Introducing Learning Management Systems Standards in Classroom

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Abstract

Learning material reuse is a major topic in both distant learning and face-to-face teaching scenarios. This article investigates the portability in the classroom of two standards specifications – LOM and IMS LD – for interoperability of learning material between distant learning management systems. For concealing the divergence between face-to-face and distant learning contexts, we introduce LessonMapper, a teaching visual support enabling on-the-fly adaptation of digital learning material presentation and distribution. We present and discuss a three-layer structure consisting of learning objects, learning material graphs and learning design for LessonMapper to integrate IMS LD and LOM.

1. Introduction

The growing number of distant Learning Management Systems (LMS) has stimulated research on systems interoperability and learning material reuse. Various standards have been published being the most relevant works the LOM [1], EML [5], and SCORM [2] standards, and the recent work done by the IMS consortium [3] that joins the previous projects. Those initiatives specify XML-based standard structures for describing the different levels of a LMS like metadata for learning objects, content packaging, content sequencing, student profile or learning design.

Those specifications have been mainly developed to support distant e-learning systems. However, currently most of the teaching/learning activities still take place in classroom. In universities and high schools, the use of computer based multimedia learning material is becoming a norm. There is indeed a lot of new computer hardware and software being used inside the classroom now like electronic whiteboards, wireless networks in combination with personal computers or PDA. For this reason the reuse of digital learning material in the classroom is also an important issue to tackle.

This article investigates the portability of metadata for learning objects and learning design standards, respectively LOM and IMS LD, in the classroom context. The couple LOM - IMS LD allows to describe the whole structure of a digital content-based course, from the basic learning objects to high-level organization. In the distant learning situation, lesson contextualization is achieved by introducing sequencing rules based on computer-based student profile evaluation. In the classroom situation, it is the teacher who is mainly responsible for doing this evaluation. However, the IMS standards do not considered this situation. This article presents a framework to tackle this deficit.

2. Instructional Design in Classroom

When designing a course, teachers should focus both on content and didactic approach. Nevertheless, experience shows that the emphasis is generally more on content production. The use of advanced instructional designs such as Learning by Doing, Collaborative Problem Solving or Constructivists Learning Environments [11] remains an exception. Timesaving that learning objects reuse generates are definitely an essential step towards generalization of innovative instructional designs. Another step consists in the reuse of the instructional design itself.

There are various initiatives for encapsulating the lesson design. Most of LMS standards, like prevalent standard SCORM [2], focus mainly on the lesson structure and navigation adaptation. Compared with other standards, EML [5] and its successor IMS Learning Design [3] offer a pedagogical flexibility that enables advanced instructional designs definition. In particular, they deal with roles definition that is essential to describe processes involved in

constructivist or collaborative methods. For that reasons, IMS LD became an obvious candidate to introduce learning design standard in classroom.

We suggest a subset of the IMS LD framework to support instructional design definition in classroom. It matches with the class situation as follows:

- learning design corresponds to the entire lesson
- method is the active instance of a lesson
- plays are independent parts of the lesson
- acts correspond to sections of lesson parts (for ex: specific chapter, final project, final exam) – they involve sequencing restrictions.
- role-parts are role-oriented elements of sections (for ex: student assignments, tutorials, lab assistance) – they involve sequencing or parallelism restrictions.
- learning activities and support activities correspond to activities processed by the role-parts.
- environments are the sets of services and learning material required by the activities.

Figure 1 shows a part of the high-level structure of the "*Basics*" section of a Java lesson. This lesson does not include advanced instructional design methods but a common pattern for a high school lecture. Basically it deals with assignments, tutorials, lab sessions, group projects and exams.

IMS LD specifications introduce environments as a linking intermediate level between learning design and *learning objects* and *services*. The environments can include sequencing rules (defined with IMS Simple Sequencing [3]) to organize the learning material. But this sequencing facility does not include roles definitions. Then, most of the examples using IMS LD show that environment references only one learning object or service letting the sequencing to be defined at an upper level.

In contrast, our example deals only with high-level activities. For instance, the "*Basics*" section tutorial is specified as a sole learning activity. In a distant e-learning system, this activity is decomposed to enable services such as adaptive course sequencing, intermediate example, simulations or on-line discussion support. In a classroom situation the teacher should be the actual organizer of the lesson. He may be supported by the system but the system should not impose her a certain sequence. Therefore more than a sequencing support, the teacher needs a discourse support.

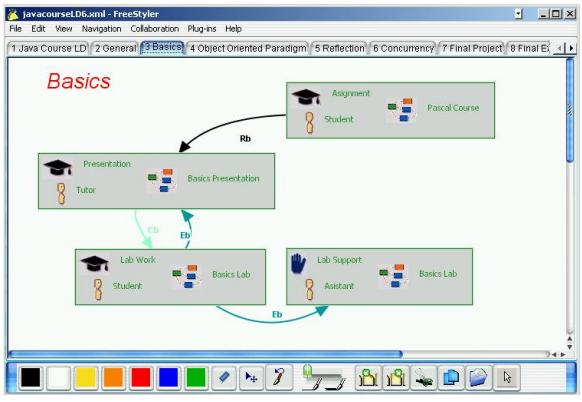

Figure 1. IMS LD in LessonMapper

3. Lecture Discourse Support

Lecture discourse supports domain refers mainly to PowerPoint ([7]) and PowerPoint-like products. However, none of those tools deal with dynamic adaptation of the presentation since sequencing is imposed by slides order or predefined hyperlinks paths. In [8], Good investigate visualization techniques to increase sequencing flexibility and discourse improvisation but they focus on PowerPoint slides management.

Complying with McCalla's work on self-adapting tutoring systems ([6]), Baloian et al. ([4]) introduced Didactic Networks as a way for structuring teaching/learning material in the form of semantic graphs in order to maintain coherence but giving some flexibility in the sequence the learning material is used during the lecture. Didactic Networks model enables grouping diverse multimedia objects references and organizing them without imposing sequencing restrictions but suggesting paths based on preferred learning strategies [9].

As a model for supporting flexible lecture discourse, Didactic Network makes a good intermediate between fine grained learning objects and high-level structure of classroom lessons. We relate them to IMS LD and LOM by considering an environment as a Didactic Network of LOM instances that reference the concrete

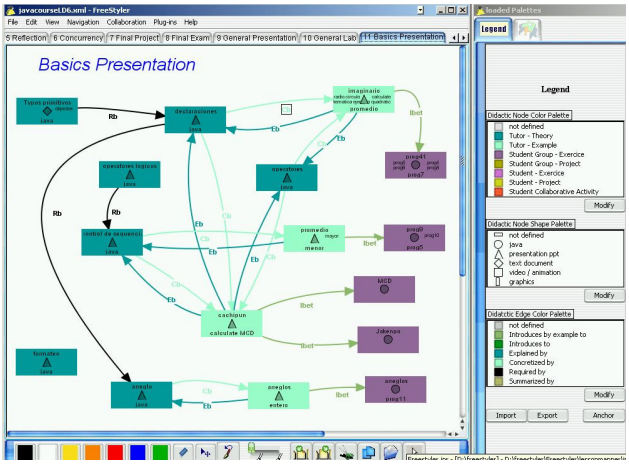

Figure 2. Didactic Network in LessonMapper

learning material and characterize it.

The graph presented in Figure 2 deals with the implementation of the "Basics" section tutorial of our Java example. A Didactic Network organizes the concrete material as a graph of LOM instances. They could refer to one or two slides presenting a concept, an example or an exercise but also reference a java program, or a collaborative learning activity.

4. LessonMapper

LessonMapper [4], a Java prototype based on XML files supports the suggested framework authoring and use. It is implemented as an extension of Freestyler, a visual tool for generating, presenting and manipulating active learning material ([10]). Figure 2 shows an instance of Didactic Networks in the LessonMapper. Each node references a specific learning objects. Double clicking on the node opens this material. LessonMapper accepts any type of material that can be opened by local applications installed on the operating system like Slide show, Web browser, Media player or Programming environment.

Learning objects in LessonMapper are described with a subset of LOM specifications including keywords, description, activity type, format and relations with other learning objects. Metadata is characterized with visual properties of the nodes: color and shape refer to the learning objects metadata according to a customizable legend. LessonMapper implements the presented subset of IMS LD with nodes characterizing structure elements, roles and objectives. Each structure element is a container that accepts other components. For instance, a play refers a page containing one or more acts. Role-parts are defined as a sole block containing one role and one activity or one role and one learning design.

The activities are associated with one didactic network but more than one activity can share a same didactic network. For instance in Figure 1, a lab session stages two role-parts: *lab work* and *lab support*. They describe respectively the students' activity and the teacher assistant activity inside the lab. Basically, those activities interact with each other and share the same didactic network that contains project description, basic java schemes and the solutions (with restricted access).

5. Conclusion

This article presents LessonMapper, a tool for supporting face-to-face computer based lessons authoring, use and reuse using distant learning standards IMS LD and LOM. In order to adapt them to the classroom context, the system proposes a three-layer architecture for structuring the learning material. The basic one is the learning objects layer where LOM is used to characterize them. The middle one is a Didactic Network that organize the learning objects. It permits to support the teacher discourse without imposing predefined sequences but suggesting directions based on the teacher choice of teaching strategies. The upper layer is a subset of the IMS LD specifications to support learning design. The instructional plan is represented by a diagram which shows the different roles and tasks coordination. As such, it can promote advanced instructional methods use.

Separating course content from learning design and complying with the current standards, this framework facilitate the reuse of learning objects and instructional designs in the specific context of face-to-face teaching. Moreover the cognitive benefits of its graphical aspect make the lesson maps valuable transition stages between the different course steps.

6. References

[1] IEEE LOM *http://ltsc.ieee.org/wg12/*

[2] ADL SCORM *http://www.adlnet.org/*

[3] IMS consortium *http://www.imsglobal.org*

[4] N. Baloian, O. Motelet, J. Pino, *Collaborative Authoring, Use and Reuse of Learning Material in a Computer-integrated Classroom*, Procs. of the CRIGW 2003 conference, Grenoble, France, August 2003.

[5] Educational Modelling Language, *http://eml.ou.nl/*

[6] McCalla, G., *The search for adaptability, flexibility, and individualization: approaches to curriculum in intelligent tutoring systems.* In Jones, M., Winnie, P. (Eds.). Adptative Learning Environments. Springer-Verlag, NATO ASI Series, 1992, pp. 123-143.

[7] Microsoft PowerPoint, *http://www.microsoft.com*

[8] Good, L. and B. B. Bederson, *Zoomable User Interface as a Medium for Slide Show Presentation,* Information Visualization 1 (1): 35-49 (2002)

[9] Nelson Baloian, Wolfram Luther, Heinz Ulrich Hoppe, Olivier Motelet, *Implementing Teaching Strategies in the Classroom,* to be published EDMedia 2004

[10] A. Lingnau, and al., *Enriching Traditional Classroom Scenarios by Seamless Integration of Interactive Media*, Proceedings of the e 3rd IEEE International Conference on Advanced Learning Technologies (ICALT'03), Athens, Greece, July 09 - 11, 2003

[11] Mahwah, NJ, *Instructional design theories and models: A new paradigm of instructional theory (Vol. 2)* (pp. 215-239). In C. M. Reigeluth (Ed.), Lawrence Erlbaum Associates.