AN AUTHORING TOOL TO DEVELOP ADAPTIVE ASSESSMENTS

Proposal Model to Construct Adaptive Assessment Items

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Abstract: This paper presents the proposal for the development of an Authoring Tool for the definition of Assessment items for E-learning platform that follows accepted and open standards like IMS an XML. The main goal of this model is the definition and packaging of semantic learning objects that could be integrated and deliberated to open e-learning platforms.

1 INTRODUCTION

In recent years, instructional and educational institutions have been incorporating information and communication technologies in learning and teaching processes in order to increase the quality, efficiency, and dissemination of education. As long as those projects cover the needs of individuals in a particular way, the success and transcendence of such developments could be incremented by performing adaptability to each user so the learning experience can be enhanced.

However, we must ensure that those efforts do not become groups of isolated isles, so we may construct standardized tools so they can be applicable, compatible, and interchangeable between them. Also, the emerging of the Semantic Web has allowed the development of systems that could satisfy the requirements of open systems. One accepted standard for the development of educative objects is the IMS (IMS organization, 2004), a global learning consortium that develops and promotes the adoption of open technical specifications for interoperable learning technologies that become the standards for delivering learning products worldwide. Among the inherent importance of the developing of e-learning platforms, we want to emphasise in the role of the assessment activity inside the e-learning process. We want to concentrate in this task, and see how it can help to improve the e-learning process to all the participants: students, teachers, and content designers.

2 IMPORTANCE OF THE ASSESSMENT ACTIVITY IN THE EDUCATIVE PROCESS

Traditionally, assessment activity has been seen like a task aside of the e-learning process and there is a danger in focusing research on assessment specifically (Booth, 2003), as this tends to isolate the assessment process from teaching and learning in general.

The results of the test made by the students could allow an adecuation of the web site that reflects the new knowledge topics or the new syllabus that will be taken. According to the Australian Flexible Learning Framework (Backroad Connections, 2003), assessment, especially when is included within a real learning task or exercises, could be an essential part of the learning experience, giving to the entire Web site the characteristic to adapt itself to the needs of the users. This could be an interesting feature of an educational Web site because the improvement of the online teaching experience by giving to the student a convenient feedback, re-adaptation of the educative content to the new knowledge level, setting user-tailored content information.

For the student, the assessment activity informs progress and guide learning; also, it is essential for the accreditation process and measures the success of the student. Assessment tasks can be seen as the active components of study, also assignments provide learners with opportunities to discover whether they understand and not, if they are able to

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perform competently and demonstrate what they have learnt in their studies. Furthermore, the feedback and grades that assessors communicate to students serve to both teach and motivate (Thorpe, 2004).

From our point of view, the assessment activity could be considered as an integrator step that help the entire process to get self adecuation to the user needs, giving feedback to both the student and the instructors.

3 DESIRABLE CHARACTERISTICS FOR AN ASSESSMENT TOOL

Nowadays, 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 want to focus on the following standards by giving their general characteristics and their support features for a learning system:

One aim is to make those systems to work in adaptive learning systems and, given the fact that the assessment activity is an important and integral part of the e-learning process; it is desirable that this evaluation activity could be adaptable as well. If we want the assessment to be interoperable, compatible, and shareable, we must have to develop a standardized tool (Barbosa, 2005).

4 PROPOSAL FOR AN AUTHORING TOOL FOR ADAPTIVE ASSESSMENTS

For the development of our Adaptive Assessment Tool, we outlined a model that will help us in the process. This model (figure 5), have 3 levels of definition, starting with the first level which shows the model in its most abstract definition, ending with the third level which is the most concrete definition of the same model.

4.1 First Level of Definition

We will explain the first and the inner level of definition (fig. 2), according to the complete figure showed in the third level of definition (fig. 4):

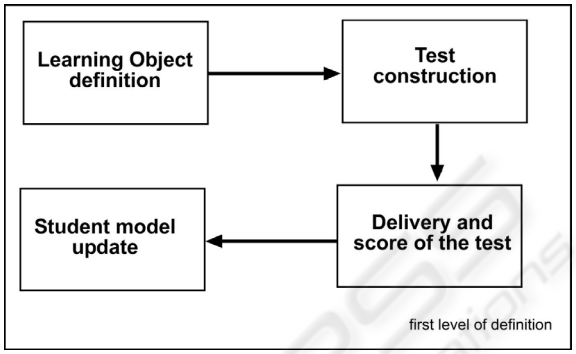

Figure 1: First level of definition.

a) Learning Object Definition: the process starts with the definition of the main component of a test: the learning object that will contain a single assessment item or question. It is convenient to define single questions to ensure a convenient granularity of the elements for the next step of the process: the construction of the test itself. To ensure the reusability, interoperability, durability, and accessibility of these objects, they will be defined using open standards, following the definition of semantic objects using XML and the IMS, IMS QTI specifications.
b) Test Construction: Here the assessment items are selected from the repository to construct the test that will be delivered to the students, selecting the questions based on the subject and unit that will be evaluated. At this point of the process, the question items are packaged following the SCORM specification.
c) Delivery and score of the test: Once we have a group of assessment items to conform a deliverable test, is time to present it to the student through an LMS. In this process is where the adaptation is made in an interaction process. The responses to each question are saved to obtain the final score for each student.
d) Student Model Update: In the LMS, the final score is taken into account to update the student model so the learning environment could adapt to the student in the next interaction process.

4.2 Second Level of Definition

Following the four quadrants of the first level of definition, we will explain them in the second level (fig.3), in a more concrete definition:

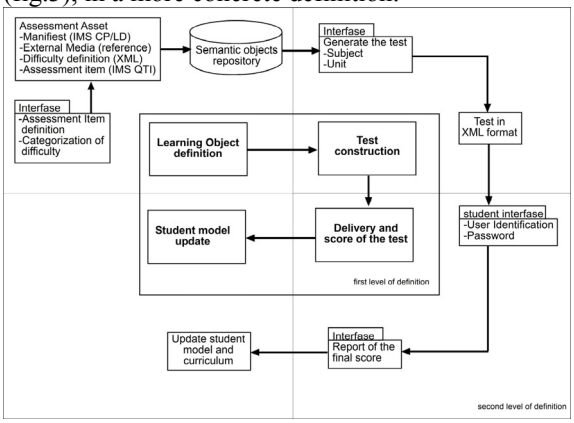

Figure 2: Second level of definition.

a) Learning Object Definition: In this level we are defining the first interface of the system, that allow to the educational instructor or teacher to capture each assessment item directly or by make a relation to external sources, assigning a categorization of difficulty that will help in the adaptation process. After that, the assessment item will be packaged with a manifest (using IMS CP/LD specification), links to external sources, the assessment item itself (using IMS QTI) and the definition of difficulty for the assessment item (using XML), and stored in a semantic object repository.
b) Test Construction: We use the second interface of the system to allow the instructor or teacher to generate the test by capturing the subject and unit of that subject that will be evaluated. This process constructs the deliverable test by selecting all the assessment assets from the semantic objects repository and transforming all the assessment items to a XML format. By doing this, we have a single file in XML format containing all the assessment items to construct single tests, allowing an adaptation process.
c) Delivery and score of the test: In the ALE, the final XML file containing all the assessment items, the test is presented to the student. A third interface is used that allows to the student to identify her/himself. In this phase, the students answer the questions as they are presented by the system. At the end of the exam, the final score could be showed to the student.
d) Student Model Update: The ALE, according to its own process could update the student model and the curriculum to save the final score of the test already performed by the student.

4.3 Third Level of Definition

In this level (fig. 4), we outline the interaction and adaptation process. In the event that the ALE do not

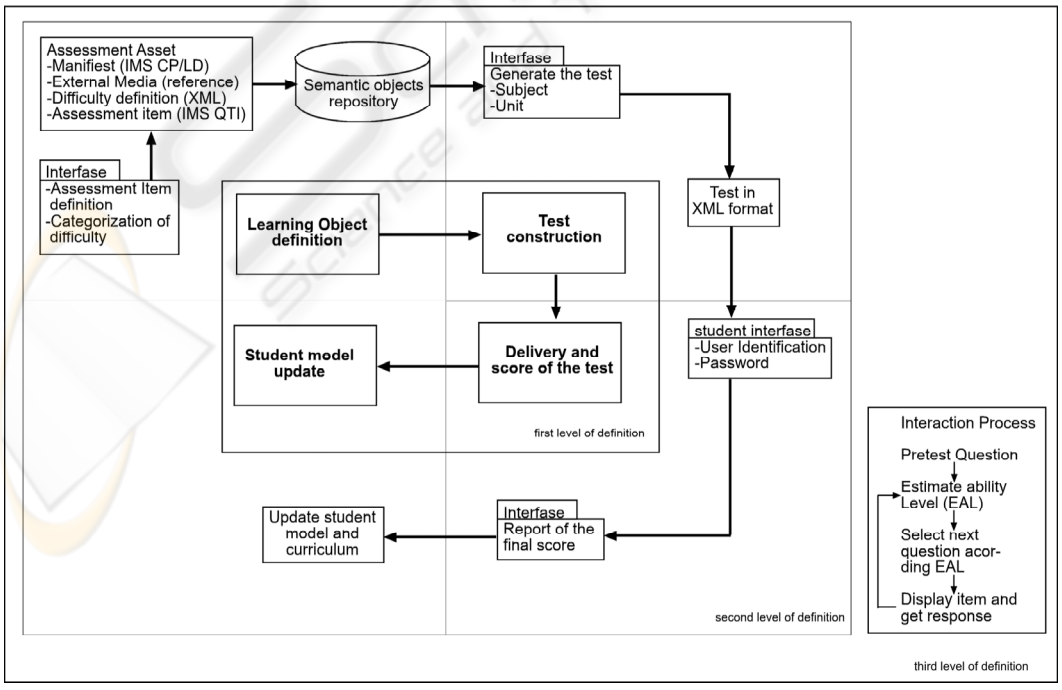

Figure 3: Third level of definition.

conform an adaptation process for external assets, we could suggest one, following the logic (Eri-CAE Network, 2003) given below:

a) All items that have not yet been administered are evaluated to determine which will be the best one to administer next, given the currently estimated ability level.
b) The "best" next item is administered and the student responds.
c) A new ability level is computed based on the responses of the student.
d) Steps 1 to 3 are repeated until a stopping criterion is met.

Questions would be given randomly to eliminate cheating. The new ability level is computed based on the equations (Mia, 1998), used in the MANIC system (op. cit.) during the quiz sessions to compute the new estimated ability level (see table 1).

To determine the first OldValue at the beginning of the test, the student is given with a pre-test question, after that, for every question, this value will be updated, based on student's response.

This could be an automatic and independent process from the ALE, which could be performed by a software agent. If the test will be able to use external multimedia assets, it is also possible to use an external agent stored in the same server, which starts the adaptation process in the client's machine.

5 CONCLUSIONS AND FUTURE 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 inside the e-learning process and defining the factors of importance to the main elements that participate in this process: the educative content and adaptation process, the users or students and the teachers and assessors. We think that the assessment activity takes place in a specific point of the process as we show it in the figure I, and we conceptualized the activity as the link that closes the chain of the e-learning process.

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.

Under this conceptualization, we want to create an Adaptive Assessment Tool (AAT) that could take into account the specific characteristic of the HyCo system and be intrinsically part of it.

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