

IMS-LD Technological Limitations to Design and Create Adaptive Learning Paths

Overview

IMS Learning Design⁹ (IMS-LD) is a specification that proposes a metalanguage to describe all the elements related to the learning process itself. The specification is understood as a stage-play approach: people act in different roles, roles work towards specific objectives by performing learning and/or support activities, and activities are conducted within an environment that consists of learning objects and services.

Use of IMS-LD is very scarce [1, 2] and most examples are limited to specific scenarios that cannot be utilised for online learning experiences. This paper is based on the largest experience that uses IMS-LD to specify adaptive learning paths and run them, in a virtual environment at the Open University of Catalonia (UOC). This paper details key technological problems found in using IMS-LD tools and how issues were solved.

Step 1: Designing adaptive learning paths using IMS-LD

This experience involves creating Adaptive Learning Paths (ALP) in the subject of Logics, within the Computer Science's Bachelor program at UOC. Some sections of the Logic subject are used to explain the shortcomings of IMS-LD.

As a result of a pedagogical study, three ALP for Logic subject, were designed (Figure 1). Each path focused on a different learner profile. At the beginning of the process, learners follow one path according to their preliminary knowledge, but during the course they will be able to change path.

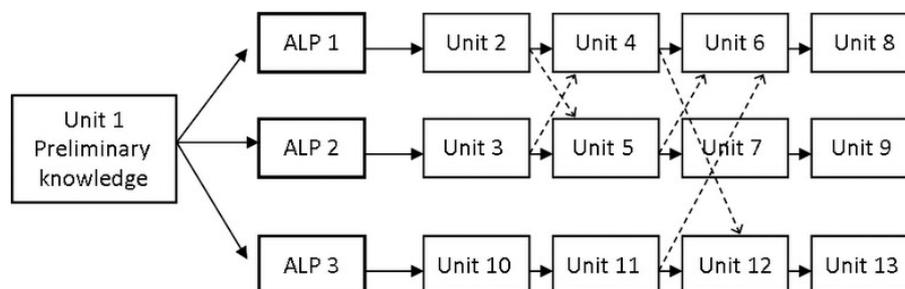


Figure 1 - Example of Adaptive Learning Paths for Logics subject

In order to specify paths according to IMS-LD we used the entity *play* to represent the subject and the class *act* to describe learning paths. Each *play* contains a series of sequential *acts* and these activities and resources are related to with one learner role. Following this structure, learning paths can be created using the Level A of IMS-LD. But Level B is required if adaptability needs to be added.

Step 2: Adding adaptability with IMS-LD Level B

Adaptive learning system allows the activity sequence to be changed according to different rules based on learner profile. Each of the three learning paths contains four *acts* with four

⁹ <http://www.imsglobal.org/learningdesign/>

activities. Each one addresses a different learner profile: path 1, linked to learner role 1, is for students with a low level background in mathematics and programming; path 2, associated to learner role 2, is for students with some competences in the subject and path 3, linked to role 3, is for learners with a rich background and knowledge about the subject. After an initial test, learners are introduced to the most appropriate learning path.

During the course, adaptively is introduced by the evaluation of each activity [3]. According this input, ALP system allows identifying the new learner profile and providing him with another learning path. Therefore, learners can change their learning path to follow a different one. Conditions and properties from Level B of IMS-LD are used to change the learner role (i.e. from learner role 3 to learner role 1).

Step 3: IMS-LD compliant tools

IMS-LD provides a generic and flexible XML based language. An editor tool is used to create the XML schema and a player tool is needed to execute the XML schema. In order to choose the best tools, an analysis, resumed in Table 1, has been conducted.

EDITORS	IMS-LD			Multiplatform	Remote edition	Open source
	A	B	C			
Reload LD Editor	✓	✓	--	✓	--	✓
CopperAuthor	✓	--	--	--	--	✓
MOT+	✓	--	--	--	--	--
ReCourse	✓	✓	✓	✓	--	✓
LAMS	✓	--	--	✓	✓	--

PLAYERS	A	B	C			
CopperCore	✓	✓	✓	✓	--	✓
dotLRN	✓	--	--	✓	--	✓

Table 1. Analysis of editors and players

To work with Level A and B, ReCourse editor (v.2.0.3) and CopperCore (v.3.2) player, were selected.

Problems found and solutions followed

During our experience both, editor and player, have shown some limitations. The three learning paths were difficult to manage using the editor because each learning path had to be created individually. In addition, CopperCore failed often when executing some units of learning created with ReCourse. It does not allow uploading several files at once, and hence several conditions and properties may not work in runtime. Finally, the main shortcoming found with the player was the impossibility of changing learner role on runtime. Although according the tools and the information model of IMS-LD it should be possible it is not described how to proceed. At this point we analysed other tools for changing learners' role with IMS-LD level B in runtime and provide learners with a really adaptive system.

To solve the aforesaid shortcomings with the editor it was necessary to edit XML files for each learning path with a plain text editor.

To load IMS-LD courses with CopperCore, we manually edited the file by removing any reference to “*ldauthor*” or “*ld-author.xsd*”, which are automatically included by ReCourse and referenced in the *imsmanifest.xml* file. A PHP script has been written to automate the process of removing such references.

For changing learner’s role with Level B we worked with an additional tool included on CopperCore player called *clicc*. It allows changing learner role in runtime and, consequently, change learners to another learning path according their new profile. Thus improving adaptivity focused on each activity output and introducing new ways to work on adaptive learning paths using IMS-LD.

Conclusion

With some technological improvements in the IMS-LD tools, adaptive learning paths can be completely performed into a virtual learning environment. However, editors and players need to be improved in future research. This experience had shown a first step to introduce adaptivity in a learning process but it needs to be tested in other subject or virtual learning environments.

References

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