

# E-LEARNING MODEL FOR ASSESSMENT

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## ABSTRACT

Using e-learning systems in education is becoming, without doubt, a more and more used learning method. It is being used in universities or in higher education centres, and also in organizations which look for a correct and continuous formation of their employees. One of the basic activities of this type of education is the process of learning evaluation, we mean, to value the acquired knowledge by the students. At the present time, there are different institutions exist which investigate in these environments, but the most important one that presents a concrete specification about the evaluation is IMS Global Learning Inc. Consortium, this norm is denominated QTI - Question and Interoperability Test -, and it has been published in mid-month of February of 2005 its last version 2.0. The objective of the present work is to display new documents of QTI specification as basic ones for the implementation in virtual environments of a serious and efficient evaluation process, besides to introduce the components and the relations of the entire evaluation model.

## KEYWORDS

Assessment, e-learning, QTI

## 1. INTRODUCTION

The assessment is one of the basic tasks of the educational work, as much in education based in e-learning systems, as in traditional or actual education. For the student, the evaluation is the moment for verifying the acquired knowledge in the learning process. In addition, the evaluation process allows the student to compare the reached knowledge with the expected one in the formative action and thus to determine if the objectives have been achieved correctly [LARA, 2001]. That's the reason it is important to know the developed works in this range in the last years, as for example the IMS Question and Interoperability Test – QTI – specification defines a way of producing assessment information that allows questions, assessments and results to be shared across different computer systems.

But there are more institutions than IMS; in the following table the institutions that collaborate in e-learning environments are enumerated, besides we inform about their Web address [CEN 2004]. They stand out for being the most excellent in this environments, the 36 subcommittee of the first joint International Standardization Organization and International Electrotechnical Commission Committee (ISO/IEC JTC1 SC36) was launched in 1999 and The Learning Technologies Standardization Committee (LTSC) from the IEEE covers practically all aspects related to computer-based education.

Table 1. E-learning Institutions.

Name	Web
ISO/IEC JTC1 SC36	<a href="http://jtc1sc36.org/">http://jtc1sc36.org/</a>
IEEE LTSC	<a href="http://ltsc.ieee.org/">http://ltsc.ieee.org/</a>
CEN/ISSS WS-LT	<a href="http://www.cenorm.be/cenorm/businessdomains/businessdomains/iss/index.asp">http://www.cenorm.be/cenorm/businessdomains/businessdomains/iss/index.asp</a>
ADL	<a href="http://www.adlnet.org/">http://www.adlnet.org/</a>
AICC	<a href="http://www.aicc.org/">http://www.aicc.org/</a>
IMS	<a href="http://www.imsproject.org/">http://www.imsproject.org/</a>
European Schoolnet	<a href="http://eunbrux02.eun.org/portal/index-en.cfm">http://eunbrux02.eun.org/portal/index-en.cfm</a>
ARIADNE	<a href="http://www.ariadne-eu.org/">http://www.ariadne-eu.org/</a>
PROMETEUS	<a href="http://www.prometeus.org/">http://www.prometeus.org/</a>
GEM	<a href="http://www.geminfo.org/">http://www.geminfo.org/</a>
EdNA Online	<a href="http://www.edna.edu.au/">http://www.edna.edu.au/</a>
ALIC	<a href="http://www.alic.gr.jp/eng/index.htm">http://www.alic.gr.jp/eng/index.htm</a>
DCMI	<a href="http://dublincore.org/">http://dublincore.org/</a>

As it was commented previously, the only institution that presents a sequence of recommendations in the process of evaluation in e-learning systems is IMS. The IMS Question & Test Interoperability specification describes a basic model for the representation of question and test data and their corresponding results reports [IMS, 2005]. The specification has been produced to facilitate the interoperability among different systems and for this reason; the norm uses the XML language [XML, 2005] to describe questions and tests.

## 2. THE NEW SPECIFICATION QTI

QTI norm has been published, in its final version 2.0, on 15 of February of 2005. In particular new QTI specification sets a data modeling valid to represent type test examinations and their results, obtained through the scoring algorithms. In addition, it allows to interchange exercises, examinations, etc. among different learning platforms, using for it, a set of metadata defined in the standard of IEEE LOM – Learning Object Metadata – [LOM, 2002].

The specification consists of seven documents and it includes [IMS Public Dispatch, 2005]:

- **Implementation Guide:** A document that takes you through the data model for assessment items for example.
- **Information Model:** The reference guide to the main data model for assessment items.
- **Meta-data and Usage Data:** A document that describes a profile of the IEEE Standard for Learning Object Metadata data model suitable for using with assessment items and a separate data model for representing usage data.
- **Integration Guide:** A document that describes the relationship among this specification and other related specifications such as IMS Content Packaging, IMS Simple Sequencing y IMS Learning Design.
- **XML Binding:** A document describing the way the data models have been bound to XML.
- **Conformance Guide:** A document that describes conformance requirements and provides a data model for the construction of QTI profiles including a predefined profile that replaces the QTI Lite specification released as part of version 1.
- **Migration Guide:** A document aimed to people familiarized with version 1.x.

### 3. ASSESSMENT MODEL

At the present time different models exist like the one proposed by QTI [QTI 2005] or the e-learning framework reference model assessment of JISC – Joint Information Committee Systems – [JISC 2005]. Besides, the Open University of the Netherlands and Educational Technology Expertise Centre (OTEC) has presented the Educational Model for Assessment. The objective of this model is to increase the interoperability of assessments. Any assessment model has to comply all of the following requirements [EMFA 2005]:

1. *Flexibility: The assessment model must be able to describe assessments that are based on different theories and models.*
2. *Formalisation: The assessment model must be able to describe assessments and its processes in a formal way, so that it is machine-readable and automatic processing is possible.*
3. *Reusability: The assessment model must make it possible to identify, isolate, decontextualize and exchange useful objects (e.g. items, assessment units, competencies, assessment plans), and to reuse these in other contexts.*
4. *Interoperability and sustainability: Separation between the description standards and interpretation technique, thus becoming resistant to technical changes and conversion problems.*
5. *Completeness: The assessment model must cover the whole assessment process, including all the typed objects, the relationship between the objects and workflow.*
6. *Explicitly typed objects: The assessment model must be able to express the semantic meaning of different objects within the context of an assessment.*
7. *Reproducibility: The assessment model must describe assessments so that repeated execution is possible.*
8. *Medium neutrality: The description of an assessment, where possible, must be medium neutral, so that it can be used in different (publication) formats, like the web, or paper and pencil tests.*
9. *Compatibility: The assessment model must fit in available standards and specifications.*

The following diagram presents the proposed model for assessment in e-learning systems; in addition we show some possible tools to implement the model in a real evaluation system.

#### 3.1 First Level

The first level is formed by two basic and fundamental elements, item and test. The item is something more than a normal question, since the item contains extra information like and also the possible response, the response processing and scoring. The test will be a composition of items organized in a concrete way according to QTI standard. In this level a TOIA tool is set out [TOIA 2005], it is developing to QTI compliant assessment management system.

#### 3.2 Second Level

In the second level it is presented a repository of assessment objects, where the different items and test will be saved. In order to organize these assessment objects it will be used the IMS Content Packaging to create a zip file containing the item or test and the IEEE LOM manifest file [LOM, 2002]. As example of a tool for the implementation of this second level we set out Dspace of the MIT – Massachusetts Institute of Technology – [Dspace 2005] [MIT 2005]

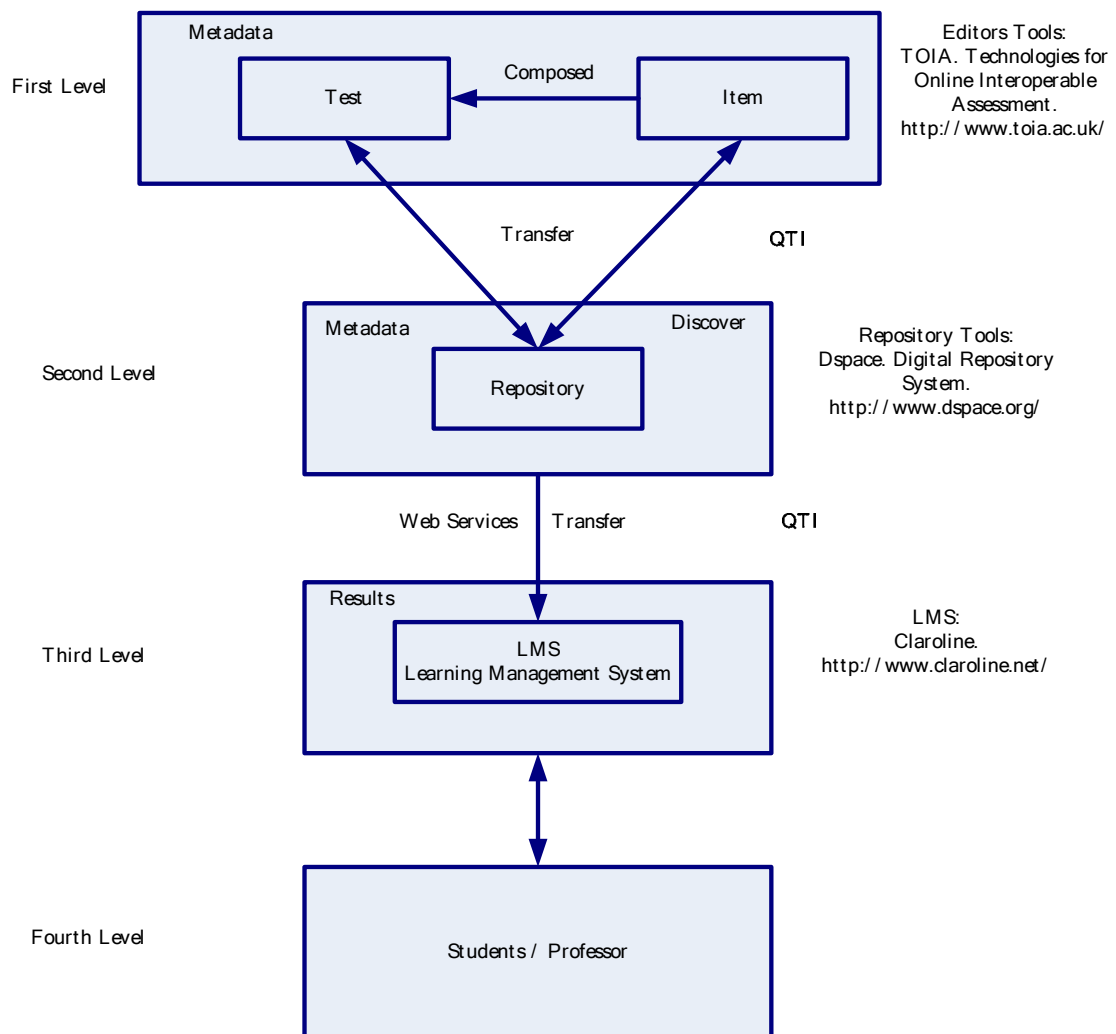


Figure 2. E-learning Model for Assessment

### 3.3 Third Level

The third level is formed by a LMS – Learning Management System – or VLE – Virtual Learning Environment – that will recover and will present the tests of the repository. At present different architectures are being implemented so that the LMS discover and incorporate assessment objects using for it Web services, where the physical location of the resources, assessment objects, is irrelevant [Ortiz, 2005]. For its use we propose Claroline which is an open source software based on PHP and MySQL.

### 3.4 Fourth Level

The fourth level will be formed by the different users of the LMS, either professors or students of a formative action where evaluation test are added.

## 4. CONCLUSIONS

The assessment must be one of the strategic objectives of the e-learning systems, for this reason this work has showed an e-learning model for assessment which can be implemented using for it the different presented tools.

The different levels we have displayed separate the functional units of the model; these units must be communicated through the QTI standard in the first and second levels; this fact is very important to achieve interoperability among the assessment objects.

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