An Open e-Learning Specification for Multiple Learners and Flexible Pedagogies

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INTRODUCTION

Significant investments have been made by universities, colleges, distance learning providers, and corporate training departments in the area of eLearning. Moving from early, tentative use of static HTML pages on web sites, the use of the internet as a delivery technology for education and training is now commonplace, with both distance and presential learning providers exploiting eLearning in their offerings. A standards-based IT infrastructure is in place in educational institutions around the world, simplifying the delivery equation and opening the doors to mainstream, large-scale, web-based education (Brusilovsky & Vassileva, 2003). Many different Virtual Learning Environments (Everett, 2002) exist, including significant contributions from the open source community (Dougiamas, 2004; Sakai, 2005). Above the underlying IT-standards, rest a significant number of eLearning standards, specifications and reference models (ADL, 2004; IMSCP, 2003; Loidl Reisinger & Paramythis, 2003), designed to improve the interoperability between systems and remove islands of eLearning.

These infrastructural changes have been mirrored by developments in the area of Learning Objects (Littlejohn, 2003; Wiley, 2002). The Learning Objects movement is based upon the idea that reusable units of content can be created, shared and reused between different communities, and is viewed as a solution to the significant production costs associated with the development of high-quality learning resources (see (Sloep, 2004) for a discussion of this issue).

These changes have also prompted some to express uneasiness with re-usable learning objects, seeing eLearning as little more than page-turning and leading to "static, fossilized, dead [content], low learner motivation & engagement, impersonal & isolating environments" (Stacey, 2003). This debate has brought pedagogy in eLearning community to the fore. How should different groups of learners best be taught? What did existing educational theory have to teach eLearning and how could the results of this work be brought into eLearning systems? How could new information and communication technology developments, particularly in the area of collaboration and cooperation, be brought into eLearning offerings? How could ongoing R&D in the area of pedagogy and eLearning be more easily brought together and compared?

This article describes the IMS Learning Design specification (IMSLD, 2003). IMSLD is an open specification, freely downloadable, maintained by an international consortium of universities, system vendors and learning providers. The specification provides a counter to the trend towards designing for lone-learners reading from screens. It guides staff and educational developers to start not with content, but with learning activities and the achievement of learning objectives. It recognises that learning can happen without learning objects, that learning is different from content consumption and that learning comes from being active. It recognises, too, that learning happens when learners cooperate to solve problems in social and work situations. In all this, it stresses that focus should fall on the learning in eLearning.

A SPECIFICATION FOR MULTI-LEARNER, MULTI-ROLE ELEARNING

At the heart of the IMSLD specification is a model which underlies many different behaviourist, cognitive, and (social) constructivist approaches to learning and instruction: People act in different roles in a teaching-learning process. In these roles, they work toward

certain outcomes by performing learning and/or support activities within an environment, consisting of learning objects and services to be used during the performance of the activities. The approach separates learning objects and services from the educational method used in the unit of learning. Put succinctly, IMSLD allows instructional designers to say who should do what, when and with which support facilities in order to reach learning objectives.

There are three main documents to an IMS specification: an Information Model, a Best Practice and Implementation Guide (BPIG) and an XML Binding document. The documents are very detailed and intended primarily for software developers who create the tools and systems that implement IMSLD. However, the benefits of use of the specification should be able to be understood by technically aware learning and instructional designers to enable them to determine its suitability for their purposes. These benefits are:

E-learning system lock-in is avoided since courses can be exported as IMSLD from one system into another. The need to move courses between systems occurs both when new systems are purchased and when a heterogeneous set of tools is used at the same time, a situation not uncommon in both single and multiple learning provider situations.

Procurement choices are increased through increasing system interoperability, with commercial and open-source tooling being better able to be mixed-and-matched to satisfy eLearning requirements.

The market for buying and selling courses is made more appealing, since publishers are no longer bound to publishing for particular delivery systems.

Instructional and learning designers are liberated from the use of non eLearning specific (e.g. HTML) or proprietary scripting languages to create learning processes. Using the concepts described in the specification, designers are able to talk in terms of pedagogy rather than technology, making pedagogical choices explicit and subject to review, inspection and critique.

New avenues for educational R&D are opened, with diverse approaches to learning and teaching being better able to be compared when they are both described and delivered in a formal language defined in an open, technical specification.

IMSLD provides a notational system to describe ‘Units of Learning’ (UOLs), an abstract term used to refer to any delimited piece of education or training, such as a course, a module, a lesson, etc (Koper & Olivier, 2004). The notation is capable of describing a wide variety of instructional models, or learning designs, such as Competency Based Learning and Problem Based Learning.

The specification provides a framework of elements that can be used to describe, formally to support machine processing, the design of any teaching–learning process. The creation of a UOL involves the specification of the learning design and also the bundling of all associated resources, either as files contained in the unit or as web references, including assessments, learning materials and learning service configuration information.

To give an indication of the type of ‘learning experience’ made possible using IMSLD, consider the following example, taken from the IMSLD Best Practice and Implementation Guide, an Problem-Based Learning:

- The coordinator for the course makes a problem description available to the group (by uploading a file to a website).
- Each of the students in the group reads the problem (on the website), as does the facilitator.
- In a synchronous conferencing system which includes the facilitator, the students decide who is going to be the chairperson - the spokesperson for the group, responsible for recording key group decisions, and the chosen representative is appointed as such by the facilitator.
- The group then communicate amongst themselves to clarify the problem, using each other and the facilitator to discuss and clarify terminology and any open issues, eventually arriving at their own succinct statement of the problem at hand.
- The chairperson states this problem description in a file uploaded to the website and the group continues by identifying possible solutions or explanations for the problem.

- These possible explanations are clustered into a small number to be explored further by the students.
- The explanations to be pursued are listed in a file uploaded to the website.
- The group then identifies the learning goals of the problem and individuals embark on the required research.
- Eventually, the group meet up (using a synchronous conferencing system) to discuss their findings, again assisted by the facilitator.
- The chairperson summarizes the findings in a file uploaded to the website.
- Subsequently, an Evaluator and the Facilitator discuss the performance of the group and the Evaluator provides an Evaluation of the group (in a file uploaded to the website).

Here we see multiple learners, acting in various roles, using various learning objects and services. This 'learning flow' is orchestrated using the learning design specification, and becomes itself a resource to be interpreted by an IMSLD-aware player (McAndrew, Nadolski, & Little, 2005), able to be shared and re-used with others. Once a learning design has been set up on a runtime system, the player uses the method to make the appropriate activities and environments avail-able to the people playing the various roles. Through this, it coordinates and synchronises multiple learners as they work through a learning design. Figure 1 shows an IMSLD player running a UOL:

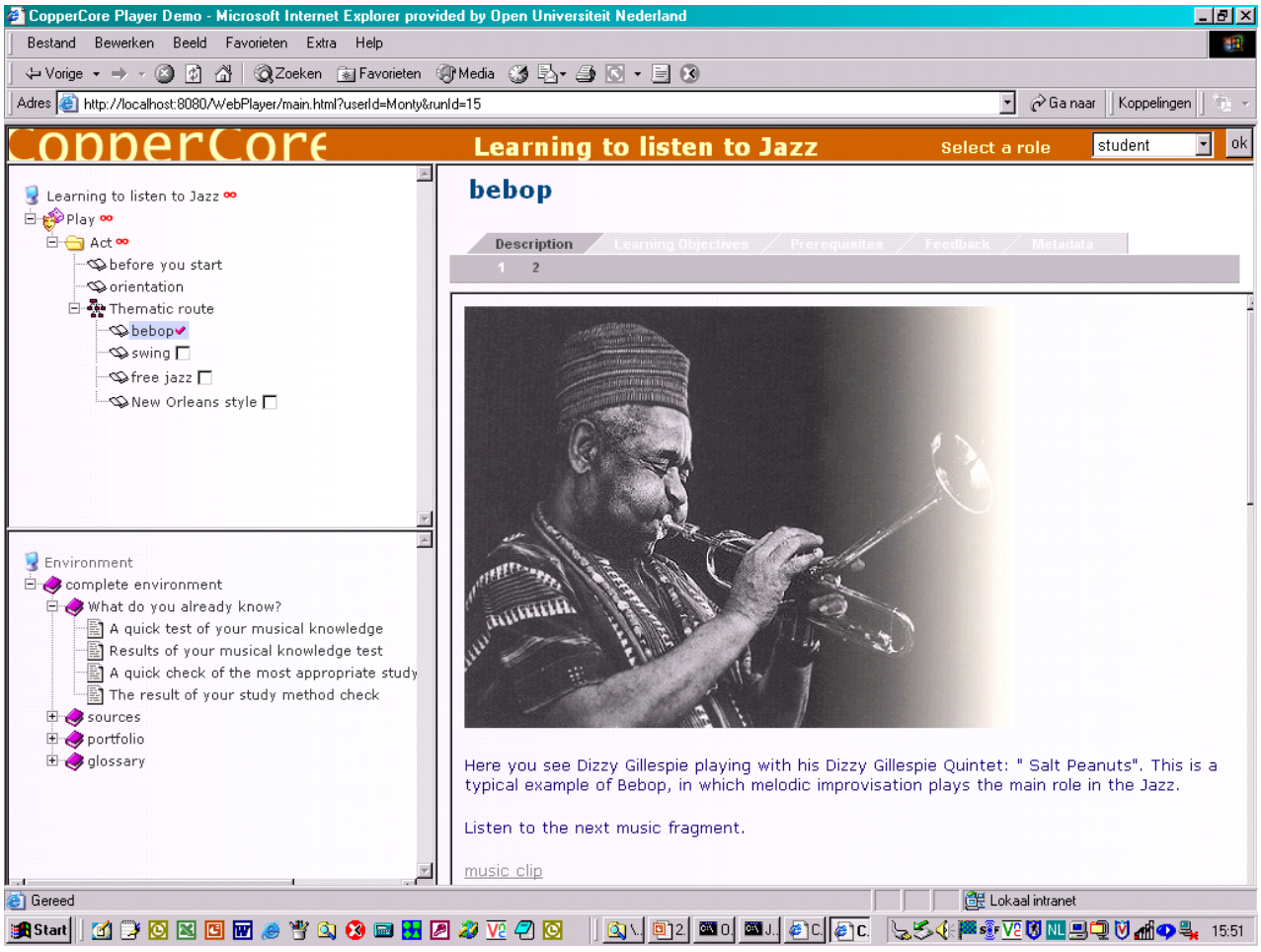

Figure 1: An IMSLD player interpreting a Unit of Learning.

The specification is divided into three levels. Level A, with the definition of the method, plays, acts, roles, role-parts, learning activities, support activities and environments. It is the core of the specification, contains the description of the elements that configure IMS LD and the coordination between them. For instance, role-parts define what activities must be taken

by a role in order to complete an act and, subsequently, a play. Level B, adds properties, conditions, monitoring services and global elements to Level A, and provides specific means to create more complex structures and learning experiences. Properties can be used as variables, local or global ones, storing and retrieving information for a single user, a group or even for all the characters involved. Through these mechanisms the learning flow can be changed at the run time, as decisions can be made taking into account dynamic content. It is the level to express most of the pedagogical needs concerning adaptation, personalization, feedback, tracking and several other usual requests of teachers and learning designers.

Lastly, Level C adds notifications to Level B, meaning an email sent and a show/hide command to a specific activity, depending on the completion of another one. Examples of advanced uses of the specification can be found in (Koper & Burgos, 2005).

The specification

Since IMS LD separates the approach to learning from the learning objects and services used, opportunities for re-use are raised. First, individual learning designs can be applied across different domains, so that the skeleton for Problem Based Learning described above can be used to structure approaches to medical problems, political problems, physics problems, computer science problems and so on. Each time, different content is coupled to the same activities of the learning design. Moreover, learning objects can be used in different educational models. Information on how to dissect a frog might support biology students in a learning-by-doing situation or might provide the problem from which to depart for students of ethics in a problem-based learning oriented approach. Here, different activities are associated with the same content.

FUTURE TRENDS

The IMSLD specification was released in early 2003. Since then a number of tools supporting the language have emerged (RELOAD, 2004; Vogten & Martens, 2004), a book (Koper & Tattersall, 2005), special issues of journals (Koper, 2005; Tattersall & Koper, 2005), a number of articles, and also projects dedicated to the use and promotion of the specification, for example, UNFOLD (2004).

During the first years of experience with the specification, a number of issues have been identified to be addressed as its use scales up. We believe the following trends will likely emerge:

- The tooling used for creation of UoLs will likely less directly reflect the concepts in the specification and will tend more towards those of educational practice. As a result, templates will likely emerge which can be used by instructional designers as a starting point for modification and tuning;
- Greater harmonization between eLearning standards will occur following that seen between IMSLD and the IMS Question and Test Interoperability specification.
- A tighter integration of design-time and run-time perspectives on IMSLD will occur, so that designs can be critiqued and improved on the basis of log data (Barré, Choquet, Corbière, & Iksal, 2004).
- A broader run-time integration of components in an eLearning Service-oriented architecture and due to this …
- … a larger variety of communication and collaboration able to integrated into learning processes, including forums, chat facilities, Wikis and online, multi-user, multi-role games
- New IMSLD-aware players will emerge, including micro-players allowing learning processes to be coordinated across mobile devices.
- IMSLD will find use not only in formalised, designed approaches to learning, but also less formal ones, typified by work in Personal Learning Environments (Liber, 2005). IMSLD's role here will be in providing post-hoc descriptions of learning processes, allowing unplanned sequences of activities to be described and shared in an interoperable manner. The work of Rasseneur, Jacoboni, & Tchounikine (Rasseneur, Jacoboni, & Tchounikine, 2004) on learners' appropriation of

curricula for their own ends is interesting in this context

CONCLUSION

The use of general languages such as HTML or proprietary scripting languages to describe learning processes leads to unnecessary difficulty in documenting teaching strategies and reusing elements of existing teaching materials. IMSLD, an open technical specification, allows learning designers to model, in a generic, formal way, who does what, when and with which content and services in order to achieve learning objectives. It allows processes to be designed that include several roles, each of which can be played by several people. It enables their activities to be specified in coordinated learning flows that are analogous to groupware workflows, and it supports group and collaborative learning of many different kinds. Using the LD language, designers are able to talk in terms of pedagogy rather than technology, helping to bring learning to the forefront in e-learning.

REFERENCES

ADL. (2004). Sharable Content Object Reference Model (SCORM) 2004. Retrieved December 8th, 2004, from http://www.adlnet.org/index.cfm?fuseaction=DownFile&libid=648&bc=false

Barré, V., Choquet, C., Corbière, A., & Iksal, S. (2004). Usage Analysis in an e-Learning System: LD Representation Significance. Paper presented at the ICALT 2004, Joensuu, Finland.

Brusilovsky, P., & Vassileva, J. (2003). Course sequencing techniques for large-scale web-based education. International Journal of Continuing Engineering Education and Lifelong Learning, 13(1/2), 75-94.

Dougiamas, M. (2004). Moodle. Retrieved December 12th, 2004, from http://moodle.org/

Everett, R. (2002). MLEs and VLEs Explained. Retrieved February 10th, 2006, from http://www.jisc.ac.uk/uploaded_documents/bp1.pdf

IMSCP. (2003). IMS Content Packaging Specification. Retrieved February 27th, 2004, from http://www.imsglobal.org/learningdesign/index.cfm

IMSLD. (2003). IMS Learning Design Specification. Retrieved February 27th, 2004, from http://www.imsglobal.org/learningdesign/index.cfm

Koper, R. (Ed.). (2005). Current Research in Learning Design:: Special Issue of the Journal Educational Technology and Society (Vol. 9): IFETS.

Koper, R., & Burgos, D. (2005). Developing advanced units of learning using IMS Learning Design level B. International Journal on Advanced Technology for Learning, 2(4), 252-259.

Koper, R., & Olivier, B. (2004). Representing the Learning Design of Units of Learning. Journal of Educational Technology & Society, 7(3), 97-111.

Koper, R., & Tattersall, C. (Eds.). (2005). Learning Design - A Handbook on Modelling and Delivering Networked Education and Training. Heidelberg: Springer Verlag.

Liber, O. (2005). Personal Learning Environments Shifting the Locus of Control. Paper presented at the Open Source VLEs: The Next Generation, York.

Littlejohn, A. (Ed.). (2003). Reusing Online Resources: A Sustainable approach to e-learning. London: Kogan Page.

Loidl Reisinger, S., & Paramythis, A. (2003). Distance Education. A Battlefield for standards. Paper presented at the EDEN (European Distance Education Network), The Quality Dialogue. Integrating Quality Cultures in Flexible, Distance and eLearning, Rhodes, Greece.

McAndrew, P., Nadolski, R., & Little, A. (2005). Developing an approach for Learning Design Players. Journal of Interactive Media in Education (Advances in Learning Design Special Issue), 2005/14.

Rasseneur, D., Jacoboni, P., & Tchounikine, P. (2004). Using and Enhancing a Normalized IMS-LD Description to Support Learners in their Appropriation of a Distance-Learning Curriculum. Paper presented at the IEEE International Conference on Advanced Learning Technologies (ICALT'2004), Joensuu, Finland.

RELOAD. (2004). ReUsable eLearning Object Authoring & Delivery. Retrieved 15 juli, 2004, from http://www.reload.ac.uk/

Sakai. (2005). Sakai: Collaboration and Learning Environment for Higher Education. Retrieved

February 12th, 2006, from http://sakaiproject.org/
Sloep, P. B. (2004). Learning Objects: the Answer to the Knowledge Economy's Predicament? In W. Jochems, R. Koper & J. Van Merriënboer (Eds.), Integrated E-Learning (pp. 139-151). London: Routledge/Falmer.
Stacey, P. (2003). People to people, not just people to content. E-Learning.
Tattersall, C., & Koper, R. (Eds.). (2005). Advances in Learning Design: Special Issue of the Journal of Interactive Media in Education. (Vol. 2005/1).
UNFOLD. (2004). Understanding New Frameworks of Learning Design,. Retrieved 15 juli, 2004, from http://www.unfold-project.net/
Vogten, H., & Martens, H. (2004). CopperCore. Retrieved 15 juli, 2004, from http://www.coppercore.org
Wiley, D. A. (Ed.). (2002). The Instructional Use of Learning Objects: Agency for Instructional Technology and the Association for Educational Communications and Technology.

Terms and Definitions

eLearning As opposed to the computer-based training of the 1980s, the term e-learning is most frequently used to refer to computer-based training which incorporates technologies that support interactivity beyond that which would be provided by a single computer. E-learning, therefore, is an approach to facilitate and enhance learning through, and based on, both computer and communications technology. Such devices can include personal computers, CDROMs, Digital Television, P.D.A.s and Mobile Phones. Communications technology enables the use of the Internet, email, discussion forums, collaborative software and team learning systems (from en.wikipedia.org)

IMS Learning Design. A specification released by the IMS Global Learning Consortium. supports the use of a wide range of pedagogies in online learning. Rather than attempting to capture the specifics of many pedagogies, it does this by providing a generic and flexible language. This language is designed to enable many different pedagogies to be expressed. The approach has the advantage over alternatives in that only one set of learning design and runtime tools then need to be implemented in order to support the desired wide range of pedagogies.

Learning Object "any digital resource that can be reused to support learning."(Wiley, 2002)

Pedagogy The art or science of teaching.

Unit of Learning An abstract term used to refer to any delimited piece of education or training, such as a course, a module, a lesson, etc. It is noted that a 'unit of learning' represents more than just a collection of ordered resources to learn, it includes a variety of prescribed activities (problem solving activities, search activities, discussion activities, peer assessment activities, etcetera), assessments, services and support facilities provided by teachers, trainers and other staff members.

Virtual Learning Environment (VLE), A software system designed to facilitate teachers in the management of educational courses for their students, especially by helping teachers and learners with course administration. The system can often track the learners' progress, which can be monitored by both teachers and learners. While often thought of as primarily tools for distance education, they are most often used to supplement the face-to-face classroom (from en.wikipedia.org).