INTERACT
INTEGRATE
IMPACT

Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE)

Adelaide, Australia
7–10 December 2003

Editors
Geoffrey Crisp, Di Thiele, Ingrid Scholten, Sandra Barker, Judi Baron

ascilite
**Australasian Society For Computers
In Learning In Tertiary Education**

INTEGRATING LEARNING OBJECTS WITH LEARNING DESIGNS

Shirley Agostinho, Sue Bennett, Lori Lockyer and Barry Harper
Faculty of Education
University of Wollongong, AUSTRALIA
*shirley_agostinho@uow.edu.au, sue_bennett@uow.edu.au,
lori_lockyer@uow.edu.au, barry_harper@uow.edu.au*

Abstract
The premise underlying the concept of a learning object is that it can be reused. Current research and development efforts focus on establishing standard ways to annotate learning objects using metadata schemas so that they can be retrieved easily. There is, however, a pressing need for research and development work to investigate how learning objects can be reused in a pedagogically appropriate way. This work-in-progress paper describes a project that aims to address this gap by developing a framework to assist teachers and instructional designers incorporate learning objects into generic learning designs they adapt to suit their educational contexts.

Introduction

In an environment where both practitioners and researchers are interested in the potential of online technologies to transform teaching and learning, considerable attention has focused on the use of learning objects. Learning objects are essentially "chunks" of learning materials that can be used within learning environments and their rationale is the facilitation of resource sharing for the purpose of maximizing reuse in different learning contexts (Downes, 2001; Wiley, 2002). Whilst the practice of reusing educational resources is not new, as teachers and designers routinely develop new learning experiences by reusing ideas and resources previously developed by themselves or others, it is the scale at which this activity is performed and the form of the entity to be shared that has been extended by the learning object concept. The concept of reuse assumes that learning objects are accompanied by a standard annotation to facilitate their retrieval and when retrieved, users know how to incorporate and aggregate the objects within their specific instructional plan. These issues, however, are yet to be solved (Anderson, 2003; Bush, 2002; Collis & Strijker, 2001) and thus are the challenges currently facing learning object advocates.

What is a learning object?

A wide range of interpretations has emerged as theorists, researchers and practitioners refine and apply the notion of learning objects (Hodgins, 2002). Alternative terms are being used interchangeably with learning objects such as instructional objects, educational teaching objects, knowledge objects, intelligent objects, digital learning items and data objects (Gibbons, Nelson, & Richards, 2002; Nichols, 2002). In its broadest sense, a learning object is "any entity, digital or non-digital, that may be used for learning, education or training" (IEEE, 2002, p. 6). This definition is useful in that it encompasses both content- and activity-based resources. However, it says little about the characteristics of learning objects that make them reusable. From a teacher or designer perspective, learning objects become reusable when they are both accessible and transferable. Accessibility is enhanced when objects are available in digital form,

referenced by online databases and described by metadata that allow teachers and designers to assess the utility of the object. Transferability is enhanced when a learning object is, as far as possible, independent of the learning context for which it was originally developed. For example, a learning object is more transferable when it can be used within a different curriculum, by a different group of learners, or on a delivery platform with different technical specifications.

Significant effort has been devoted to the development of standards to describe and annotate objects, for example Learning Object Metadata (IEEE, 2002), and specifications for how metadata descriptions should be applied for particular collections of learning object, for example The Learning Federation initiative (2002) and CanCore (Friesen, Roberts & Fisher, 2002). While finding solutions to these issues is important, the focus on mainly technical considerations has left the implications of implementation largely unexplored (Bannan-Ritland, Dabbagh & Murphy, 2002) and as Wiley (2002, p. 2) concludes, "if this out-of-balance research and development thrust is not righted soon, we will find ourselves with digital libraries full of easy-to-find learning objects we don't know how to use".

Use of learning objects

Research into the pedagogical considerations for the use of learning objects requires attention to the design of both learning objects themselves (Longmire, 2000) and their use within the broader instructional context (Bannan-Ritland et al. 2002; Wiley, 2003). It seems unlikely that a simple collection of learning objects will provide a satisfactory learning experience. Teachers and designers need to be able to incorporate selected learning objects with approaches best suited to their context. To achieve this, they need access to appropriate tools and strategies that make the process of implementing learning objects as flexible and seamless as possible. Research work has begun to investigate the instructional design implications of reusing learning objects. Examples include exploring new pedagogies to encourage reuse (Collis & Strijker, 2001), the development and implementation of authoring tools such as the Instructional Architect system (http://ia.usu.edu/) and the RELOAD system (http://www.reload.ac.uk/), and the development of support systems that provide basic scaffolding for designers in the form of wizards and templates (Kang, Lim & Kim, 2003). There is still, however, little research being conducted about how learning objects might be incorporated into constructivist and learner-centred approaches to learning. A current project underway at the University of Wollongong aims to develop a framework to guide the retrieval and reuse of learning objects in a pedagogically appropriate way and thus address this gap by developing a system that will facilitate the use of learning objects within constructivist-based learning designs. The initial focus of the project is on university education, however the work also has implications for other sectors.

The Smart Learning Design Framework project

The Smart Learning Design Framework (SLDF) project aims to facilitate the reuse of learning objects by guiding their retrieval within the context of a learning design. A learning design can be considered as "the instructional 'glue' that holds various parts of an instructional episode into a complete learning experience" (Anderson, 2003, p. 21). By drawing together the concepts of learning objects and learning designs a process will be defined that will assist teachers and instructional designers create an online 'unit of study' (Koper, 2001), that is, the instantiation of a learning design (which can be in the form of a single activity, a module or whole subject). This process will support a teacher/designer to:
- Select an appropriate generic learning design;
- Adapt the learning design to their educational context/setting;
- Access existing learning object repositories to search and retrieve suitable learning objects that can be used within the adapted learning design;
- Add learning objects (which they may create themselves) to existing learning object repositories; and
- Package the 'unit of study' for delivery via the appropriate hardware devices and/or networks.

This project builds on the concept of generic learning designs developed by the *Information and Communication Technologies and their Role in Flexible Learning* project (Agostinho, Oliver, Harper,

Hedberg, & Wills, 2002), which identified a collection of high-quality constructivist-based designs for online learning. To facilitate the use of these generic designs, The Smart Learning Design Framework will be operationalised in the form of a Learning Design Assistant/Wizard, which will function as an Electronic Performance Support System (EPSS). An EPSS provides integrated access to information, advice, and tools to help users perform a task with the minimum of support from other people (Northrup, Rasmussen & Pilcher, 2001). The EPSS will support teachers and designers to develop high quality "units of study" by:

- Providing generic learning designs in the form of interactive templates with access to rich descriptions of applications of each design; and
- Including prompts and advice based on the rationale and requirements of the design, the requirements of educational context in which the design will be implemented, and the characteristics of the learning objects suitable for inclusion (based on their accompanying metadata).

The unit of study will be packaged and delivered using a platform-independent method based on the MPEG-21 standard (Lukasiak, Burnett, Drury, & Goodes, 2003). The vision of MPEG-21 is "to define a multimedia framework that will enable transparent and augmented use of multimedia resources across a wide range of networks and devices used by different communities" (Rump, 2002). Thus information derived from the component learning objects and the delivery options will be used to ensure that the appropriate version of the unit of study is delivered to each student.

The scope of the SLDF project will involve achievement of the following deliverables:

- Documentation of the Smart Learning Design Framework in terms of its conceptual structure, metadata schema (both at the Learning Object and Unit of Study level), and how it could be applied using the MPEG-21 standard. (End of 2003.)
- A compilation of generic learning designs. This deliverable will involve applying the unit of study metadata schema. (End of 2003.)
- A demonstration of the process by which generic learning designs can be adapted to a particular context/setting, appropriate digital learning objects identified, selected or created to be used in the adapted design and delivered in a networked environment. (Proposed for 2004.)

Conclusion

The concept of reuse is appealing to many educators but there has been little investigation of the practical implications that emerge when teachers and designers try to integrate learning objects into a unit of study designed for their particular educational context. What is known is that university teachers need access to tools that diminish the need for specialist design and technical expertise and support them in the process of creating high-quality online learning experiences.

References

Agostinho, S, Oliver, R., Harper, B., Hedberg, J., & Wills, S. (2002). A tool to evaluate the potential for an ICT-based learning design to foster "high-quality learning". In A. Williamson, C. Gunn, A. Young & T. Clear (Eds.), *Winds of change in the sea of learning. Proceedings of the 19th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education*. (pp. 29-38). Auckland, New Zealand: UNITEC Institute of Technology.

Anderson, T. A. (2003). I Object! Moving Beyond Learning Objects to Learning Components. *Educational Technology*, July-August, 19-24.

Bannan-Ritland, B., Dabbagh, N., & Murphy, K. (2002). Learning object systems as constructivist learning environments: Related assumptions, theories, and applications. In D. A. Wiley (Ed.), *The Instructional Use of Learning Objects* (pp. 61-98). Bloomington, Indiana: AIT/AECT. [Online]. Retrievcd October 2002, from http://reusability.org/read/chapters/bannan-ritland.doc.

Bush, M. D. (2002). Connecting Instructional Design to International Standards for Content Reusability. *Educational Technology* 42(6), 5-13.

Collis, B., & Strijker, A. (2001). New pedagogies and re-usable learning objects: Toward a new economy in Education. *Journal of Educational Technology Systems*, 30(2), 137-157.

Downes, S. (2001). Learning objects: Resources for distance education worldwide. *International Review of Research in Open and Distance Learning*, 2(1). [Online]. Retrieved April 11, 2003, from http://www.irrodl.org/content/v2.1downes.html.

Friesen, N., Roberts, A., & Fisher, S. (2002). CanCore: Metadata for Learning Objects. *Canadian Journal of Learning and Technology*, 28(3). [Online]. Retrieved March 2003, from http://www/cjlt.ca/content/vol28.3/.

Gibbons, A. S., Nelson, J., & Richards, R. (2002). The nature and origin of instructional objects. In D. A. Wiley (Ed.), *The Instructional Use of Learning Objects* (pp. 25-58). Bloomington, Indiana: AIT/AECT. [Online]. Retrievcd October 2002, from http://reusability.org/read/chapters/gibbons.doc.

Hodgins, H. W. (2002). The future of learning objects. In D. A. Wiley (Ed.), *The Instructional Use of Learning Objects* (pp. 281-298). Bloomington, Indiana: AIT/AECT. [Online]. Retrievcd October 2002, from http://reusability.org/read/chapters/hodgins.doc.

IEEE. (2002, July 15). *Draft Standard for Learning Objects Metadata*. Learning Technology Standards Committee of the IEEE. [Online]. Retrieved 13 March, 2003, from http://ltsc.ieee.org/doc/wg12/LOM_1484_12_1_v1_Final_Draft.pdf.

Kang, M, Lim, D. H., & Kim, M. (2003). *Learning designer™: An e-learning design and development tool generating SCORM learning objects*. Paper presented at Learning Objects 2003 Symposium, Honolulu, 24 June 2003. [Online]. Retrieved 30 July, 2003, from http://www.cs.kuleuven.ac.be/~erikd/PRES/ 2003/LO2003/Kang.pdf.

Koper, R. (2001). Modeling units of study from a pedagogical perspective meta-model behind EML, Educational Technology Expertise Centre, Open University of the Netherlands.

Longmire, W. (2000, March). A primer on learning objects. *Learning Circuits Webzine*. [Online]. Retrieved April 11, 2003 from http://www/learningcircuits.com/mar2000/primer.html.

Lukasiak, J., Burnett, I., Drury, G., & Goodes, J. (2003). *Flexible content packaging of Learning Objects and learning Designs*. Paper presented at Learning Objects 2003 Symposium, Honolulu, 24 June 2003. [Online]. Retrieved 30 July, 2003, from http://www.cs.kuleuven.ac.be/~erikd/PRES/ 2003/LO2003/Lukasiak.pdf.

Northrup, P.T., Rasmussen, K, L., & Pilcher, J, K. (2001). Support for Teachers Enhancing Performance in Schools (STEPS): An EPSS professional development tool. In B. H. Khan (Ed.)., *Web-based training* (p. 469-474). Englewoods Cliffs, New Jersey: Educational Technology Publications.

Nichols, M. (2002). *Education and Learning Objects: A Primer*. [Online]. Retrieved 13 March, 2003, from http://www.cta.ac.nz/papers/Learning%20Objects%20CPIT.doc.

Rump, N. (2002). *MPEG-21 MDS - Frequently Asked Questions (FAQ) - Version 5.0*. ISO/IEC JTC1/SC29/WG11 N5187, International Organisation for Standardisation.

The Le@rning Federation schools online curriculum content initiative. (2002, June 12). *Metadata Application Profile: Version 1.1*. Report produced by Curriculum Corporation and education.au limited.

Wiley, D. A. (2002). Learning objects. In A. Kovolchick & K. Dawson (Eds.) *Educational Technology: An Encyclopedia*. Santa Barbara: ABC-CLIO. [Online]. Retrieved April 7, 2003, from http://wiley.ed.usu.edu/docs/encyc.pdf.

Wiley, D. A. (2003). Learning objects: Difficulties and opportunities. *Academic ADL Co-Lab News Report: No. 152-030406*. [Online]. Retrieved April 7, 2003, from http://wiley.ed.usu.edu/docs/lo_do.pdf.

Acknowledgement