

# THE LEARNING DESIGN IN EDUCATION TODAY

## *Putting Pedagogical Content Knowledge into Practice*

Isabel Azevedo<sup>1</sup>, Dulce Mota<sup>1</sup>, Carlos Vaz de Carvalho<sup>1</sup>, Eurico Carrapatoso<sup>2</sup> and Luis Paulo Reis<sup>2,3</sup>

<sup>1</sup>*School of Engineering and GILT – Graphics, Interaction and Learning Technologies, Polytechnic of Porto, Rua Dr. António Bernardino de Almeida, 431, 4200-072 Porto, Portugal*

<sup>2</sup>*FEUP- Faculty of Engineering of the University of Porto, Rua Dr. Roberto Frias, s/n, 4200-465 Porto, Portugal*

<sup>3</sup>*LIACC – Artificial Intelligence and Computer Science Lab, R. Campo Alegre, 1021, 4169-007 Porto, Portugal*

**Keywords:** Learning Design, Pedagogical Content Knowledge, Learning Resources, Collaborative Learning, Cooperative and Collaborative Work.

**Abstract:** This article describes the use of learning design to contextualise learning resources in a repository through the use of pre-defined templates. We advocate a close connection between a resource and its pattern of use in order to improve learning objects reuse. Moreover, we present the rationale for adopting and using learning design templates in the TREE repository.

## 1 INTRODUCTION

Education is increasingly a competitive area and the vision statements of institutions necessarily address quality, also by launching more and better services to students and staff, like repositories of educational resources. However, a study that aimed to uncover the diverse views on users' needs identified the following obstacles to adopting digital resources: how to find, manage, maintain, and reuse resources even in new contexts (Harley, 2008).

Wiley considers the following point as very important: "the role of context is simply too great in learning, and the expectation that any educational resource could be reused without some contextual tweaking was either naive or stupid" (Wiley, 2006).

The resource's submitters often provide some pedagogical advice for its application. Although undoubtedly useful, the comments in a text format might vary in the details provided and they might not facilitate the reuse of the resources.

The main focus of the work described in this paper is the creation of a close connection between a resource and its patterns of use, through learning designs. At the same time, we describe important aspects that embrace the development of learning activities supported by computer with a reusability attention.

This paper is structured as follows. Section 2 introduces the main concepts that scaffold the

learning design research domain as well as learning design templates potentialities. Section 3 provides the rationale for adopting and using learning design templates in the TREE (Teaching Resources for Engineering Education) repository (Azevedo, Ortiz, Carvalho, Seiça, & Carrapatoso, 2010). It also elucidates how they are considered. Finally, section 4 summarises the main findings of this paper and presents some concluding remarks.

## 2 LEARNING DESIGN ISSUES

Nowadays, there are many technologies used in information and communication fields that draw the educators' attention. It is a consensual idea the importance of the technology and its impact in the two last decades. It is also acknowledged the importance of diversifying teaching and learning methods in order to respond to diverse learning styles as well as to provide different learning experiences.

Learning design aims at contributing to the reflexion of the mentioned aspects, and consequently, helping educators in the preparation of learning activities that respond to different teaching and learning approaches.

There are many design issues that educators have acknowledged as being of great value to foster students' achievement. For instance, students'

expectations, interests, preferences and learning styles. In this sense, learning design arises as a new focus of interest embracing all actors of education field.

Learning design can be introduced as follows: "it aims at providing teachers with a framework capable to bridge the gap between rich, descriptive models and technologies, and the everyday practice and understanding of teachers" (Cameron, 2009). It has the potential to go beyond the learning content creation itself and proceed to the "process" of education. In other words, learning design helps to bring to the stage the learning issue while the technological aspects come after. In turn, the contributions of the new technologies to the learning design also need to be underlined once usual teaching-learning methods and pedagogies that were previously taken for granted can now be reconsidered (Beetham, 2007).

Another definition of learning design is presented in (Koper, 2005): "as the application of learning design knowledge when developing a concrete unit of learning (UoL), e.g. a course, a lesson, a curriculum, a learning event". The meaning of learning design knowledge is transmitted by a series of prescriptive rules with the following format: "if situation, then method". The left-hand side of the rule is the learning situation which accommodates the situational factors. The main objectives of these factors are twofold - firstly, they may represent the requirements that any new learning design method has to meet – secondly, they can be seen as descriptors of the situation in which an existing learning design method has been applied. The term *situational factors* are justified by the assumption that one method may behave best in a particular situation whereas another method may work best in a different one. Learning outcomes and learning conditions are the two subclasses of situational factors. The former is related to the level of effectiveness, efficiency, attractiveness and accessibility of the learning design method. The latter is related to the characteristics of some elements, such as the learning objective (knowledge, skill, attitude, competence), the learners (pre-knowledge, motivation, situational circumstances), the setting (individual and/or group work, work at school and/or work and/or home) and the media (bandwidth, synchronous/asynchronous, linear/interactive, media types) (Koper, 2005).

Following the IMS Learning Design specification, a learning design basically describes a teaching-learning process. This process has several components, namely metadata, roles, plays, acts,

environment, role-parts, sequence of activities and conditions. This conception may be compared to a script of a film or a theatrical play.

It is worth stressing that the term learning design is used to describe a learning experience supported by tasks to which students should be engaged to. For example, students may be formed into groups and required to discuss the relations between two given topics; or they may be asked to gather some information about a theme and then write a report.

## 2.1 Learning Design Repositories

The use of learning technologies and specifications should be considered for that wide contextualisation of the resources. The IMS LD specification can be used to sustain this approach and state how to use a Learning Object.

In fact, several learning design repositories have appeared, based (or not) on the IMS LD specification. For instance, there is a Learning Design Repository available at <http://www.idld.org>, which encloses a number of learning scenarios.

The European Network for Lifelong Competence Development (TENCompetence) was a four-year project supported by the European Commission through the IST Programme running from December 2005 to November 2009. It used IMS LD in the context of Life Long Competency Development. It developed systems using the specification, in the context of one of its work packages that focussed specifically on Learning Activities.

Another remarkable project from the pre-IMS LD era was the Learning Designs Project (Australian Universities Teaching Committee, 2003), which generated "generic/reusable learning design resources".

The LAMS (Learning Activity Management System) community of practice maintains a repository of learning scenarios in LAMS sequence format (.las files).

Considering all those initiatives, it is expected that Learning Design Repositories will become increasingly popular, as the possibility to search on learning design properties, for example, is a very interesting functionality to provide to end users.

## 2.2 Learning Design Templates

To design an effective learning process it is necessary not only to consider the learning resources, but also the activities and interactions that will support the knowledge transfer, and the whole learning situation. Accordingly, the resources should

be connected to a description of how to apply them, supporting some pedagogical knowledge. Thus, it is advisable to state how to use a learning object, and what learning outcomes to expect in order to promote learning objects repositories use.

Templates are defined to support different pedagogical approaches and to provide a practical context for learning objects. They represent learning strategies that can be used for a number of resources, as shown in Figure 1.

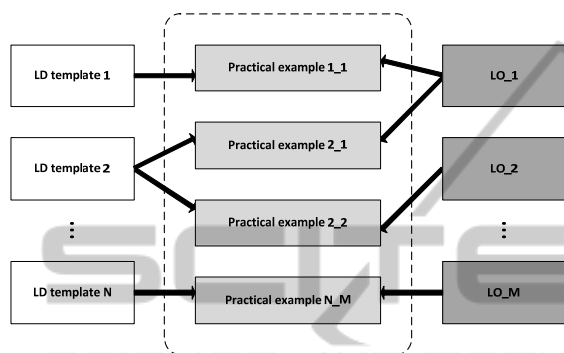


Figure 1: Use of IMS LD templates (adapted from (Azevedo, Carrapatoso, & Carvalho, 2008)).

### 3 THE USE OF LEARNING DESIGN TEMPLATES IN THE TREE REPOSITORY

In the TREE repository there are resources and the corresponding metadata fields, which are important for the UoL generation. The user can initiate the process, not only for resources he previously submitted, but for any other that he had used before or have an idea of how to apply it successfully. The option to generate a UoL is immediately shown to the provider, when a resource is submitted. But it is also available after the submission.

There have been some approaches proposed for systematising activities through the use of the IMS LD specification in an easier way. One of these initiatives that exploit informal descriptions of learning designs is the 8 Learning Events Model (8LEM) (Verpoorten, Poumay, & Leclercq, 2007).

The 8LEM model was chosen for the initial creation of templates because of its simple and very usable approach in modelling common situations in learning processes. A learning design template has associated a number of activities and, for each one, a generic user (a student, a monitor, a teacher) implicated is specified, and how the task is conducted. The individual activities are in a

sequence (a “method” in the IMS Learning Design nomenclature). A UoL may also have one learning objective for the set of specified activities.

For a resource, the user decides on the template to be used and a form is dynamically generated to instantiate the chosen template with the resource with some fields to be filled in. Then the system generates a UoL.

The approach was tested and the generated UoLs were successfully used in different IMS LD players. To be used in an LMS, if that possibility becomes a common practice, it is necessary to consider the specific users of interest, possibly the students that are following a module, for instance, and other detailed information.

The use of some LOM fields in the TREE repository complements the approach.

### 4 CONCLUSIONS

Some past projects were very important for the attention gradually given to learning designs, but it is necessary to advance the use of learning designs. We discussed the use of learning design templates in a repository. This strategy permits considering learning not only in a perspective of contents, but the activities that can be carried out using the resources are also regarded.

However, the point of using learning design templates supporting a pedagogical context and their utilisation for generating UoL is not to support instant reuse, but to sustain reuse with conscience. The final users are still responsible for instructional decisions and they have to carefully think about them. Any necessary edition can be done in simple text editors, but demanding a great knowledge of the IMS LD specification, or IMS LD editors, that vary in the degree of ease of use.

Presently, we are conducting our research to the collaborative work field among educators to foster the creation of UoLs using a high-level graphical design tool with synchronous and asynchronous communication. The main idea is to engage the educators in interactive discussions in order to help them to design interesting, creative and useful UoLs.

### REFERENCES

- Australian Universities Teaching Committee. (2003). Learning Designs Project. from <http://www.learningdesigns.uow.edu.au/project/index.htm>
- Azevedo, I., Carrapatoso, E., & Carvalho, C. V. (2008). *A Framework to Scaffold the Reuse of Learning Objects*.

- Paper presented at the Eighth IEEE International Conference on Advanced Learning Technologies.
- Azevedo, I., Ortiz, A., Carvalho, C. V., Seïça, R., & Carrapatoso, E. (2010). *Applying and Reusing Knowledge in a Repository*. Paper presented at the The 10th IEEE International Conference on Advanced Learning Technologies (ICALT 2010), Sousse, Tunisia.
- Beetham, H. (2007). "An approach to learning activity design", *Rethinking Pedagogy for a Digital Age- Designing and delivering e-learning*, H. Beetham and R. Sharpe (Eds), Routledge Taylor and Francis Group, pp. 27-40.
- Cameron, L., (2009). "How Learning design can illuminate teaching practice", *The Future of Learning Design Conference*, (available in <http://ro.uow.edu.au/fld/09/Program/3>).
- Harley, D. (2008). Why Understanding the Use and Users of Open Education Matters. In T. Iiyoshi & M. S. V. Kumar (Eds.), *Opening Up Education. The Collective Advancement of Education through Open Technology, Open Content, and Open Knowledge*: The MIT Press.
- Koper, R. (2005). "An Introduction to Learning Design. A handbook on Modelling and Delivering Networked Education and Training", pp. 3-20, Rop Koper & Colin Tattersall (Eds), Springer-Verlag Berlin Heideberg, ISBN: 3-540-22814-4.
- Verpoorten, D., Poumay, M., & Leclercq, D. (2007). The eight learning events model: A pedagogic conceptual tool supporting diversification of learning methods. *Interactive Learning Environments*, 15(2), 151-160.
- Wiley, D. (2006). RIP-ping on Learning Objects. from <http://opencontent.org/blog/archives/230>.

PRESS  
TECHNOLOGY PUBLICATIONS