TRENDS IN THE IMPLEMENTATION AND MANAGEMENT OF THE LEARNING DESIGN UNDER THE IMS LEARNING DESIGN STANDARD.

G. ARROYO DELGADO, A. MORALES FLORES, I. HERNÁNDEZ RENOVATO and R. AGUILERA TERRATS
CENTRO INTERDISCIPLINARIO DE INVESTIGACIÓN Y DOCENCIA EN EDUCACIÓN TÉCNICA (CIIDET)
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The need for a bridge between basic learning research and educational practice has long been discussed.

The functional value of this bridge would be its ability to translate the relevant aspects of learning theories into optimal instructional actions [Ertmer and Newby, 1993].

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The **Educational Modeling Language (EML)** that will be designed and implemented, will be based on the standard **IMS-Learning Design (IMS-LD)**.

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Until now a **Methodology for Educational Modeling has been published**.
Originally [Koper, 2000] defined, in a simple way, an Educational Modeling Language (EML) as: *A system of notation for units of study* where that system of notation has some of the following basic assumptions:

(a) **Formalization**,  
(b) **Pedagogical flexibility**,  
(c) **Explicit instruction method**,  
(d) **Completeness**,  
(e) **Compatibility**,  
(f) **Reusability**,  
(g) **Reproducibility**,  
(h) **Interoperability**.
[Koper, 2001] also offers the concept of unit of study (UoL) as the smallest unit that offers learning events for learners, which satisfies one or more interrelated learning objectives, where this unit of study is the result of an instructional design process and this one should consider the following characteristics:
UoL characteristics

(i) the *roles* of the teaching staff and students in the learning process
(ii) the learning objectives and target group
(iii) the prerequisites of the learners
(iv) other characteristics of the student (learning styles, environmental circumstances, etc.)
(v) the domain of learning (for example, mathematics is different from social science)
(vi) the context of learning (distance learning, blended learning, support structure available, library, etc.)
(vii) the assessment of learning
[Rawlings et al., 2002] offers another definition of an EML developed by the Open University of the Netherlands as:

**EML**

A semantic specification, based on a pedagogical meta-model, which describes the structure and processes of a learning unit.

If we consider a UoL as a specific instance of a pedagogical model and this model, in turn, as an *instance of a pedagogical metamodel* [Ortiz, 2011].

So, an EML is a model of pedagogical models used to formalize the teaching-learning processes.
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So, an EML is a model of pedagogical models used to formalize the teaching-learning processes.
IMS-Learning Design (IMS-LD) is defined as a specification of a model to represent and codify structures and learning methods for the different actors of the learning process [Burgos et al., 2007].

- Technically IMS-LD involves a formal specification in Extensible Markup Language (XML) [W3C, 2008], so any learning design can be validated according to this specification [Global Learning Consortium, 2003].
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One of our purposes is to model the UoL with a Domain Specific Language for Educational Modeling (DSLEM). A Domain Specific Language (DSL) is a *programming language designed for a particular application domain that allows raising the level of abstraction of a more complicated language* [Hudak, 1998].

Common examples of DSLs include:

- LEXX and YACC
- TEX and LATEX
- HTML and XML
- Mathematica and Maple
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Domain Specific Language

In this project an educational modeling methodology was already published to generate UoL [Arroyo et al., 2013] in which its objective is to improve and strengthen the teaching and learning process in technological higher education in face-to-face, distance or blended mode, the methodology specifies how to model UoL and clearly shows the procedure to generate UoL using the Reload LD Editor application [Milligan et al., 2005].

The methodology is available at:

http://www.cb-ciidet.com/garroyo/IMS-LD/
Implementation of Units of Learning Repository

After publishing the educational modeling methodology to generate UoL, we planned to continue with the development of DSL for Educational Modeling (DSLEM) that possesses a higher level of abstraction and that allows us to produce UoL in a more simpler, valid and formal way than the current tools to generate UoL under IMS-LD.

However, there were some drawbacks that prevented us from continuing with the implementation of the DSLEM, for the moment.
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Implementation of UoL Repository

Parallel to the development work of the DSLEM; it was investigated the issue and the implementation of a repository of UoL in order to manage these UoL in a simple way. The repository allows above all to share the UoL, which is one of the objectives of the project.

- First of knowing and understanding the IMS-LD standard,
- Then generating UoL according to the published educational modeling methodology.
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- Later, and more technically, it was investigated on the XML technology to understand the formal specification of IMS-LD,

- To extract the information from the UoL, which is, in XML format; XMLDOM was used and XPath was used to navigate between the XML design elements.

- The web application was developed using a local WAMP server, then the web application was moved to a public web server where the development was continued.
The repository has a database table consisting of the following attributes: a key, the name, description and metadata of the UoL; the name of the subject and the curriculum, where this learning design is applied, were added very aptly.

Four views were created for the application:

1. a welcome view,
2. another to upload the generated UoL,
3. the third to search an UoL,
4. a fourth view where we can browse the information of the selected UoL.
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1. store the learning designs, this is to store the UoL
2. show the roles of the actors in the learning process of a UoL,
3. show the learning objectives of the UoL
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The web address of the repository is publicly available at:

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Conclusions and future work

- The background of a modeling project of learning units has been presented which consists of a modeling methodology of learning units as well as the preparatory work of a domain specific language for educational modeling (DSLEM), in addition to a repository of units of learning.
Conclusions and future work

- Preliminary experiments have been carried out for the development of the domain specific language for educational modeling, with which it is hoped that it will be possible to generate the learning units in a more agile and systematic way, however this tool is not yet finished.

- On the other hand, the prototype of learning units repository has already been released and its use is publicly offered.
Thank you very much for your attention!
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CONCLUSIONS AND FUTURE WORK

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