Toward Simple Learning Design 2.0

Simple interoperability for learning activities

Guillaume Durand
Learning and Collaborative Technologies
National Research Council Canada, IIT
Moncton, Canada
Guillaume.Durand@NRC-CNRC.gc.ca

Stephen Downes
Learning and Collaborative Technologies
National Research Council Canada, IIT
Moncton, Canada
Stephen.Downes@NRC-CNRC.gc.ca

***Abstract*—In 2003, based on the work done by the OUNL on Educational Modeling Language, IMS-LD was released and brought to the research community a new era in the design of learning activities. Six years later, IMS-LD is no longer evolving while facing an increasing number of critiques. The specification is still not implemented by any leading brands in the e-learning industry. The current development of new IMS specifications offers a window of opportunity to rethink IMS-LD. After discussing IMS-LD, trying to understand the existing critiques and analyzing the new technical context, this paper proposes the guidelines for the creation of this new learning design specification. This specification would be split in two specifications satisfying both the instructional designers and the learning platform developers and vendors. The specification optimized to learning platform vendors, called Simple Learning Design 2.0 will be designed to ease the deployment of the learning design concepts in the existing Learning Management Systems. SLD 2.0 is currently developed in the context of the SynergiC3 project.**

***Index Terms*—IMS-LD, Learning Design, learning activities, interoperability.**

I. INTRODUCTION

In February, 2003, the first release of the Instructional Management System (IMS) Learning Design (LD) specification arrived [1]. Based on the Education Modeling Language (EML), authored at the Open University of the Netherlands, the purpose of IMS-LD was to "to enable many kinds of educational designs to be created, using a consistent notation, which can be implemented uniformly in multiple courses or learning programs." [2] The idea was to create a pedagogically neutral notation that would describe the strategies used to deploy learning materials in educational scenarios – in other words, learning designs.

EML was released and employed as a modeling language, in the mould of UML. And although learning technology specialists were excited by the idea of having a specification to design learning activities, it proved too complex to work with. Then, with the arrival of CopperCore [3], in 2004, technologists began using IMS-LD to design educational scenarios, rather than to merely model them. The concept of learning design as envisioned in IMS-LD is therefore an evolution of that envisioned in the original EML.

II. UNDERSTANDING LD

A. Learning Design and learning design

The concept of learning design and IMS-LD are sometimes difficult to understand, even for people familiar to the specification. The term "Learning Design" with capital L and D stands widely for IMS-LD in the research papers [4] and even in the IMS-LD documentation [1]. This implicit convention of naming IMS-LD is also reused in this paper.

However learning design is far from being limited to IMS-LD. An elegant way of understanding the meaning of learning design was summarized in 2004 by Sandra Britain [4]. Learning design may be associated with:

- The concept of learning design,
- The implementation of the concept made by IMS-LD and other languages,
- The technical realisations around the implementation of the concept.

The concept of learning design arrived in the literature of technology for education in the late nineties and early 2000s [5] with the idea that "*designers and instructors need to choose for themselves the best mixture of behaviourist and constructivist learning experiences for their online courses*" [6]. But the concept of learning design is probably as old as the concept of teaching. Learning design might be defined as "*the description of the teaching-learning process that takes place in a unit of learning (eg, a course, a lesson or any other designed learning event)*" [7]. A teacher preparing a course is a learning designer, and learning design could be as simple as the activity of preparing a course.

B. What is Learning Design

As introduced at the beginning of this paper, LD is issued from the OUN-EML. The modeling aspect of LD is essential. LD is firstly a language allowing to specify all kind of learning activities as it was initially announced: "*The objective of the Learning Design Specification is to provide a containment framework of elements that can describe any design of a teaching-learning process in a formal way*" [1].

LD defines learning activities that simultaneously include several roles playable by several actors in a defined environment. By analogy, IMS-LD may be thought of as a script for a play, in which each of several participants plays his or her role as directed by the director. This analogy also called the "theatrical metaphor" of IMS-LD has a deep impact on its information model. The Fig.1 below illustrates LD information.

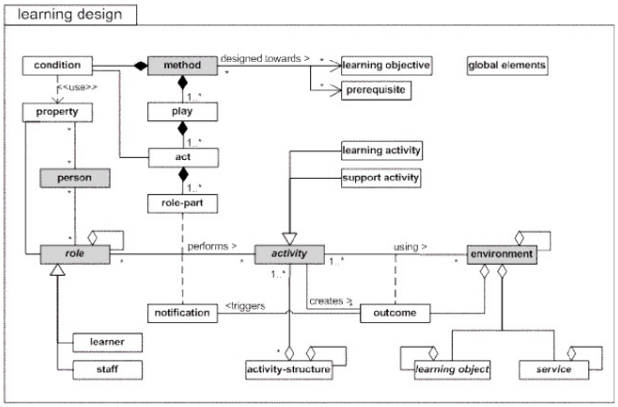

Figure 1. The IMS-LD information model [1].

The concepts of roles and learning environment are essential to IMS-LD and distinguish it from predecessors such as IMS Simple Sequencing (IMS-SS) [8]. Unlike LD, IMS-SS is not able to express activities including more than one role. Thus, IMS-LD can express collaborative activities in a way that predecessors could not.

Another feature of LD is its status as a standard. LD is not a norm but an IMS standard distributed by the IMS as an XML binding. The XML binding represents the LD information model as a set of XML elements.

```
<imsld:play>
  <imsld:act>
    <imsld:role-part>
      <imsld:role-ref ref="R-Group"/>
      <imsld:activity-structure-ref ref="AA1"/>
    </imsld:role-part>
    <imsld:role-part>
      <imsld:role-ref ref="R-Group"/>
      <imsld:learning-activity-ref ref="STR1"/>
    </imsld:role-part>
  </imsld:act>
</imsld:play>
```

Example 1. Expression of a play in the IMS-LD XML Binding

Ex. 1, shows how a *play* is expressed using the XML Binding. This *play* has one act played by the *role* "R-Group".

Thanks to that binding, the description of a learning activity (also called scenario or a Learning Design in the context of IMS-LD) is expressed in XML, which is readable by computers. The choice of XML for the language has a deep impact, transforming the initial modeling language (EML) in a computing language (see Fig. 2).

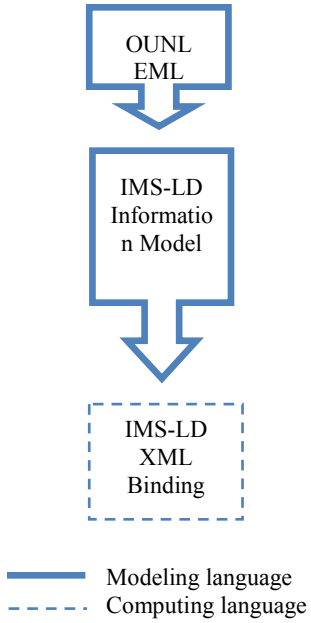

Figure 2. IMS-LD as a modeling and computing language.

C. *LD Implementations*

IMS-LD is implemented by being 'played' on omen of various players, including SLED, Collage, etc.. Most of these are based on the CopperCore [3] engine. Learning Designs used by these players are created by one of many authoring systems. Some authoring tools, such as RELOAD Learning Design Editor [9], are very close to the language. Others, such as LAMS, require little knowledge of the specification [10]. It is worth noting that all these implementations were developed by research consortium and universities, and that there are currently no implementations in the major commercial learning management systems. LAMS, meanwhile, is integrated into open source learning management systems such as Moodle and Sakai.

However, this does not mean that the industry is not interested in LD. In 2004, Blackboard appeared to show a lot of interest in LD [11], but this no longer seems to be the case. No Blackboard product currently implements LD. Rather, Blackboard and the other major LMS vendors appear to be more interested in other specifications like Common Cartridge and SCORM 2.0.

III. EXTANT CRITIQUES OF LD

Probably the first critique could be the difficulty of creating a LD scenario directly in XML [12]. The simplest learning activity requires a large number of lines. While one solution would be to use an authoring tool, existing authoring tools require a deep knowledge of the specification and thus do not really simplify the creation task. The form-based system adopted by such editors may eliminate the need to create raw XML, but are not otherwise efficient or user-friendly. As a consequence, various graphical editors have been developed. However, these designs struggle to balance

simplicity with the language's inherent complexity. Graphical editors keeping the entire range of the language are inherently difficult to use, while others opting for a more restricted interpretation, such as LAMS [10], appear to have been more successful.

Even as some authors criticize IMS-LD for its complexity, a second critique is raised by others who criticize its lack of expressivity. For example, a recurrent critique highlights the impossibility of using LD to clearly specify some collaborative activities [13] [14] [15]. Even if LD allows to organise some activities using collaborative tools, it does not specify the nature of the collaboration in the collaborative tools. This difficult balance between complexity and expressivity is probably due to a misunderstanding of the specification. Initially coming from EML, LD was initially understood as a modeling standard. It seems that LD is now a specification aiming at exchanging the playable description of a learning activity between LMSs. So LD operates as both a modeling language and an interoperable activity language. This leads people to expect more – or less – from IMS-LD.

A third criticism raises the absence of dialog between the IMS and the LD community after the publication of LD in 2003. Most people began to use IMS-LD only after the release of the specification; it was not a canonization of existing practice. But no new releases of LD were ever issued. Consequently, there was no real discussion between the IMS working group and the LD community. Proposals for the extension and modification of LD coming from researchers, teachers, instructional designers have been met with silence.

From the perspective of interoperability, LD raises some big issues that are not treated so far. It is difficult to automatically map the services and the content defined in the scenario with the services and the contents available in the LMS. Several solutions have already been proposed (grid technology, ontology, etc...) but in the absence of communication between IMS and the LD community no consensus has been reached.

Finally, LD is not supported by a content standard and its integration with the existing standards is sometimes more a patch than a real solution [16]. Even if the wide majority of the SCORM 2004 [17] contents does not use IMS-SS [8], IMS-SS remains a successful implementation compared to LD. Although IMS-SS is less powerful and as complicated as LD, it manages to be spread and be used thanks to SCORM 2004. No such implementation exists for IMS-LD.

IV. Simple Learning Design 2.0

A. *Stop the complexity/expressivity quarrel*

As introduced previously, the ambiguity around LD is probably the major problem of the specification. In parallel, it is also true that the LMS vendors and the teachers need a specification to express learning activities. However, this does not mean that both of them need the same specification. The teacher or the instructional designer who is in charge of planning and designing learning activities needs probably a graphical specification allowing him/her to create easily his/her scenarios and to share and reuse them in his/her community. Consequently, the specification has to be easy to use for a non-technical end-user. Considering now the LMS vendor, the LMS vendor needs to satisfy its clients asking for learning design tools. Before deciding whether it worth something to implement the learning design specification, the LMS vendor will try to understand what will be the implementation costs and what would be the benefits. If the technical specification has not being designed to minimize the implementation costs, the perspective of having benefits has to be stronger. Therefore the easier the specification to implement is, the easier it has a chance to be used and diffused among LMS vendors.

These examples illustrate how it is complicated to create a learning design specification meeting both usability and technical needs. IMS-LD tried to do that and it's maybe not the right way to proceed.

B. *A new context*

A few years ago IMS announced the arrival of a new content specification supported by some major industrial actors of e-learning. This specification, called Common Cartridge [18], is clearly a competitor to SCORM and would offer the perfect framework to host a new version of LD. The first version of IMS-CC was released in July 2008. This version includes a content packaging, some metadata and an authorization service specification.

IMS is also currently developing LTI (Learning Tools Interoperability) and LSI (Learning Service Interoperability). These specifications defining the launch and the communication between the services of several learning management systems would solve the interoperability problem of LD. As it is announced [18] IMS-LTI and IMS-LSI will be integrated in the coming version of IMS-CC.

C. *SLD 2.0, the future*

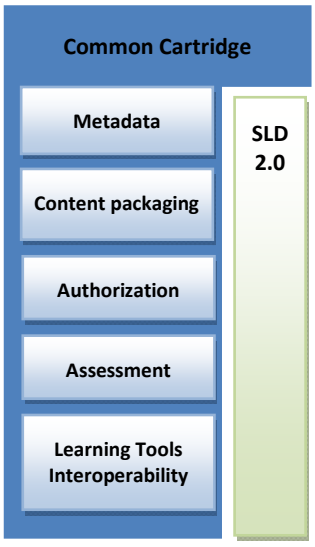

Figure 3. SLD 2.0 as a component fitting Common Cartridge.

Integrated to IMS-CC, LD would play the same role than plays IMS-SS for SCORM 2004 allowing much more

possibilities in term of learning activities. This integration would require some modifications of the existing specification. For example, the declaration of the environment has to be adapted to IMS-LTI in IMS-CC. IMS-CC will define roles. What will be the impact for the roles defined with LD? Simple LD 2.0 (SLD 2.0) would be this unofficial prototype of new version of LD in IMS-CC 1.1. The first objective of SLD 2.0 is to be an adaptation of LD to this new IMS context as it is illustrated by fig. 3.

The second objective of SLD 2.0 would address the usability problem of the specification by the LMS vendors. As seen previously, LD raises some major difficulties in its implementation in existing LMS. SLD 2.0 will rethink the learning design in the LMS's context while keeping the most essential features of LD like its capacity to express collaborative activities. This search of simplicity also explained why SLD 2.0 will be inside the IMS-CC package and not outside. The expression of the activity will be directly linked to the contents and services of the IMS-CC package. With SLD 2.0, the deployment of a learning activity in the LMS will consist in registering participants and starting the activity. They will no longer be useful to specify manually the contents and services to use.

However, SLD 2.0 won't be a modeling language. So, in a project parallel to SLD 2.0, it would be useful to create the real "UML" for learning design (i.e. a real Educational Modelling Language). This language would be graphical and dedicated to non technical staff like teachers. The definition of such of language would be the first piece of a real teacher centered learning engineering framework.

V. CONCLUSION

After having explained the difficulties meet by the people trying to use LD and introducing the new IMS context, it appears that it is definitively the time to a new learning design specification. There is a learning design need to satisfy in the existing Learning Management Systems. A solution would be to design a LMS vendor's oriented specification adapted to the new context and easier to deploy. This new specification called Simple Learning Design 2.0 won't be a modeling language but just a technical specification embedded in IMS Common Cartridge. SLD 2.0 is not an official specification of the IMS, but an exploratory work within the SynergiC3 project [18]. A first prototype of SLD 2.0 is currently under development and will be the object of a future paper.

ACKNOWLEDGMENT

The authors wish to thank Desire2Learn Incorporated and the Université de Moncton, the two key partners of the National Research Council of Canada in the SynergiC3 project [19]. SynergiC3 is a $5.5 million, four-year project. It will receive up to $2.9 million from the Atlantic Canada Opportunities Agency's Innovation Fund (AIF), a program designed to encourage partnerships among private sector firms, universities, colleges and other research institutions to develop new products and services.

REFERENCES

[1] IMS Learning Design. Information Model, "Best Practice and Implementation Guide", Version 1.0 Final Specification IMS Global Learning Consortium Inc., Online available: http://www.imsglobal.org/learningdesign/, Last visited in Mar. 2009.

[2] B. Olivier, "Learning Design Update," Online available: http://www.jisc.ac.uk/uploaded_documents/Learning_Design_State_of_Play.pdf , Last visited in Mar. 2009.

[3] CopperCore, Online available: http://CopperCore.sourceforge.net/, Last visited in Dec. 2008.

[4] S. Britain, "A Review of Learning Design: Concept, Specifications and Tools" A report for the JISC E-learning Pedagogy Programme, May 2004.

[5] G. Conole, and K. Fill, "A learning design toolkit to create pedagogically effective learning activities". Journal of Interactive Media in Education, 2005 (08).

[6] A. Carr-Chellman and P. Duchastel, "The ideal online course," British Journal of Educational Technology, 31(3), 229-241, July 2000.

[7] R. Koper, "Current Research in Learning Design," Educational Technology & Society, 9 (1), 13-22, 2006.

[8] IMS Simple Sequencing. Information Model, "Best Practice and Implementation Guide", Version 1.0 Final Specification IMS Global Learning Consortium Inc., Online available: http://www.imsglobal.org/simplesequencing/ .Last visited in Mar. 2009.

[9] RELOAD LD Authoring Tool, Online available: http://www.reload.ac.uk/ldeditor.html. Last visited in Dec. 2008.

[10] J.R. Dalziel, "Implementing learning design : The learning activity management system (lams)," In Interact, Integrate, Impact : Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education, December 2003.

[11] Blackboard Press Releases Archives, "Blackboard Inc. and Open Universiteit Nederland Announce Strategic Alliance', April 2004, online available:: http://www.blackboard.com/Company/Media-Center/Press-Releases/Archive.aspx?releaseid=519762, Last visited in Feb. 2009.

[12] P. Van Rosmalen, H. Vogten, R. Van Es, , H. Passier, P. Poelmans, and R. Koper, "Authoring a full life cycle model in standards-based", adaptive e-learning. Educational Technology & Society, 9 (1), 72-83, 2006.

[13] M. Caeiro, L. Anido, M. Llamas, "A Critiqueal Analysis of IMS Learning Design", In: Proc.of computer Supported Collaborative Learning, pp.363–367, 2003.

[14] D. Hernández-Leo, J.I. Asensio-Perez, Y. Dimitriadis, "Computational Representation of Collaborative Learning Flow Patterns using IMS Learning Design," Educational Technology & Society 8(4), 75–89, 2005.

[15] Y. Miao, K. Hoeksema, H.U. Hoppe, A Harrer, "CSCL Scripts: Modeling Features and Potential Use," In: Proc. of Computer Supported Collaborative Learning, pp. 423–432, 2005.

[16] C. Tattersall, D. Burgos, H. Vogten, H. Martens, and R. Koper, "How to use ims learning design and scorm 2004 together," In: Proc. Of the International Conference on SCORM 2004, Tamkang University, Taipei, Taiwan, January 2006.

[17] Advanced Distributed Learning (ADL), "Shareable Content Object Reference Model (SCORM) 2004 3rd Edition Sequencing and Navigation Version 1.0", 2006, Online available: http://www.adlnet.gov/downloads/AuthNotReqd.aspx?FileName=SCORM.2004.3ED.DocSuite.zip&ID=237, Last visited in Mar. 2009.

[18] IMS Common Cartridge Version 1.0 Final specification and schema, IMS Global Learning Consortium Inc., Online available: http://www.imsglobal.org/cc/index.html, Last visited: December 12, 2008.

[19] Information on SynergiC3 online available: http://www.synergic3.com/, Last visited in Feb. 2009.