

Chapter XII

An Object–Oriented Approach to Manage E–Learning Content Using Learning Objects

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ABSTRACT

Learning objects (LO) are theoretically based on granular, reusable chunks of information. In this chapter the authors argue that LOs should consist of more than just content, that is, they should include pre-knowledge questions on the basis of the concept of the advanced organizer, of self-evaluation questions (assessment), and finally of appropriate metadata. The used metadata concept must be based on accepted standards, such as learning object metadata (LOM) and the shareable object reference model (SCORM). A best practice example of the realization of these concepts is the Virtual Medical Campus Graz (VMC-Graz), which actually is the realization of an information system to make a new curriculum digitally accessible.

INTRODUCTION

Learning objects (LOs) are theoretically based on granular, reusable chunks of information. In this article the authors argue that LOs should consist of more than just content; that is, they

should include preknowledge questions on the basis of the concept of the advanced organizer, self-evaluation questions (assessment), and finally appropriate metadata. The used metadata concept must be based on accepted standards, such as learning object metadata (LOM) and

the shareable object reference model (SCORM). A best-practice example of the realization of these concepts is the Virtual Medical Campus Graz (VMC-Graz), which actually is the realization of an information system to make a new curriculum digitally accessible.

We regard LOs as having a historical foundation in the object-oriented paradigm of computer science. Object orientation basically values the creation of components (called objects) that can be reused (Booch, 1994; Dahl & Nygaard, 1966).

Cisco (n.d.) defines such a learning object as “a granular, reusable chunk of information that is media independent.” The term *information chunk* reaches back to Miller (1956); in his sense, a chunk is an information unit that can be perceived at one time by the individual and stored in the short-term memory (STM). Chunks are generally information units that can be individually complex and intra-individually very different (Simon, 1974).

Generally, the term *media object* is also often used, and for the purpose of e-learning, this type of object is further defined as “digital media designed and/or used for instructional purposes” (South & Monson, n.d.). Such objects range from simple text to video demonstrations and interactive simulations (Holzinger & Ebner, 2003).

According to Wiley (2001), however, the main idea of LOs is to break educational content down into small chunks so that they can be (re)used in various learning environments, in the spirit of object-oriented programming. The Learning Object Metadata Working Group of the IEEE Learning Technology Standards Committee (LTSC) refers to an LO as “any entity, digital or non-digital, which can be used, reused or referenced during technology enhanced learning” (Robson, n.d.). Some authors use other terms; for example, they speak of e-

learning objects (ELOs; e.g., Muzio, Heins, & Mundell, 2002) or reusable learning objects (RLOs; e.g., Polsani, 2003).

Within the VMC-Graz, we use LOs as a new way of considering and handling learning content. They include at least the following four characteristics (compare also with the Center for International Education of the University of Milwaukee; Beck, n.d.):

- They must be much shorter than traditional learning units, typically ranging from 2 minutes to 15 minutes (absolute maximum within the VMC-Graz is 45 minutes).
- They must be self-contained: Each learning object can be used independently.
- They must be tagged with metadata, which contain descriptive information allowing them to be easily found.
- They can be aggregated: Learning objects can be grouped into larger collections of content, including traditional course structures.

INSTRUCTIONAL DESIGN THEORY AND LEARNING OBJECTS

Instructional design theories (IDTs) describe methods of instruction and the situations in which these methods should be used. The methods can be broken into simpler component methods and are probabilistic (Reigeluth, 1999). IDT, or instructional strategies and criteria for their application, play an important role in the application of learning objects. Combination and granularity are two factors that we consider vital:

- **Combination:** Whilst the LTSC promotes international discussion around the tech-

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