

QUALITY LEARNING OBJECTS MANAGEMENT

A Proposal for E-learning Systems

Erla Morales, Ángela Barrón

Department of Theory and History of Education, Salamanca University, Canalejas Street 169, Salamanca, Spain

Francisco García

Department of Computer Science, Salamanca University, Plaza de los Caídos Street, s/n, Salamanca, Spain

Keywords: Learning Objects, Evaluation, Knowledge Management.

Abstract: Web development is promoting important advantages for educational area specially e-learning systems. By one side Learning Objects (LOs) aim the possibility to reuse specific information and by the other side they can be interchanged through different context and platforms according to the user's needs. However an urgent necessity exists to guarantee the LOs quality content. There exists a plethora of quality criteria to value digital sources but there are only a few suggestions about how to evaluate LOs to structure quality courses. Our proposal consists on a system to evaluate LOs as a continued process taking into account quality criteria related to metadata information, especially the educational category, together with a strategy to ensure a continued LOs quality contents.

1 INTRODUCTION

In today's world many efforts exist in development of standards and specifications for management information without interoperability problems. The Learning Object (LO) concept is a set of resources that could be used as independent and reusable units of learning through different context and platforms.

To achieve this each one of LO may have metadata (data about data) for their description and administration. In this way it is possible to know what kind of LO we are trying and if it is reusable for new contexts of use.

However through metadata is possible to know information about LOs but it doesn't guarantee they content quality.

Nowadays some efforts exist to evaluate LOs. There are LOs repositories like MERLOT, CLOE and DLNET (MERLOT, 2003) which propose three dimensions of evaluation. However to guarantee an optimal evaluation it is necessary to take into account more things. Define criteria into different kind of categories or principles aim to review different points of view, for this reason we suggest four categories with quality criteria. To ensure LOs

quality characteristics we propose to complete their metadata information according to our quality criteria.

There are a lot of LOs definitions and different level of granularity. Our proposal is directed to LOs as educational content, for this reason in section 2 we suggest our own LO definition that establish its components and a knowledge model that establish a relation between them.

One of the most famous instruments for evaluating LOs is LORI (*Learning Object Review Instrument*) (Nesbit et al, 2003) which aims to evaluate LOs according to nine general items. However items must to consider LOs metadata information and made a relation between them because metadata contains LOs information and in some case they be able to be managed through their metadata information only.

In section 3 we propose an evaluation instrument which considers our four categories to evaluate LOs from different points of view relating to quality criteria with LOs metadata information.

Some LOs evaluation proposal suggest a collaborative methodology taking into account different kind of experts' participation (Nesbit et al, 2002) and (Nesbit et al, 2004).

According to this to promote a better LOs quality section 4 proposes a LO evaluation strategy, which combine our evaluation instrument with a collaborative strategy executed by experts. To improve and continuous LOs refeed we suggest a user evaluation test.

2 NORMALIZATION OF LEARNING OBJECTS

There are different LOs definitions (Wiley, 2000); (Moreno and Bailly-Baillièrre, 2002); (IEEE, 2002); (Polsani, 2003).

However taking into account LOs characteristics and they management for e-learning system we define a LO as a “unit with a learning objective, together with digital and independent capabilities and accessible through metadata to be reused in different contexts and platforms” (Morales et al, 2005a).

LOs must have a learning objective because it enables to direct the contents and material relating to them. Ideally a LO must contain different types of element which help to clarify the main idea.

Independent LOs means the possibility to teach some topic by itself avoiding reusability problems.

Accessible through metadata capabilities deliver the LOs characteristics providing different kind of information about them. Our proposal is based on IMS specifications for this reason we refer metadata considering IMS LOM (Learning Object Metadata) (IMS LOM, 2003).

Finally, LOs reusability means the possibility that a LO could be reused many times independent of software and platforms changes. This issue reflects their interoperability and durability characteristics.

However to achieve a suitable LOs management it is necessary to take into account some pedagogical issues related with their quality.

Educational objectives are related with cognitive levels. Therefore, different kinds of taxonomies exist that establish what it's possible to learn into a specific cognitive domain therefore some kind of objectives, contents and difficulty level exist.

To ensure a suitable LOs management we propose their normalization through a knowledge model that classify LOs taking into account their objectives, contents and difficulty level.

1.- *Classify LOs objectives according to their complexity level.* In this way it is easier knowing about their compatibility for suitable new educational situations. Then, we suggest Bloom's

cognitive domain taxonomy (Bloom, 1956) because it defines what and how to learn according to complexity levels: low level (knowledge, comprehension and application) and high level (analysis, synthesis and evaluation).

2.- *Define the difficulty level to each one of LOs,* for this issue we propose three kinds of complexity levels: basic, medium and advanced because this kind of classification would help teachers to select the LO content according to their teaching objectives.

3.- *Classify the imported LOs into three kind of content:* data and concept, procedure or processes, and reflection or attitude. This classification aims to define the kind of content according to the learning objectives.

LOs classification must be added to their metadata information in this way it is possible to manage them according to their characteristics. We suggest to add this information into educational metadata category specially description element it is because our classification describe general issues to take into account before a LO can be reused.

The provided LOs classifications for the knowledge model allow teachers to find content according to the subject area, type of content, and level of difficulty.

Nevertheless, LOs normalization is not enough to guarantee their quality. Next we suggest our own LOs evaluation proposal.

3 EVALUATION INSTRUMENT

To evaluate LOs according to their characteristics we propose to divide metadata information especially educational section into four categories. Each one of this categories have quality criteria to evaluate their content, according to this it is possible to evaluate them taking into account different points of view.

Psychopedagogical category: This category contains pedagogical criteria related to the psychology of learning. This kind of criteria aims to determine if the LO is suitable to promote learning.

Didactic-curricular category: This kind of criteria aims to evaluate if an object is related to curricular objectives according to the context in which it will be applied.

Technical-Aesthetic category: Contain criteria to evaluate technical issues like interface design and metadata information.

Functional category: Contain criteria that aim to verify a suitable LO functionality because if we have

an object which does not work correctly it could obstruct the learning process.

To facilitate LOs review evaluators can see metadata information file as well as LO URL location. In this way users could know a complete information about the LO they are trying.

To ensure a suitable LO evaluation each one of quality criteria have metrics for their evaluation that aim to know what is they means. This information is part of the instrument we are proposing.

The third column shows the range scale for evaluation, if evaluators don't know how to evaluate it or if they have a doubt it is possible to select DN= Don't Know, otherwise they can select the following rate scale 1=very low, 2=low, 3=medium, 4=high and 5=very high.

Figure 1 shows some of the evaluation criteria we are proposing. For example, into didactic-curricular category there are quality criteria related with LOs objectives, contents, and activities, each one of this have a final score that aim to know their individual scoring to reinforce them if it be necessary. According to this, the final scoring of each category is average out at the field "category score" from this results it is possible to obtain a final LO evaluation at the field "final evaluation results". In case of any doubt, critic or suggestions evaluators have a comments section.

The final evaluation results could don't have whole numbers, for this reason LOs level of quality will be interpreted taking into account the following rating scale 1.0-1.9= very low, 2.0-2.9=low, 3.0-3.9=regular, 4.0-4.5=good, 4.6-5.0=very good.

4 EVALUATION STRATEGY

We propose two modes of applying the instrument in order to value the LO: individual and collaborative. Individual evaluation provides us an initial appreciation of the quality of the LO based on the judgment of each participant.

According to (Vargo et al, 2003) we suggest a collaborative evaluation to encourages not only different points of view over the subject under evaluation, but also a critical objectivity and a reliable LOs evaluation.

The possibility of completing an evaluation through collaborative method enables to contrast the individual's initial evaluation with the others experts' evaluations. It aims to share different points of view to achieve an advanced and reliable evaluation (Vargo et al, 2003).

To help teachers in this work by one side our tool aim to analyze graphics that show statistics that reflect individual an collaborative evaluation and by the other side it provide a forum for discussions to achieve an agreement for a final evaluation.

After LOs evaluation they must to be saved into a repository that contains normalized and quality contents. From this repository teachers could search LOs to structure their courses offering quality contents for their students. These contents will be part of biggest units of learning like lesson, modules, courses, etc. and they will be published by e-learning system for their usability and be continually evaluated to guarantee their quality.

Therefore a re-feeding process is needed which taking into account students' and teachers'

Metadata Educational Category	Evaluation Criteria	Rating Scale Don't Know= D/K, Very Low = 1, Low= 2, Medium = 3, High= 4, Very High= 5	Comments
	PSYCHOPEDAGOGICAL		
Intended End	Motivation Capability		
User Role			
Typical age range	Suitable age range		
Difficulty level	Suitable for previous knowledge		
	CATEGORY SCORE	#DIV/0!	
	DIDACTIC- CURRICULAR		
Context	Suitable for formative level		
Description	Objectives		
	Contents		
	Activities		
Typical Learning Time	Suitable for objectives		
	Reusability		
	CATEGORY SCORE	#DIV/0!	

Figure 1: An example of Evaluation Instrument.

contributions to the LOs quality.

According to this, we propose a LOs re-evaluation, which considers a learners' experience about the efficacy of the LO to improve their knowledge (Morales and García, 2005); (Morales et al, 2005b). For this reason once students have finished their lesson they have to respond a little test about their satisfaction with the contents. Each one of this questions are related with LOs evaluation instrument, in this way it is possible to contrast them with previous experts evaluation.

Taking users responses, evaluators may have to re-feed LOs to guarantee their continued quality.

5 CONCLUSIONS

To make suitable LO evaluation a first thing we must to consider is LO definition, we think our definition may be suitable for LOs management because it promotes a simple LOs contents that could help to reuse them in an easy way.

Our normalization proposal helps to promote a uniform LO level of granularity and the possibility to increment LO reusability to another specific context. It is because relating a LO to knowledge domain aim to attend different educational situations for different requirements.

LOs evaluation proposal is a way to evaluate them according to their characteristics. LOs are characterized for the separation between their content and presentation. Therefore, the relation presented between LOs metadata and quality criteria is a concrete way to evaluate them.

Each one of evaluation categories aim to evaluate this characteristics into a concrete set, providing specific criteria to evaluate them. Metadata record evaluation into technical category aim evaluators to complete or correct metadata information and evaluate the standard compliance.

Finally we think to achieve an integral LOs evaluation is important not only to consider different kind of experts evaluators but the possibility to discuss their opinion through a collaborative strategy. However an expert evaluation must be reinforced with users' evaluations, which might contribute their experience and express their satisfaction.

Our future work is to implement this model in order to make possible adjustments and modifications.

ACKNOWLEDGEMENTS

This work was partly financed by Ministry of Education and Science as well as FEDER Keops project (TSI2005-00960).

REFERENCES

- Bloom, B., 1956. *Taxonomy of Educational Objectives: Handbook I, Cognitive Domain*. David McKay.
- IMS LOM., 2003. Learning Resource Metadata Specification. <http://www.imsglobal.org/metadata/index.html>
- MERLOT., 2003. *Multimedia Educational Resources for Learning and Online Teaching*. <http://merlot.org>.
- Morales, E. and García, F., 2005. Quality Content Management for E-learning: General issues for a decision support system, *In ICEIS'05 7th international conference on enterprise information system*. ICEIS Press.
- Morales, E., García, F., Barrón, A., 2005a. Knowledge Management System to Re-feed Learning Objects Repository. *In (m-ICTE'05) 3th international conference on multimedia and information & communication technologies in education*.
- Morales, E., García, F., Barrón, A., 2005b. Knowledge Management for E-learning based on Learning Objects. A qualitative focus, *In ITHET'05, 6th international conference on information technology based higher education and training*. IEEE CS Press.
- Moreno, F., Bailly-Baillièrè, M., 2002. *Diseño instructivo de la formación on-line*. Aproximación metodológica a la elaboración de contenidos, Ariel Educación.
- Nesbit, J., Belfer, K., Leacock, T., 2003. Learning Object Review Instrument (LORI) User Manual E-Learning Research and Assessment Network
- Nesbit, J. C. & Li, J., 2004. Web-based tools for learning object evaluation. *International Conference on Education and Information Systems: Technologies and Applications Orlando, Florida*.
- Polsani, P., 2003. *Use and abuse of reusable learning objects*. Journal of digital information. <http://jodi.ecs.soton.ac.uk/Articles/v03/i04/Polsani/>
- Vargo, J., Nesbit, J.C., Belfer, K., Archambault, A., 2003. *Learning object evaluation: computer-mediated collaboration and inter-rater reliability*. *International Journal of Computers and Applications*, 25, 3.. <http://www2.cstudies.ubc.ca/~belfer/Papers202-1335.pdf>.
- Wiley, D. A., 2000. *Learning object design and sequencing theory*, Unpublished Doctoral Dissertation, Brigham Young University, Provo, UT, <http://reusability.org/read/chapters/wiley.doc>, (2000).