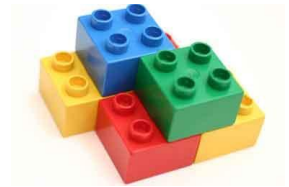# Educational Technology

Learning Objects

K. Vassilakis / M. Kalogiannakis

Learning Objects - Contents

- Definitions - terminology
- Desired Attributes
- Limitations
- Design guidelines

Most material is taken from:
- Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy, D.Wiley, 2000
- Guidelines for authors of Learning Objects, R.S. Smith, The New Media Consortium, 2004

Learning Objects

- Early on 90's, educational technologists had already perceived the <u>importance of content</u>.

- So, several radical approaches were explored on developing digital educational content.

  - *For instance, in their effort for an efficient exploitation of learning material, many educational technologists borrowed the concept of object-oriented programming.*

- In 1994, the term "Learning Object" was popularized by W. Hodgins in order to describe effectively the educational content of the new digital era.

- The following years the term "Learning Object" has received considerable attention in eLearning context, attracting more and more educational communities.

New approaches for content development

- That period, the new proposed design approaches of Learning Objects took into consideration (wikipedia):

  - *the reduction of the cost of learning,*

  - *Use of standards for managing learning material and*

  - *the potentiality of <u>use and reuse</u> of learning content by various digital learning platforms, such as LMSs.*

- Consequently, educational technologists tried to attribute Learning Objects (LO) some desirable features satisfying the new concepts of development.

- But satisfying all the desired features, was proved a rather difficult task.

Flash Activity

Προσπαθήστε να δώσετε μια περιγραφή-ορισμό για τα Learning Objects

Definitions

- *Any entity, digital or non-digital, that <u>may be used</u> for learning, education or training* (IEEE 1484.12.1-2002, Draft Standard for Learning Object Metadata, 2002).

- *Any entity, digital or non-digital, which can be used, <u>re-used</u> or <u>referenced</u> during technology supported learning* (IEEE, The Learning Object Metadata standard, 2005).

- *Any digital resource that <u>can be reused</u> to support the instruction* (http://reusability.org/read, D. A. Wiley, 2002).

- *Any <u>reusable digital resource</u> that is encapsulated in a lesson or assemblage of lessons grouped in units, modules, courses, and even programmes* (*Learning objects: A practical definition, McGreal, R., 2004*).

- Unlike IEEE, ISO does not use the term Learning Object. In ISO/IEC 2382 IT vocabulary for learning, education and training (*part 36, 2008*) the term *learning resource* is used instead, by describing it as an <u>entity</u> that can be <u>referenced</u> and used for <u>learning</u>, <u>education</u> and <u>training</u>.

A confusing term

- In the Educational Technology community there have been several extensive and endless debates regarding the definition of Learning Objects:

  Every paper on the topic started with its own definition
  (M. Weller, 2020, 25 Years of Ed Tech)

- *The learning object remains <u>an ill-defined concept</u>, despite numerous and extensive discussion in the literature* (*Towards a useful classification of learning objects, Churchill, 2007*).

- *The notion "learning objects" is confusing in part, because there are <u>dozens of definitions</u>. Almost every article written about learning objects provides its own unique definition of the term* (*The Learning Objects Literature, Wiley, 2008*).

- According to Friesen (2003), *the term "learning object" suggests neither simplicity, compatibility nor any obvious relative advantage over teaching practice.*

- Other terms commonly used instead: knowledge / instructional object and learning / educational resource, content object, or simply educational material.

What's behind Learning Objects

- The idea behind Learning Objects (LO) is their potential <u>reusability</u> in <u>diverse learning</u> process:

"write once, use anywhere"

(http://opencontent.org/blog/archives/230)

Instructional designers should <u>build small</u> (relative to the size of an entire course) instructional components that <u>can be reused</u> a number of times <u>in different learning contexts</u> (Wiley, 2002).

- Learning Objects should be digital entities <u>deliverable over the Internet</u>.

- A Learning Object is a <u>type of knowledge object</u>.

- They are used for promoting <u>flexibility</u> and <u>reusing</u> of online materials in order to <u>meet the needs of individual learners</u>.
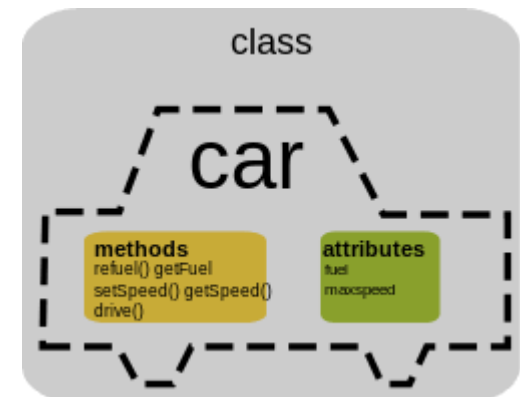
The LEGO metaphor

- The behavior of LO have been likened to LEGO blocks:

  - *combinable, assembled and simple (Willey 2002).*

- The metaphor

  - *Create small pieces of instruction (LEGO' s brick),*
  - *that can be assembled (stacked together)*
  - *into some larger instructional structure (house) and*
  - *reused in other bigger instructional structures (cities).*

- LEGO metaphor implies:

  - *modularity,*
  - *reusability,*
  - *share-ability and*
  - *interoperability of LOs.*

en.wikipedia.org

Object-oriented programming metaphor

■ Some claim that the idea behind learning objects is grounded in the object-oriented programming paradigm.

■ Object-oriented programming is based on components (called objects) that can be reused.

■ Independent pieces of instruction that contain data, attributes, and methods and fulfill the principles of:

- *encapsulation,*
- *abstraction,*
- *inheritance, and*
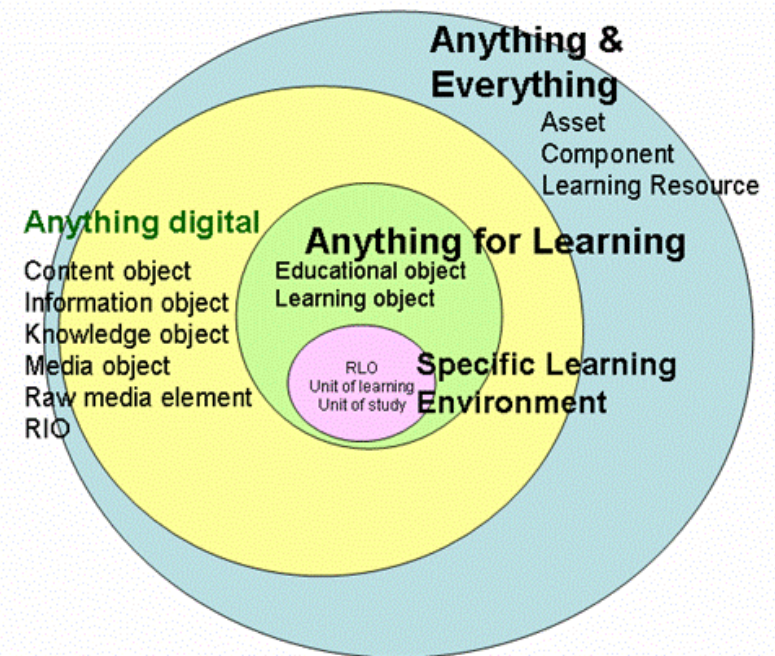- *polymorphism*
  (Fernandez-Manjon and Sancho, 2002).

https://commons.wikimedia.org/

Educational resources terminology

Anything	Anything Digital	Anything for Learning	Specific Learning Environment
Asset Component Learning Resource	Content Object, Information Object, Knowledge Object, Media Object, Raw Media Element, Reusable Information Object (RIO)	Educational Object, Learning Object	Reusable Learning Object (RLO), Unit of Learning, Unit of Study

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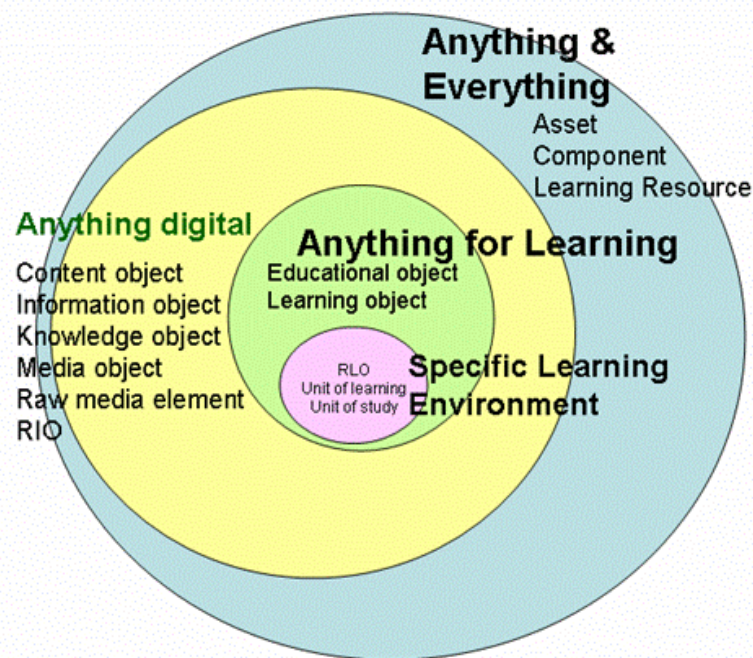*Learning object terminology:*

Source:

Learning Objects: A Practical Definition, McGreal R., International Journal of Instructional Technology and Distance Learning, V1.9,21-32, 2004.

Expected advantages of Learning Object's technology

■ *Learners* could benefit from courses being more <u>readily customized – edited</u> for their various needs.

■ *Training facilitators* could <u>access</u> and <u>share</u> resources, allowing them to quickly <u>construct new learning modules</u> and courses with a <u>minimum of effort</u>.

■ *Managers and administrators* could achieve efficiency by eliminating <u>duplication of effort</u>.

■ *Institutions* could offer new courses more <u>easily</u> and <u>create new income streams</u> by licensing content created internally to <u>other institutions</u> and individuals.

■ International, national, state and institutional agencies could come together to *create large libraries* (repositories) of content material that <u>can be shared</u>.

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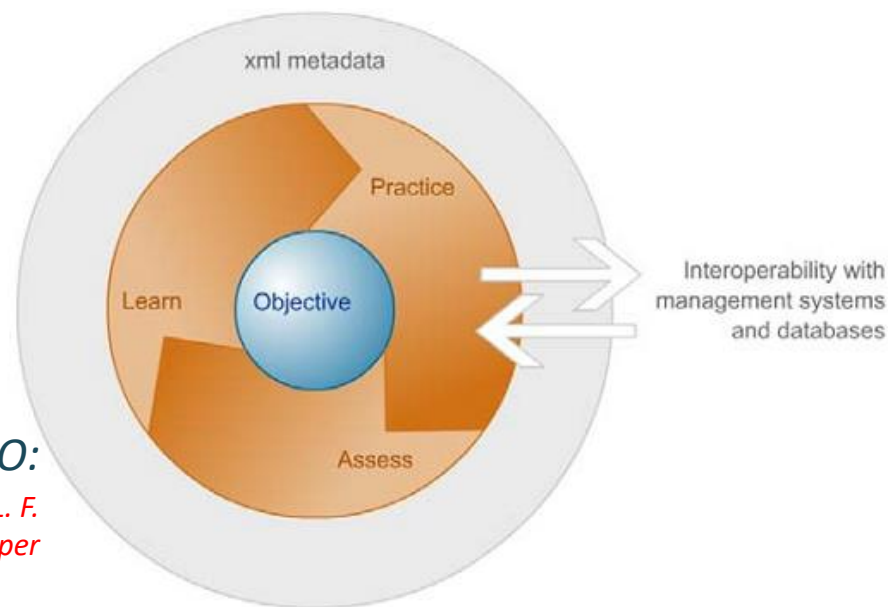
achieved

Flash Activity

With what has been said so far, what do you think are the desired characteristics that learning objects should have?

15

Desired attribute: Educational soundness

- *Context in education is essential.* A learning object could be a single <u>digital resource</u> (pictures, documents, sounds, video, simulations) or a collection of digital materials, <u>coupled with</u> a clear and measurable <u>learning objective</u> designed to support a <u>learning process</u> (have a learning goal).

- The key distinguishing feature between a plain digital resource and a learning object is <u>educational soundness</u> and clear connection to a learning process (learning added value).

- By combining learning objects in different ways, higher-level learning goals can be met, and ultimately, even <u>entire courses could</u> be constructed.

xml metadata

Practice

Learn   Objective

Assess

Interoperability with management systems and databases

Anatomy of a LO:

Elusive Vision: Challenges Impeding the Learning Object Economy, L. F. Johnson, New Media Consortium, 2003 – Macromedia white paper
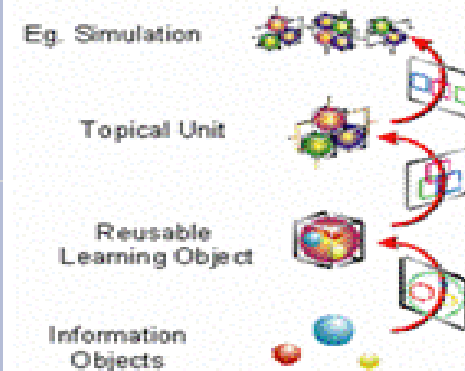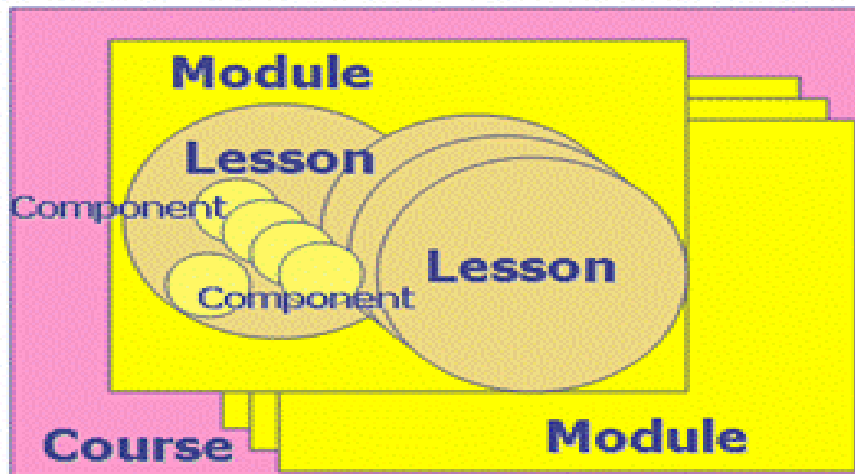
Desired attribute: Granularity

- Learning Objects used for learning, exist and interoperate at different <u>levels of granularity</u>.

- Granularity refers to <u>size</u>, <u>decomposability</u> and <u>the extent</u> to which a Learning Object could <u>be used as part of</u> a larger Learning Object.

- At the simplest level, a Learning Object could be a document, an image, a sound, a video clip or a Java applet (<u>row content</u>).

- A higher lever a Learning Object could be a unit, a lesson (a group of units) or a module (group of lessons).

- A group of lessons or modules formulate a course (syllabus).

- A group of courses that lead toward a certificate or diploma is considered to be a program (curriculum).

- Obviously, granularity <u>is critical for reusing</u> (aggregation level).
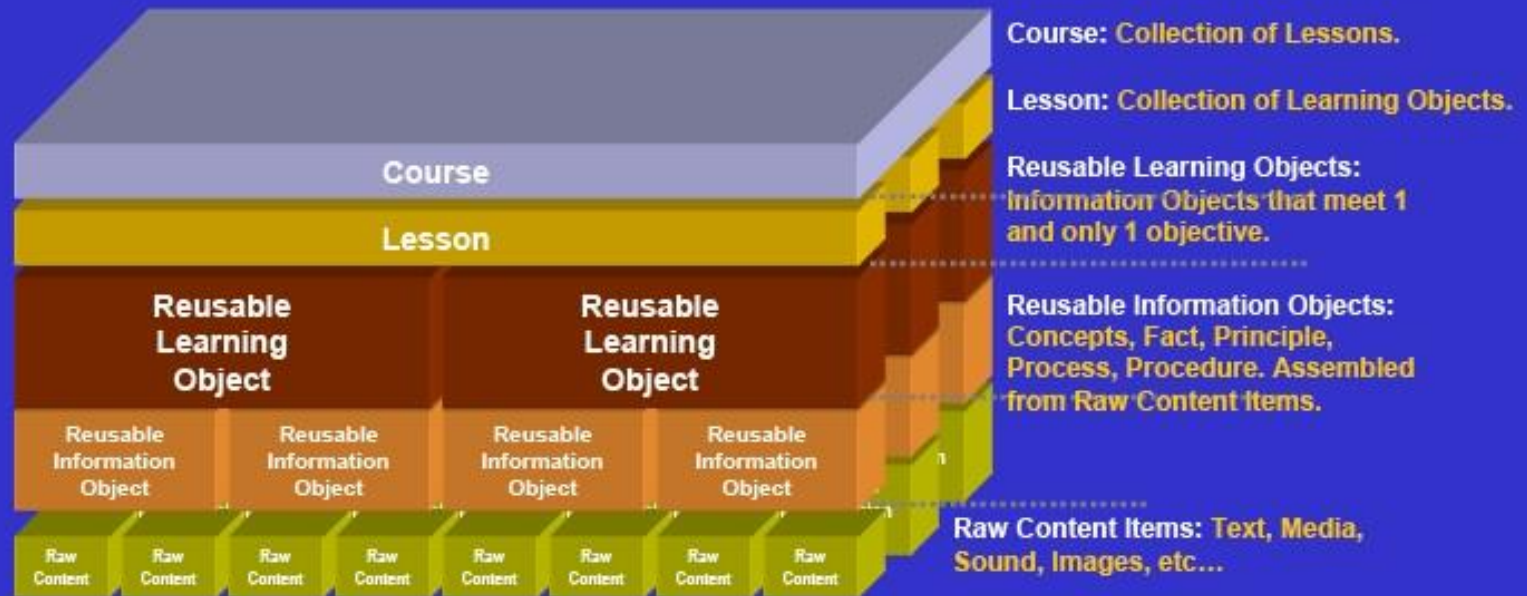
Learning Objects granularity

Hodkins-Autodesk's granularity

Autodesk Content Strategy
Building Block Model View

Course: Collection of Lessons.

Lesson: Collection of Learning Objects.

Reusable Learning Objects: Information Objects that meet 1 and only 1 objective.

Reusable Information Objects: Concepts, Fact, Principle, Process, Procedure. Assembled from Raw Content Items.

Raw Content Items: Text, Media, Sound, Images, etc...

Course

Lesson

Reusable Learning Object

Reusable Learning Object

Reusable Information Object

Reusable Information Object

Reusable Information Object

Reusable Information Object

Raw Content

Raw Content

Raw Content

Raw Content

Raw Content

Raw Content

Raw Content

Raw Content

www.autodesk.com

www.learnativity.com

autodesk

Desired attribute: Aggregation

- An educational strength of a Learning Object is its <u>aggregation potential</u> (it can be customized).

- The formal <u>composition</u> of a LO is <u>an arrangement of assets</u>. Preferably a LO should be a combination of multiple elements.

- LOs can <u>be grouped into larger collections of content</u>, including traditional course structures.

- An <u>ideal LO</u> should be able to <u>be tailored</u> to meet different educational objectives and learners' requirements.

- Online <u>courses</u> can be designed as a <u>collection of LOs</u> rather than as whole, inseparable, long courses.
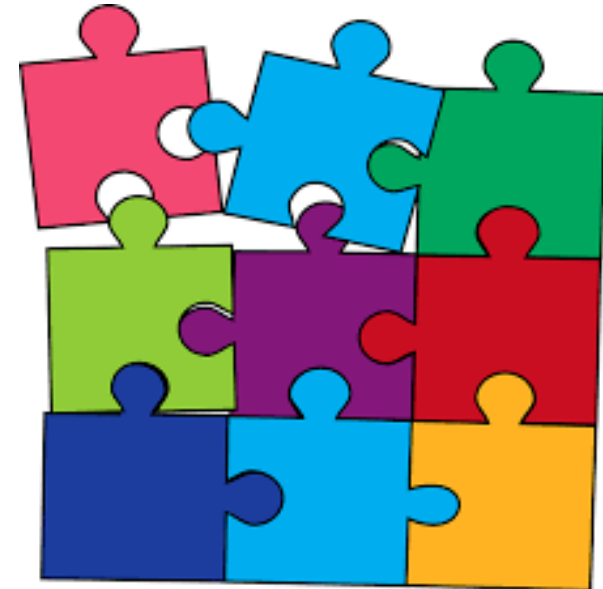
http://pixabay.com

Aggregation level

- Defining <u>the level of aggregation</u>, i.e. its role and position in the learning content hierarchy, <u>is not trivial task</u>.

- The structure and composite nature of a learning object is still open to interpretation. <u>It depends on granularity</u>.

- There is <u>not known optimal methodology </u>for estimating aggregation level, but some proposed content models (IMS CP, IMS CC, SCORM, LOM, Cisco) and research works suggest various aggregation levels.

- More work, however, needs to be undertaken to provide a standard specification of a LO and its aggregation level (Balatsoukas 2008).

- According to IEEE (LOM 2002) the aggregation level describes "<u>the functional granularity</u>" of a learning object.

Aggregation level

- Defining the level of aggregation, i.e. its role and position in the learning content hierarchy, is not trivial task.

specification of a LO and its aggregation level (Balatsoukas 2008).

- According to IEEE (LOM 2002) the aggregation level describes "the functional granularity" of a learning object.

Desired attribute: Accessibility

- Accessibility refers to whether people with <u>disabilities</u> who require assistive technology, can reach, perceive and use the content in a LO.

- Technical structure of a LO <u>should support assistive technology</u> for learners who require it.

- Accessible design grants a wider range of learners more options and <u>greater flexibility in learning</u>.

- Also, it provides benefits to those <u>learners with differing learning styles</u> (visual, auditory, tactile) and allows people to learn in their preferred learning style.

- Another interpretation of accessibility is the <u>ability to locate and access</u> instructional components from one remote location and deliver them to many other locations.
  - *This means that a LO should be <u>identifiable</u> and <u>locatable</u> when needed.*

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- A

- A (v learning style.

Open access movement (free to everyone).

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Web Accessibility Initiative (WAI)

- Nowadays, accessibility of a resource (and thus a learning object) mostly means <u>web-based accessibility</u>.

- W3C Web Accessibility Initiative (WAI) has <u>mission</u> to lead the Web to <u>its full potential to be accessible</u>.

- WAI develops strategies, guidelines and resources to help make the web accessible to people with disabilities.

- Web accessibility also benefits others, including older people with changing abilities due to aging.

- 3 Web accessibility guidelines:
  - *Authoring Tool Accessibility Guidelines (ATAG)*
  - *Web Content Accessibility Guidelines (WCAG) and*
  - *User Agent Accessibility Guidelines (UAAG)*

- WCAG 2.0 is approved as an ISO standard: ISO/IEC 40500:2012

Desired attribute: Reusability

- LOs can be used in <u>multiple context</u>; for multiple <u>purpose</u>; at multiple <u>times</u> (e.g., LOs can be used to teach an undergraduate or graduate course, short course, certificate course, or extension/outreach).

- A learning object is reusable (RLO) when it can be used to create <u>other learning activities</u> within a given content area or other content area. <u>LOs are supposed to be RLOs</u>.

- To an instructional designer, learning object "reuse" means placing a <u>learning object in a context other than that for which it was designed</u>.

- Critical precondition: *The learning object can <u>be taken independently</u>* (*self-contained chunks of learning*).

- Reusability facilitates the creation of adaptive, scalable systems by <u>tagging LO's with metadata </u>(including copyrights).

The Reusability Paradox

- The more context a learning object has, the more (and the more easily) a learner can learn from it.

- Learning tends to <u>be highly contextual</u>, and context is not as easy to disseminate as data alone.

- To make learning objects maximally reusable, learning objects <u>should contain as little context as possible</u>.

- Pedagogical effectiveness and potential for reuse are completely at odds with one another.
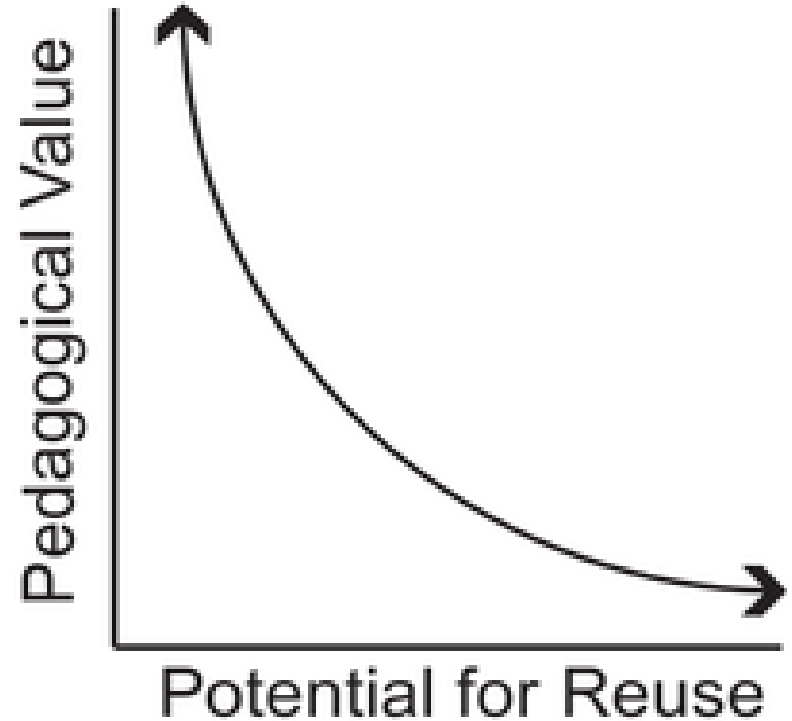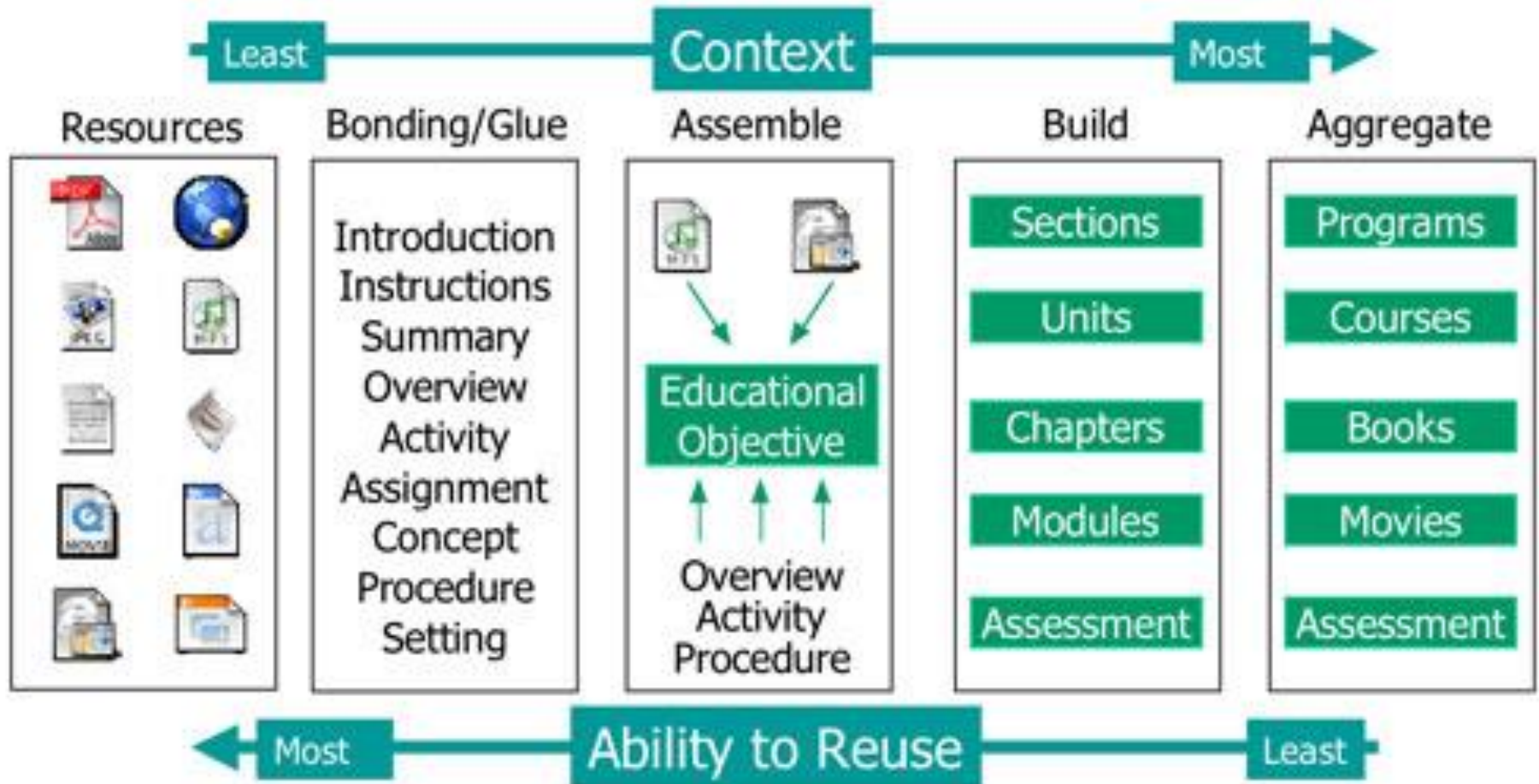

The inverse relationship between reusability and pedagogical effectiveness
Source:
    http://cnx.org/content/m11898/latest
    (D. Wiley module)

Relationship between context and reusability

A Learning Object could be reused:

- by the <u>same learner</u> working on <u>different tasks</u> or activities, or solving <u>different problems</u>,

- by learners <u>at various levels</u> in knowledge or skill acquisition (different academic levels, for example),

- by learners in <u>different courses</u> within a discipline,

- by learners in <u>different disciplines</u>, where the content in the learning object applies to each discipline, though perhaps in different ways,

- as <u>part of a more complex</u> LOs or series of objects,

- by developers who <u>may borrow</u> "widgets" or functions of one LO for use in another,

- by developers who may <u>borrow content for use</u> in another LO

Packaging

- LOs often need to be moved between educational organizations for diffusion, sharing or business purposes.

- Packaging is wrapping of LOs (as an individual module, course or a collection of courses) into interoperable, distributable packages.

- It gives the ability to content developers to aggregate different sized LOs in a standard manner that facilitates transfer and interoperability across systems.

- This ability is crucial to the content being reusable and therefore a key technology in the Learning Object area.

- A package should also contain metadata with description of the content and any technical details for the taking platform to run the Learning Object.

Packaging - how

- Packaging process can be difficult and time consuming and has led to the development of several <u>packaging specifications/standards</u> to address portability of LOs.

- A packaging specification <u>defines how</u> the content should be packaged digitally to facilitate the sharing among various <u>compliant</u> to the specification platforms.

- Various packaging specifications provide common frameworks for the packaging and distribution of content.

- In practice, the educational resource is represented as an <u>XML manifest</u> file.

- Basic packaging specifications are IMS Content Packaging (CP) and AICC Course Structure File (CSF).

- The most known packaging suites are SCORM and IMS CC.

SCORM

Desired attribute: Interoperability

- Interoperability is the ability to easily <u>move LOs from one system to another</u>.

- LOs should be able to function in <u>diverse platforms</u> (hardware) <u>system software</u> (OS) and <u>presentation tools</u>, with minimum adaptation requirements.

- <u>A "must" for reusability</u>. A LO should include interoperability mechanisms that facilitate its exchangeability across authoring tools and virtual learning environments.

- Interoperability concerns <u>any educational material</u> in a LO even a wide range of <u>assessment questions, navigation, conditional sequences, tracking and advance learning activities</u>.

- Interoperability is facilitated, if LO is <u>independent</u> of both the <u>delivery media</u> and <u>content management systems</u>.

Interoperability - How
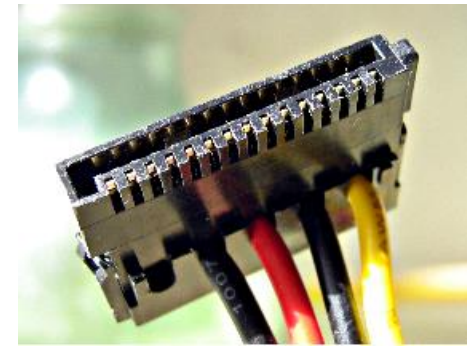
- Working with standards

- Using metadata

- Adoption of <u>international standards</u> and specifications to define LO's interfaces for interoperability with each other and with the systems that they will be utilized in.

- Various tools for creating LOs <u>adopt standards</u> and specifications to produce LOs that can be stored and shared in repositories and included in virtual learning environments.

- Interoperability <u>is crucial when referring to LOs across different digital learning platforms</u> such as Learning Management Systems (LMS) and Learning Object Repositories (LOR) in a service-oriented context.

Desired attribute: Metadata tagging

- Metadata is <u>information about information</u>

- It is structured in a manner that facilitates the <u>management, discovery and retrieval</u> of LOs.

- Metadata also provide a way for <u>non-textual</u> LOs to be discovered or located.

- Metadata standards have been developed to support both:

  - *targeted resource <u>discovery by human</u> users of the Web and*

  - *<u>machine interoperability</u> (information exchange).*

Educational Metadata

- <u>Educational metadata</u> standards extend the scope of description that can be included in a metadata record with information that has particular <u>educational relevance</u>.

- Learning object metadata may be:

  - *<u>objective</u> information (such as the size of a file in megabytes) or*

  - *<u>subjective</u> (such as a professor's opinion of the quality of content).*

- The potential for instructional (re)use of different types of learning objects will be maximized <u>by different types of metadata</u>.

Metadata example

```xml
<?xml version="1.0" encoding="UTF-8"?>
<lom xmlns="http://ltsc.ieee.org/xsd/LOM" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://ltsc.ieee.org/xsd/LOM http://ltsc.ieee.org/xsd/lomv1.0/lom.xsd">
  <general>
    <title>
      <string language="en">Ship</string>
      <string language="nl">Boot</string>
    </title>
    <language>en</language>
  </general>
  <technical>
    <location> http://en.wikipedia.org/wiki/Image:Bateaugoelette.jpg </location>
  </technical>
  <classification>
    <keyword>
      <string language="en">schooner</string>
    </keyword>
  </classification>
</lom>
```

An example of a Learning Object and its associated LOM metadata
(http://www.dlib.org/dlib/january08/ceri/01ceri.html)

- A metadata record can <u>either</u> be located <u>separately</u> from the resource it describes or be <u>embedded</u> or packaged with it.

Flash Activity

Based on the knowledge about metadata and everything that has been reported so far about Learning Objects, what are, in your opinion, the benefits of metadata in the context of Learning Objects?
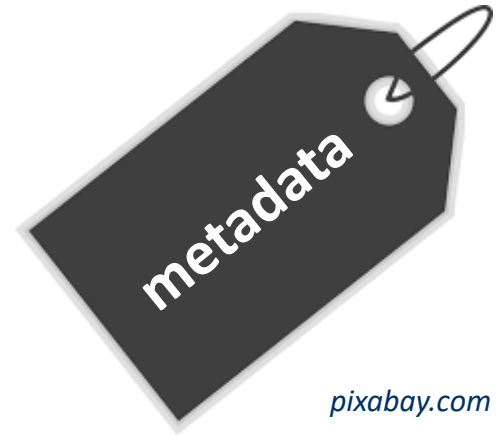
Learning object

Content

Metadata

Benefits of metadata in a Learning Object

- Facilitating <u>the discovery and the instructional use</u> of Learning Objects.

  - *by supporting their reusability, discoverability, interoperability, durability and property attribution, usually in the context of repositories.*

pixabay.com

- Cataloging and searching.

  - *Fields from various metadata standards like Dublin Core and LOM are used to describe LOs. Searching engines examine the data in those fields to come up with a list of LOs that match specific criteria*

en.wikipedia.org

Benefits of metadata in a Learning Object

- Ownership, attribution, and rights management.

  - *Fields in metadata standards that describe who owns a resource, who <u>should be credited</u> when it is used, and how it may be used.*

  - *These metadata fields can help ensuring that the LO is used as author's intention and give proper credits for her (his) work.*

- Communicating with virtual educational systems.

  - *Developers of various virtual systems (LMS, VLE) refer to the known specifications when they create functions that allow course creators to track student progress, sequence LOs, and so on.*

  - *Although the products are different, they can interoperate with LOs that also have the same specifications.*

commons.wikimedia.org

www.flickr.com

Benefits of metadata in a Learning Object

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  - *Fields in metadata standards that ___ resource, who should be ___ it may be used ___*

  - *___ that the LO is ___ give proper credits for her*

commons.wikimedia.org

- Communicating with virtual educational sy___

  - *Developers of various virtual ___ the known specific ___ allow co___ ___quence LOs ___*

  - *Alth___ ___ different, they can interoperate with ___ have the same specifications.*

www.flickr.com

Metadata make Learning Objects "machine processable"

Metadata make Learning Objects ready for semantic web

Other desired attributes of Learning Objects

- Flexibility:
  - *the ability to <u>mix and reuse</u> learning objects from a range of sources into multiple applications.*

- Durability
  - *the ability to <u>withstand technology changes</u> without requiring redesign or recoding.*

- Scalability:
  - *the ability to <u>extend</u> to <u>large audiences</u> without a proportional increase in cost.*

- Usability:
  - *Should support the process of learning and enhance the <u>ability of the student to engage</u> with its content. Learners should focus on mastering the material they are trying to learn <u>rather</u> than on <u>figuring out how to use</u> the learning object.*

Some more desired attributes of Learning Objects

- **Integrity:**
  - *LO should be authentic and <u>takes account</u> of the ways <u>knowledge is conceptualized</u>, the <u>skills</u> and competencies of the domain and the ways of <u>communicating</u> both within and outside the domain.*

- **Cost effectiveness:**
  - *as non-consumable resources, LOs can be used in a course from <u>one semester to the next</u>, or be <u>repurposed</u> for different courses or even different disciplines. Many are available free of charge (open).*

- **Customizability:**
  - *Instructors may select learning objects to <u>suit their</u> course material and particular instructional style.*

- **Easy maintenance:**
  - *Ease of updates, searches, and content management.*

Standards and Specifications

- In the context of eLearning technology, standards are generally developed to be <u>used</u> in <u>systems' design</u> and <u>implementation</u> for the purposes of ensuring <u>interoperability, portability and reusability</u>.

  - *These attributes should <u>apply</u> to both the <u>systems</u> themselves and of the <u>content and metadata</u> they manage.*

- An important part of the standardization process is the <u>development of specifications</u>.

  - *Specifications can be said to represent standards <u>early</u> in their <u>development</u>, prior to receiving approval from standards bodies, and they tend to be experimental, incomplete and more rapidly evolving.*

- As e-content and eLearning systems are often created in a manner that makes it very difficult to support their interchange or their successful interoperation, standards have <u>been receiving significant attention</u>.

Learning Objects: Standards & Specifications

- **IEEE/LTSC** – Institute of Electrical and Electronics Engineers – Learning Technology Standards Committee (IEEE 1484.12.1-2002 Learning Object Metadata -LOM).

- **ISO/IEC 19788**, Metadata for Learning Resource (MLS)

- IMS Instructional Management Systems Project – *IMS Global Learning Consortium* (Learning Resources Meta-Data Specification, Content and Packaging Specification, Common Cartridge, Learning Object Discovery & Exchange –LODE- activity).

- **DCMI** - Dublin Core Metadata Initiative (Dublin Core Metadata Record, metadata standards for RLO discovery across domains, metadata interoperability frameworks).

- **ADL** – Advanced Distributed Learning Initiative (CAM Content Aggregation Model, SCORM Sharable Content Object Reference Model, xAPI/LRS).

- **Creative Commons** (Intellectual Property and Digital Rights).

Learning Objects: Standards & Specifications

- **IEEE/LTSC** – Institute of Electrical and Electronics Engineers – Learning Technology Standards Committee (IEEE 1484.12.1-2002 Learning Object Metadata -LOM)

- **ISO/IEC 19788**, Metadata for Learning Resource (MLS)

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- **ADL** ...d Distributed Learning Initiative (CAM Content Aggregation Model, SCORM Sharable Content Object Reference Model, xAPI/LRS).

- **Creative Commons** (Intellectual Property and Digital Rights).

"the nice thing about standards is that there are so many to choose from" (Tanenbaum, 1981, p. 221)

Learning Objects: attributes in summary

- *Accessible* (digital, web-based, 24/7, for disables).

- *Reusable* (in various levels/contexts).

- *Self-contained* (each LO focuses on a specific learning objective).

- *Small in size* (to focus learner's attention, 2-15 minutes).

- *Standardized* (follow open international standards/specifications).

- *Searchable* (discoverable, i.e. tagged with metadata).

- *Flexible* (easy to update; provide access to quality teaching and learning resources for a wide range of learners).

- *Interoperable* (across different platforms and communicate with other tools to build larger modules, courses or curricula).

- *Suited for new types of learners* (net-generation learner; learner-centered).

- *Cost-effective* (avoid duplication of material; intellectual capital).

Benefits of Learning Objects

■ **For Learners**

- *Personalized courses can be constructed to meet individual requirements.*
- *Learning comes in digestible chunks.*
- *Learning is available on a just-in-time basis.*

■ **For Administrators**

- *Courses can be customized to suit the needs of different audiences.*
- *Courses can be constructed using components from a wide range of sources.*
- *Components can be reused to meet a range of learning needs.*

■ **For Developers**

- *LOs can be built or modified using many different authoring tools.*
- *The same LOs can be employed across a variety of hardware and software platforms.*
- *LOs and assets can be stored in repositories so that the developer can search for them and repurpose them.*

Flash Activity

What are risks of Learning Objects for:
      (a) learners,
      (b) administrators
      (c) developers

Risks of Learning Objects

- **For Learners**
  - *Learners will require <u>self-motivation</u> to select LOs.*
  - *The implementation of LOs will require a paradigm shift in <u>the way learners view education</u>. Education/training is traditionally viewed as events of training courses.*

- **For Administrators**
  - *<u>More work to organize Learning Objects</u> into courses and training programs.*
  - *When administrators try to link several Learning Object together to make a training course or program, they may find that <u>the navigation of each LO is unique</u>.*

- **For Developers**
  - *Developers will <u>need to build many small Learning Objects</u> as opposed to a few larger courses. This will be perceived as <u>counterproductive</u> because of the additional work in development as well as design.*
  - *A manager or content owner requesting a course on a program or process <u>may not want to break the materials into small learning objects</u> that stand alone and are labeled with "assembly required".*
  - *If developers wanted to repurpose existing LOs from other developers, they would need to have access to the <u>original development tool</u>.*

LOR issues for VET sector organizations. Flexible Learning Advisory Group, 2003

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Learning Objects: issues

- The known "<u>reusability paradox</u>", in which the more reusable Learning Objects are, the less instructionally effective they are, and vice versa.

- <u>Lack of technical experience</u>. One of the most common barriers to creating LOs. Edutech people thought that this problem would be solved with the emergence of new tools which require no more special technical knowledge.

- <u>Incorporating effective pedagogy</u> into the LO. Often the educational objective lost while development occurs through an advanced authoring tool with many features.

- <u>Intellectual property and copyright issues</u> (ownership, fair usage).

- <u>Author workload</u>. A high-quality LO requires time to plan, gather/create assets, and develop, test, and release the finished product.

- It is difficult to decide <u>how much content to include</u> in a single LO (navigation/downloading time).

- Specifications and standards related to LO are almost <u>completely technical</u> (XML, controlled vocabularies).

Solutions on managing the sharing of LO

- A way of <u>describing the LOs</u> so it can be found, (like a cataloguing system in a traditional library) – *Metadata*.

- A technology to <u>enable a resource to be used and work successfully</u> not only on the system and with the tools it was created in, but with other systems that may be quite different – *Packaging*.

- A technology <u>to store the resources</u>, which allows them to be easily found, retrieved, published and submitted to the storage system – *Repositories*.

- Tools to <u>protect the intellectual</u>, moral and legal rights of the creators/owners of LOs, ensure that creators/owners have some control over how the resources are used, and automate payment for use of the resources - *Digital Rights Management and open licenses*.

- A way to <u>bring various technologies together</u> so they work with one another to allow sharing and reuse of LOs - *ADL SCORM and IMS CC.*

Influence on educational technology

- A lot of research on:

  - *Development of standards,*

  - *Interoperability,*

  - *Accessibility and*

  - *Learning theories.*

- eLearning environments:

  - *LMS / LCMS / VLE (improvements).*

  - *Learning Object Repositories (to store Objects).*

  - *Educational metadata (LOM, DC-ed, LRMI).*

  - *Open Educational Resources (Open courses, MOOCs).*

- Open Education.

https://www.flickr.com/photos/topgold

R.I.P. Learning Objects?

- There have been lots of articles around the blogosphere of late ringing the death bell for learning objects. It's hard to tell if they're right or not, because no one can agree about what a learning object is.

- I will here attribute learning objects' inability to live up to the incredible hype and investment they received to the fact that the premise of the possibility of **simple reuse was simply wrong**.

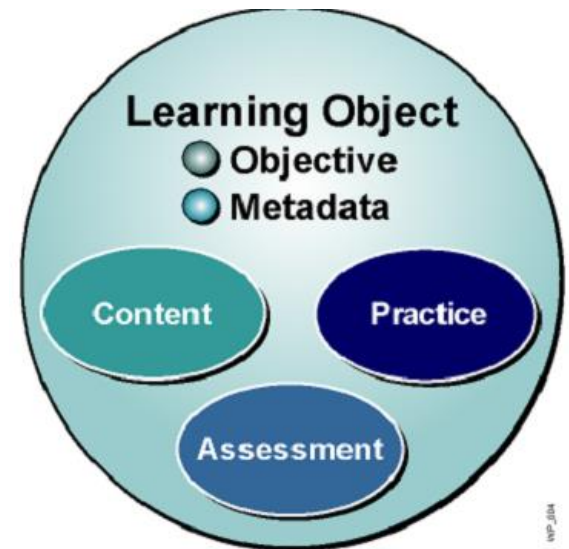*RIP-ping on Learning Objects, Willey 2006, http://opencontent.org/blog/archives/230*

Guidelines for authors of Learning Objects
R.S. Smith,
The New Media Consortium, 2004

- Designing to Enable Learning

- Learner's Experience

- Accessibility & Reusability

- Choose Technology

- Adding Metadata

Guidelines: Enabling Learning

■ Keep your <u>educational goal in focus</u>.

   Do not add unrelated features. Include only assets that support your educational goal.

■ Choose <u>meaningful content</u> that directly supports your educational goal.

   Plan <u>delivery of segments/chunks</u>. Build a flowchart of content with <u>specific objectives</u>, examples.

■ <u>Present</u> content in <u>appropriate ways</u> (depending on content's type).

■ Select <u>appropriate activity</u> structures.

   Offer the learner a choice of paths through the LO and a range of activities that address <u>different modalities</u> of learning.

■ Consider <u>assessment issues</u>.

   Provide sample assignments, usage tips, links to related resources, and other support material.

Guidelines: Learner's Experience – graphic design

- Try to make your LO attractive.

- Each page or screen should <u>be visually balanced but</u> avoid to create symmetry.

- Use physical placement on the screen or page to establish and strengthen <u>visual relationships between items</u> (emphasizing important item, grouping related content).

- Select <u>one or two visual elements</u> and use them throughout the piece to create a <u>sense of rhythm</u> (be consistent with colors).

- <u>If elements</u> in your design <u>are not the same</u>, make them <u>very different</u> (not just slightly different) to create contrast.

- All elements should work together to create <u>a harmonious whole</u>.

- It will be wise to have a <u>graphic designer</u> look over your work if you have no experience in that area.

- Keep your designs <u>simple</u>. Make sure any graphics you use are <u>professional-looking</u>.

Guidelines: Learner's Experience – usability

- Try to make your learning object easy to use.

- Make your interface as <u>simple and clear</u> as you can (learners should not spend time on figuring out how to use the content)

- Remove any <u>obstacles to accessing</u> the content.

- <u>Instructions</u> should be <u>clear and easy</u> to understand.

- <u>Be consistent</u> in the use of design elements (buttons), language, formatting, appearance, and functionality.

- Allow <u>learners to control their interactions</u> (give them the freedom to choose how to complete-return to-undo a task).

- Follow established <u>standards of design</u> and use conventions that are familiar to learners (navigation-quitting-control elements) .

- <u>Simplify</u> the design wherever possible and stick to basic principles of aesthetics (amount of text, formatting, colors, number of graphics).

- Ask <u>someone else</u> to read the guidelines and compare your learning object to the key points.

Guidelines: Accessibility & Reusability

- Try to make your LO accessible to all.

  - *Have in mind learners with <u>disabilities.</u>*

  - *Design for <u>device independence</u> (variety of I/O devices).*

  - *Provide <u>alternative formats</u> for visual and auditory content (include text descriptions for the assets).*

  - *Allow learners to <u>control moving</u> content (scrolling, animations, lunching).*

- Try to make your LO reusable

  - *Solve the <u>copyright problem</u> for others who want to reuse your materials.*

  - *Make sure your learning object is <u>self-contained</u> and can <u>stand on its own</u> (eliminate dependencies, support goal, small enough).*

  - *Design your learning object so it may be used by a <u>diverse audience</u> (however think about reusability paradox).*

Guidelines: Adding Metadata

- Design for interoperability (reusability, discoverability also).

- Specify <u>what metadata</u> to collect and <u>how to represent</u> it.

  - *Decide –if not yet- what standard / specification you follow (choose a well known best fit your content).*

- Describe <u>how to access metadata</u> (consider packaging also).

- <u>Include</u> appropriate <u>metadata in learning objects</u> you author. Choose development tools that support the chosen standard or specification.

- When you add learning objects to a collection or library, <u>provide requested metadata information</u>.

- Provide contact information, <u>copyright and use licenses</u>, technical requirements, and version information.

- <u>Check your listings periodically</u> to update any information that has changed.

Guidelines: Choose Technology

- LOs can be anything from web pages to mini- applications. They can be created with anything from a simple text editor to specialized tool.

- Selection depends on the developer's technical expertise, features supported, technical support, and expense or availability of the chosen technology and the equipment required to run it.

- Choose a technology and a tool your primary developer is comfortable using (or able to learning).

- Choose a technology that supports the features you want to include in your LO (do not forget features that support accessibility compliance).

- Choose a tool that is supported by your institution's instructional technology staff, if applicable.

- Choose a tool you can afford (check for updated licenses, ask for educational discounts, consider open-source alternatives).

- House your learning objects on a secure, stable platform with permanent Internet access.