Chapter XV
# Pedagogical Scenario Modeling, Deployment, Execution, and Evolution

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## ABSTRACT

*The rise of the pedagogical scenario approach supported by the standardization of IMS learning design is changing the focus from the pedagogical objects to the activities that support learning. With the standardization, comes the promise of the reuse of successful designs for the pedagogical scenarios. However, the uptake of this approach relies on a sound support of the users both at the design phase and at the execution phase and the level to which successful design can be adapted for reuse in both phases. This chapter covers the whole lifecycle of pedagogical scenarios and shows the current level of support one can find in existing learning management systems and tools. It presents, also, the way to enhance this support through the use of model-driven engineering for the design and deployment phase and implementation techniques to provide execution engines that allow flexible runtime execution.*

## INTRODUCTION

The management and reuse of learning objects has now reached a certain maturity thanks to the standards such as sharable content object reference model (SCORM) (ADL, 2006) that enables the reuse of learning objects across learning management systems (LMS) and learning object metadata

(LOM) (LTSC, 2002) that defines metadata for their description. Content object repository discovery and registration/resolution architecture (CORDRA) (CORDRA, 2006) completes this with the means to federate object repositories and to enable the retrieval of learning objects. Thanks to this set of standards, the cost of design is lessened because of the possible reuse and the better perenniality of the resources. This level of maturity has not been reached already when one considers the pedagogical scenarios design. Indeed, the focus is evolving from the resources to the activities. The emerging standard related to these scenarios is IMS learning design (IMS-LD) (IMS, 2003). However, designing pedagogical scenarios is still an expert job at least because there is still a lack of proper editors. Having however succeeded in the design of a pedagogical scenario, it is still common to re-engineer it or to make it evolve slightly because the context or the hosting learning management systems (LMS) changes or because the learners have difficulties with some activities. These modifications of the scenarios can happen between two executions (iterative design) or at runtime if the LMS can support it. In this chapter, we will present solutions to support the lifecycle of pedagogical scenarios from the design time to the deployment on a specific LMS and the execution and runtime evolution. These solutions aim at keeping the pedagogical design across different contexts which will lessen the cost of the design while permitting a continuous adaptation.

This chapter is divided into four parts. The first part gives some background on IMS-LD and provides an example scenario for the chapter. The second part presents the current level of support for IMS-LD considering both authoring tools and existing LMS. The third part presents a proposition based on model-driven engineering to support the implementation of an IMS-LD scenario into a LMS that does not provide support for IMS-LD. The fourth part presents an alternative approach that is to build an execution engine that can then

be integrated into existing LMS to provide direct support for the scenarios. In the conclusion we will show how these two approaches complement each other and contribute to the uptake of the pedagogical scenarios by supporting their whole lifecycle.

## THE PEDAGOGICAL SCENARIO APPROACH

The pedagogical scenario approach is raising interest because it is seen as a mean to reintroduce pedagogical reflection based on the different existing theories into the planning of teaching and learning activities (Schneider et al., 2005; Earp & Pozzi, 2006). This holds primarily in the domain of e-learning where the focus has mostly been put on learning resources up to now. Indeed by the means of pedagogical planning, the learning objects are put into the context of learning activities with a specific pedagogy in mind. The main standard for the description of learning scenarios is IMS-LD (IMS, 2003). In the next sections, we will review the main elements of the language and provide an example scenario. We will also analyze the main features provided by the specification.

### IMS-LD

The IMS-LD meta-model, that is, the set of modeling concepts, permits defining learning designs. A learning design corresponds to a pedagogical scenario. It is made up of learning objectives, prerequisites, components and a method. Components and Method are the main features of the IMS-LD:

- Components of a learning design refer to the list of activities, roles and environments that make it up (bricks of scenario):
  1. Activities are tasks in the learning process.

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