Computers & Education 54 (2010) 661–668

Contents lists available at ScienceDirect

Computers & Education

journal homepage: www.elsevier.com/locate/compedu

Layered learning design: Towards an integration of learning design and learning object perspectives

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ARTICLE INFO

Article history:
Received 29 April 2009
Received in revised form 8 September 2009
Accepted 16 September 2009

Keywords:
Learning design
Learning objects
Authoring tools and methods

ABSTRACT

The use of ICT to enhance teaching and learning depends on effective design, which operates at many levels of granularity from the small to the very large. This reflects the range of educational problems from course design down to the design of activities focused on specific learning objectives. For maximum impact these layers of design need to be co-ordinated effectively. This paper delineates a reference model of 'layered learning design' where designs at one layer should use and incorporate designs from lower (more specific) layers in elegant and powerful ways. This would allow different designers, or tutors, to focus on different levels of abstraction in the learning design process, and to collaborate in combining designs to make a substantial impact on practice.

The paper first delineates a model of the different layers of learning design. These layers range from the strategic structuring of learning activity (to achieve high-level goals) down to the design for basic learning activities. The paper then tackles the issue of the integration of this model with a major 'aggregation' model for learning objects. The essential insight is that learning objects should be viewed as instances of learning designs. This leads to a combined reference model where there is a correspondence between learning designs and learning object types at each layer. Finally, the paper applies the combined model to map some major contributions to learning design research and development.

1. Introduction

1.1. Context and motivation for the paper

There is widespread interest in developing, exchanging and re-using good designs for learning. The Australian Learning and Teaching Council (2009) and AUTC Learning Designs Projects (2002), for example, have sought to establish rich repositories of learning design descriptions. The JISC Design for Learning (D4L) programme in the UK has funded a range of projects that tackled different aspects of design for learning. International standardization work has been focused on the IMS LD framework, derived originally from the Educational Modelling Language (EML) of the Open University of the Netherlands (IMS LD, 2003).

There is some vagueness or latitude, however, over what is encompassed by the area of learning design or 'design for learning' (the term used in the JISC D4L programme). Learning Design, with a capital 'L' and 'D' usually refers to the technical standardization work associated with the IMS LD specification (IMS LD, 2003). Much of the work on learning design, however, operates outside this technical standardization sphere. A large proportion of the work is concerned with the representation and exchange of 'teaching plans' (e.g. the Australian repository projects, and Phoebe, 2009). Other work concerns higher level module or course planning (London Pedagogy Planner, 2008). Finally, there is work that is concerned with the design of specific learning activities and learning objects (Sharing the Load, 2008). This range of applications provides the background to the issues addressed in this paper.

There is a strong consensus on the need for adequate representations of learning designs (Laurillard, 2008; Littlejohn, 2007; Oliver, 2007). There are a range of different candidates for how to represent learning design (e.g. D4L, 2008; Harper & Oliver, 2002; Koper & Olivier, 2004; Lockyer, Bennett, Agostinho, & Harper, 2008; Wills & McDougall, 2008). There is also a growing parallel field of work on 'pedagogy planners' – tools that capture learning designs and make them available for reuse and repurposing (Dalziel, 2003; LDSE, 2009; LPP, 2008).

These projects, though sharing a common name, vary in their motivation and the 'size' of the unit studied – where 'size' needs to be defined in terms of educational ambition and scale, and the conceptual structure required to achieve that ambition. This leads to confusion

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doi:10.1016/j.compedu.2009.09.026

in making sense of how these various initiatives and programmes of work relate to each other. This in turn leads to unnecessary duplication, failure to clarify clearly the scope of projects, and the failure to identify potential productive relationships. We need greater conceptual clarity about the nature of the underlying problem space. We need a conceptual model in which different types of learning design can be related to each other in a principled way.

This is a major challenge for the Learning Design Support Environment (LDSE) project. The project is part of the ESRC/EPSRC TEL (Technology Enhanced Learning) programme (TEL, 2009). The LDSE project aims to provide support for teaching and learning design that will cover the full range from courses, through sessions (e.g. lessons) down to specific learning activities (LDSE, 2009). This poses significant challenges for how to retrieve, use and *orchestrate* resources that already exist. An optimal position is that designs at the 'higher' layer should reuse and incorporate 'lower layer' designs in elegant and powerful ways. However, this requires a principled framework, or reference model, that (a) guides the identification of level of design 'granularity', and (b) elucidates the relationship between lower level and higher level designs. This paper concerns the development of such a reference model.

The conceptual clarification given by such a model should aid both the initial development of learning resources and the reuse of existing resources. In terms of development, individuals and groups should be able to work intensely in developing particular areas of 'learning design' that can then be integrated into the overall framework. Studies that focus on enriching particular areas can be pursued in depth, while still being seen as part of an integrated whole.

The advantages of such a model for supporting the range of design activity envisaged in the LDSE project include:

1. Aid the 'location' of resources, e.g. retrieved from the Web, which can be placed in a specific area of the overall conceptual framework.
2. Assist in the coherent orchestration of different resources: the framework should clarify the relation of particular design resources and tools in relation to other resources and tools. This is particularly important for projects such as the LDSE as it needs to integrate resources retrieved from a number of disparate sources.
3. By providing a clearer conceptual base the model should provide input into the development of better (metadata) descriptions of the resources.

The contribution of particular research/development areas, e.g. IMS LD, can also be critically viewed within this wider conceptual map to establish their focus, scope and limitations, e.g. which layer(s) does IMS LD focus on and which designs are outside its scope. Establishing scope is very important as it identifies the boundary where one approach needs to be linked to others in order to provide an overall comprehensive approach to 'learning design'.

The emphasis in this paper is on pedagogical/conceptual relationships. The parallel issue of technical relationships is a separate but related topic. This focus is important because the development of the technical framework for reuse has tended to override and potentially distort the primary task of elucidating a sensible pedagogical framework. The issue of conceptual clarification of the pedagogical level should provide the grounding framework for the challenge of technical integration.

1.2. Structure of the paper

The first part of the paper is concerned with elucidating a framework for different layers of learning design. It begins with a critique of the layers arising from the JISC D4L programme (D4L, 2008). It then systematically delineates a set of layers, beginning with basic learning activity, and then working upward through different layers of tactical and strategic design. The paper begins with the base layer as this is often neglected in the learning design literature. Much of the discussion is focused on the relationship between this layer and the session (or lesson layer) as it is believed that this is the area where greatest benefit is to be achieved from conceptual clarification.

Two of the fundamental entities of the discipline of technology enhanced learning are learning designs and learning objects. There has been considerable work on both these topics. However, this work has been marked by divergences across disciplinary perspectives, and a general failure to integrate the work in different fields (Boyle, 2008). There is considerable theoretical clarity and potential practical benefit to be gained from linking these areas of work. The paper thus discusses the relationship between the layered learning design approach and 'aggregation' models for learning objects, in particular the ALOCOM model (Verbert & Duval, 2004). By treating learning objects as instances of learning designs it seeks to develop an integrated model combining learning designs and learning objects. Some of the major contributions to the learning design field are then mapped to the framework that emerges from this work. The paper culminates by re-iterating the benefits to be gained by adopting this approach.

2. Layered learning design

In an interim report for the JISC Design for Learning (D4L) programme, the Glenaffric evaluators identify the need . . ." to develop a discourse to address the potential vacuum between designing and using learning objects, and higher-level lesson planning (Glenaffric, 2007). They present an initial layered model to address linking these areas of work. At this point the model was represented as three layers: course, lesson and object.

This model is expanded in the interim final report from the JISC D4L programme (Beetham, 2008). This sets out four layers (Fig. 1).

The four layers are explicated as follows:

- *Course design*: Designing courses/curricula or whole programmes at the highest level e.g. leading to a grade or qualification.
- *Session planning*: Designing or planning sessions (or lessons, or units of learning in IMS LD).
- *Activity design*: Designing activities (things learners actually do – also 'tasks').
- *Designing learning objects* (reusable chunks of content, usually at a fairly small level of granularity).

The JISC D4L work opens up the issue of layered learning design, and its role in communicating design ideas across teams working on educational design and development projects. It also suggests an initial starting point for identifying the main layers. However, this concept