A tool for online assessment in adaptive e-learning platform

Héctor G. Barbosa, Francisco J. García, Maria José Rodriguez-Conde
Instituto Tecnológico de Colima, México, Universidad de Salamanca, España
barbosa@usal.es, fgarcia@usal.es, mjrc@usal.es

In this article, we present some general aspects of the on-line assessment activity. For the purpose of this paper, we want to focus ourselves in the activity of valuation that takes place in the e-learning process and discuss the importance of this action for each participant of the process. After that, we profile the desirable characteristics of an adaptive system and we describe the importance of the assessment activity. Later we present a proposal model for an adaptive assessment tool for an educational platform that can accept objects developed under open standards.

I. INTRODUCTION

Nowadays there are lot of works done and developments in progress in the area of e-learning. We can see Instructional and educational institutions have been incorporating information and communication technologies in learning a teaching process in order to increase the quality, efficiency and dissemination of education.

To be sure that these efforts do not become groups of isolated islands, most of these projects look for to be compatible with some accepted standards, so that they can be interoperables, compatible and interchangeable. Among the inherent importance of these works, we want to give emphasis to the paper of the activity of the assessment inside the e-learning process. We want to focus ourselves in this action, and to see how it can help improve the learning process for all the participants: the students, teachers, the designers of contents, etc.

II. LEARNING TECHNOLOGY STANDARDS

Today, it is necessary to produce educative Internet-based systems that permit the dissemination of the education, covering the needs of diverse learning group profiles. To obtain this, it is desirable that such systems perform automatic task to adapt itself to each user, disconnecting the content from its presentation by using a semantic approach rather than a syntactical one, defining a meaningful web.

In consequence, learning systems must be flexible and efficient, and one way to accomplish that is to be an open and standardized system. We'd like to focus on the Learning Technologies Standards (LTS) and, inside these, the IMS specification, giving the general aspects and the desirable characteristics for a learning system.

The LTS is a group of agreements about the characteristics that a learning element should have. The use of standards ensures instructional technologies to work with other systems (interoperability), follow-up information about learners and contents (manageability), generate learning objects that are usable in other contexts (reusability) and avoid obsolescence (durability) (Booth and Berwyn, 2003). Among these standards we want to mention the IMS Specifications: This is an LTS born in 1997 as a project of the National Learning Infrastructure Initiative at Educause. Its mission is to promote distributed learning environments.

For the IMS, many areas require interoperability when learning is distributed, thus it details a set of specifications that build a framework to interchange educational elements (Thorpe, 2004). This framework covers among others, the IMS specification, specially: IMS Learning Resources Metadata Specification, for describe learning resources for searching and discovering. It is based on IEEE LOM and the IMS Question and Test Interoperability (IMS QTI), for share test items and other assessment tools. It defines a data model for the presentation of questions, test and the correspondent results reports.

III. IMPORTANCE OF ASSESSMENT ACTIVITY

Conceptualizing the e-learning process to its basic elements we can identify at last three elements: 1. the educational material to be taught by the teacher in a classroom, 2. the assessment activity to measure the student learning and, 3. the report of the score results given by the teachers to the students. This model is well suitable for the traditional educative process.
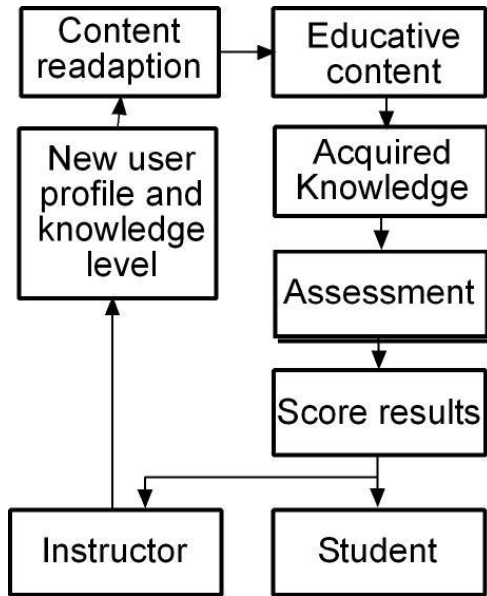
FIGURE I
ASSESSMENT IN THE E-LEARNING PROCESS
(Barbosa, H.; garcía, F., Rodriguez, M., 2007)

This is a narrow conceptualization for a complex process in which there are several factors that must be taken in account like: student learning styles, technical implications, adaptive educative content, learning and knowledge management, feedback, motivation, etc. Traditionally, assessment activity has been seen as an activity apart of the e-learning process and there is a danger in focusing research on assessment specifically, as this tends to isolate the assessment process from teaching and learning in general (McLoughin and Luca, 2003).

In the figure I, we can see a more complex model for the e-learning process in which we remark the assessment activity to emphasize the role of this task in the whole educative development "closing" the process, refreshing the information to the students (giving the scores), to the instructor (by giving support for feedback) and the instructional designer (to update the contents of the learning system).

IV. ADASAT

First of all, we'd like to determine the necessary technologies and concepts that were used for this tool.

- ALE: Adaptive Learning System, conform its learning components to build the most suitable adaptive learning experience.
- Learning Designs: Sequence of educative activities that could attach several learning objects and definitions such objectives, prerequisites, and activities to complete or fulfil the lesson. These designs are defined using the IMS LD (IMS Learning Domain) specification.
- Metadata: by using metadata objects we give to the AAT the characteristics of interoperation, reusability and interchange among other systems.
- SLO´s: The Semantic Learning Objects, compliant with IMS Metadata, stored as XML files in IMS metadata SLO repositories. By using SLO´s, we could differentiate between the educative content and the learning processes.
- XML: Extensive Markup Language, to ensure an interchangeable tool using meta-data, building a well documented and deployable tool.
- IMS specification: Define a data model for the representation of educative objects for learning systems. Among the IMS specifications, we could find the IMS QTI (IMS Question and Test Interoperability), for the representation of questions and tests and the correspondent results reports.

Under this conceptualization, we created an Adaptive Assessment tool (AAT) that:

- Allow the professor or instructional designer to integrate the test questions, defining an XML file as output associated with a repository of learning objects in metadata format, following the IMS specifications.
- On the other side, we want ensure that the assessment tool take into account the pedagogical aspects to conform an adaptive systems by considering the learning styles of each student integrating this style with a set of questions to create a Learning Test Definition.
- Integrate the test with other learning activities in the Learning Domain Model.
- Design an adaptation model as the component that integrates all the definitions made with the Learning Domain Model: the learning design, the test, learning style and adaptive rules, generating an IMS LD file containing a deliverable learning design to the next module, the Interaction Model.
- The Interaction Model delivers and adaptive unit of learning to the student – an IMS CP file–, tracks the behavior of the student like the learning activities visited and the result of the test made by him/her. At the end this module updates the student model.

After that, we applied this tool to a group of students in the University of Salamanca, consisting in the definition and the application of a test in English knowledge.

We split this group into two: for the first group we apply the test with questions and accompanying multimedia material that matches their preferences of presentation

(audio, text or video); for the second group we applied a test that did not match their preferences. Also we applied a test to determine the learning style of each student, prior to the adaptive test.

The aim of this process is to evaluate the hypothesis that, if a student is presented with an adaptive test that matches its preferences of presentation of the accompanying multimedia material, he/she could average better results in that test.

V. CONCLUSIONS AND FURTHER WORK

Online assessment is an important step inside the e-learning process because gives convenient feedback to all participants in the process, helping to improve the learning and teaching experience.

In this paper we wanted to emphasize the role of the assessment by putting it at the 'centre' of the e-learning process and defining the importance factors to the main elements that participate in this process: the educative content and adaptation process, the users or students and the teachers and assessors. Definably the assessment activity takes place in a specific point of the process as we show it in the figure 1, and we conceptualized the activity as the link that closes the chain of the e-learning process.

According to the new developments in the area of e-learning we can see that most of them look to be compliant with accepted standards like the LTS. This gives the convenience to those developments to be interoperable and adaptable to different platforms. In concordance, referring to the assessment activity we can think that it must be interoperable as well, because it is one element of the e-learning process and plays an important role inside this experience. When we talk about assessment we could define some components of quality, especially for the users; some of those are: validity, reliability, flexibility and fairness [6].

Adaptability is another key factor in assessment. Given the fact that assessment is an important element of the e-learning process and that this process looks to be interoperable, then we can think that the assessment tool could be used with different educative content administrators with different conceptualizations and ways to design and apply a test for their students. To face this situation it is necessary to develop an assessment tool that give several ways to design an test with different types of resources, different kind of assessments, group of students, kind of questions, managing schedules, etc.

The results obtaining from the application of this tool to a group of students reported better scores when the test were adapted to the preferences of presentation. We are working now in the description of the final conclusions of this work.

REFERENCES

Barbosa, H., García, F. and Rodríguez, M., "Construction of Assessments with double adaptation processes", In EIAE 07, University of Bridgeport and the IEEE. Innovations in E-Learning Instruction Technology, Assessment and Engineering, Iskander (ed.), pp. 133-137.

Booth, R., Berwyn, C. "The development of quality online assessment in vocational education and training". Australian Flexible Learning Framework, Vol.1, 2003, pp. 17 – 25.

McLoughlin and Luca, J. "Assessing Students' Self-Regulatory Skills", In "Assessment and Online Teaching", Australian Flexible Learning Framework Quick Guides series, Australian National Training Authority, Version 1.00, October 15, 2003, pp.3

IMS QTI Item overview, Version 2.0 Public Draft, http://www.imsglobal.org/question/qti_item_v2p0pd/indes.html, 2004.

Thorpe, M., "Assessment and 'third generation' distance education", In "Exploring assessment in flexible delivery of vocational education and training programs", Australian National Training Authority, 2004, pp. 20