-presentation
Reusable component objects	(Not applicable)	No	Yes	Yes / No	Yes / No
Common function	Exhibit, display	Pre-designed instruction or practice	Pre-designed instruction and/or practice	Exhibit, display	Computer-generated instruction and/or practice
Extra-object dependence	No	No	Yes	Yes / No	Yes
Type of logic contained in object	(Not applicable)	None, or answer sheet-based item scoring	None, or domain-specific instructional and assessment strategies	Domain-specific presentation strategies	Domain-independent presentation, instructional, and assessment strategies
Potential for inter-contextual reuse	High	Medium	Low	High	High
Potential for intra-contextual reuse	Low	Low	Medium	High	High

Table 1. Preliminary Taxonomy of Learning Object Types

8. Learning Content Management System (LCMS):

LCMS = LMS + CMS [RLOs]

Let us first try to understand this equation.

8.1 What is Learning Management System (LMS)? (6)

A LMS's objective is to simplify the administration of learning/training programs within an organization. For employees, it helps them to plan their learning progress.For administrators, it helps them to deliver, analyze, and report on their employees learning "condition" within the organization.

From *Figure 3*, it is clear that the smallest self-contained piece of instruction in the LMS is the course itself. Thus, if there is to be any reusability, it would have to be at the course level (one course --> many learners).

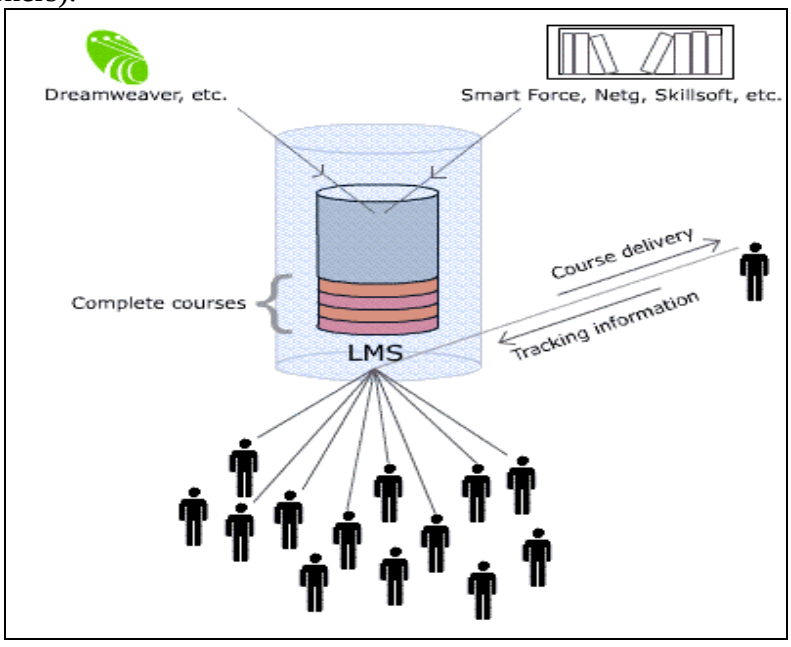


Figure 3:LMS
Source: from (6)

8.2 What is Content Management System (CMS)?

Its objective is to simplify the *creation* of online content (articles, reports, pictures, ad banners, etc.) used in publications.
In a CMS, complete articles are assembled from several self-contained chunks called "content components".

From Figure 4, it is clear that the smallest self-contained piece of information is the content component. Thus, in this case the reusability would be at the content component level (one content component --> many articles --> many readers).

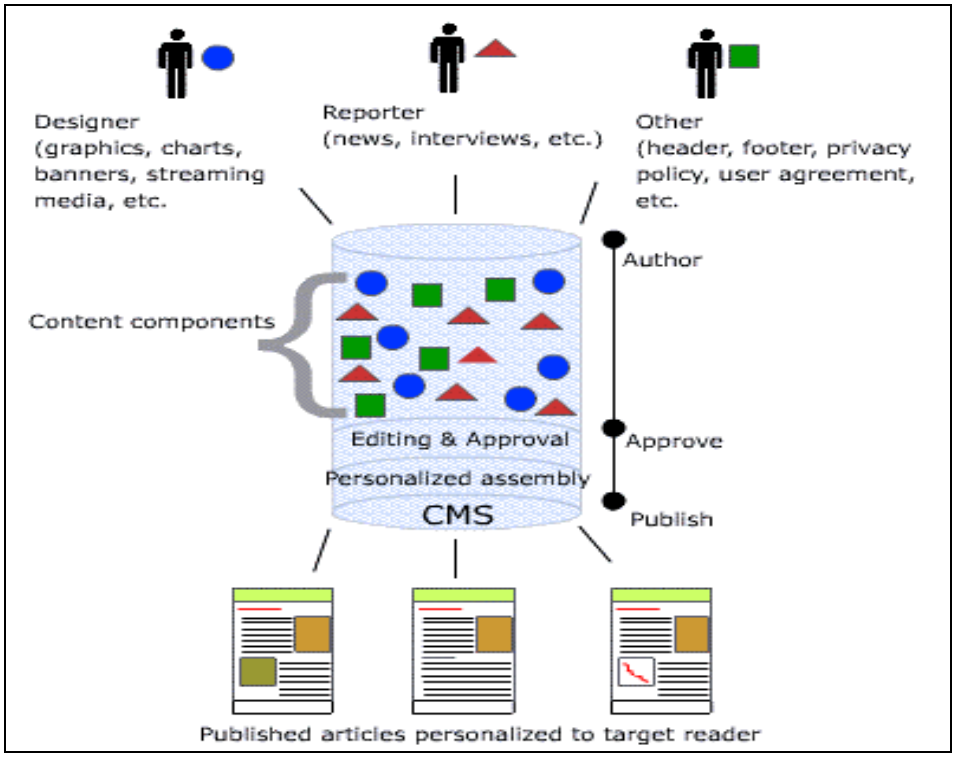


Figure 4: CMS
Source : from (6)

8.3 What are RLOs(Reusable learning objects)?

RLOs are:

> the smallest independent instructional experience that contains an objective, a learning activity and an assessment.

Since RLOs are the smallest self-contained chunks of instruction, they can be mixed and matched to create larger personalized instruction sets (courses, lessons, tracks, etc.)

So finally, **What is a LCMS (Learning Content Management System)?**

> "LCMS is a system (mostly Web-based) that is used to author, approve, publish, and manage learning content (more specifically learning objects)."

A LCMS combines the administrative and management dimensions of a traditional LMS with the content creation and personalized assembly dimensions of a CMS.

In a LCMS (Figure 5), we would have libraries of RLOs that can be used either independently, or as a part of larger instruction sets (one RLO --> many courses --> many learners).

Just like in a CMS, there would be workflow processes around a LCMS too:

- Instructional designers would create either new RLOs targeting specific performance goals, or new courses by assembling already created RLOs
- Editors (senior instructional designers/ learning officers) would go view the submitted RLO/course, and either approve or reject it. If approved, the RLO/course would be made available to all to use, otherwise it would be sent back for revision
- Personalization rules would set in, targeting the new RLOs/courses to those who fit (or, have subscribed to) its profile
- RLOs and courses that have outlived their usefulness would either be backed up and archived, or just deleted from the repository

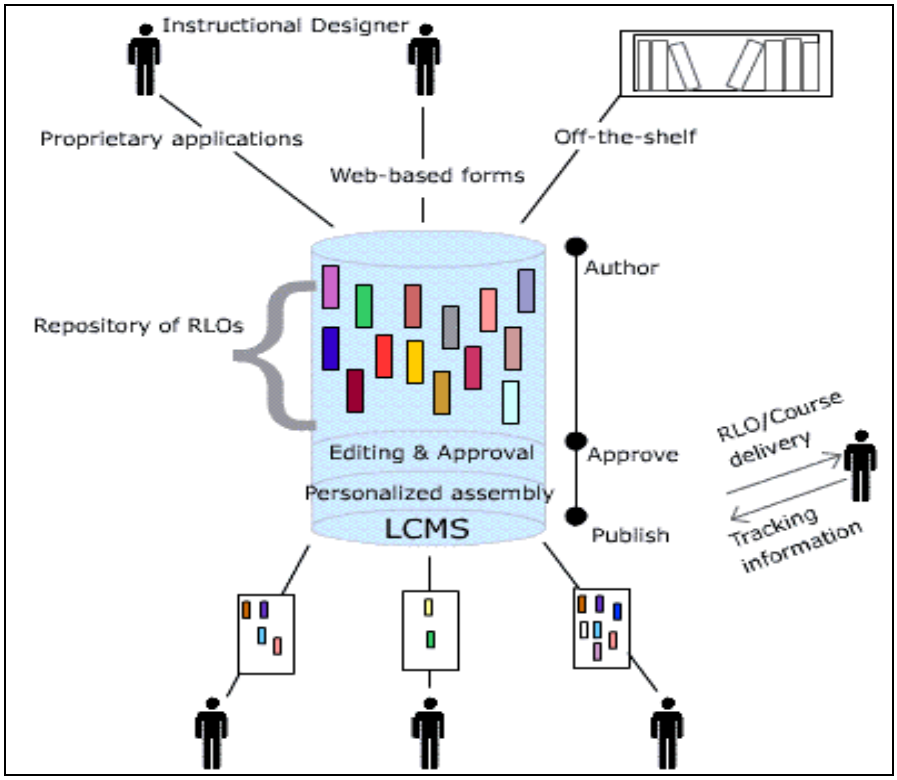


Figure 5: LCMS
Source: from (6)

9. Conclusion

In the era of Internet learning objects present the next wave and are becoming the hype of the digital learning industry. They provide a new world of easily accessible and individualized learning, made possible by the flexible deployment over networks of small, reusable components from multiple sources. The basic concept is the learning and reusability in learning objects. The organizations will have greater control over their instructional content, resulting in better customization of their learning programs using learning content management system.

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