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Importance of Online Assessment in the E-learning Process

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Abstract - **In this article, we present some general aspects of the On-line Assessment activity. For the purpose of this paper, we want to focus in the assessment activity that take place in the e-learning process and discuss the importance of this action for each participant of the process. After that, we outline the desirable characteristics of an assessment tool under an adaptive learning environment, following with the description of the main attributes of an Adaptive Assessment Tool for an Adaptive Learning Environment actually in development.**

Index Terms – Adaptive Assessment Tool, Adaptive learning environments, Assessment in e-learning, Learning Technology Standard specifications.

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 particularly way, the success and transcendence of such developments could be incremented by performing adaptability to each user so the learning experience can be enhanced.

To be sure that all of these efforts don't become groups of isolated isles, most of these projects look to be compliant to some accepted standards, so they can be applicable, compatible and interchangeable between them. One accepted standard is the IMS, 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 these works, 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.

The rest of this paper is structured as follow: In the next section, we depict how we see the importance of the assessment activity in the e-learning process dividing the information for each main element in the e-learning process. In section "Desirable Characteristics for an Assessment Tool", we put in relief the general and desirable characteristics of an assessment tool for an adaptive learning system; also, we explain some desirable components of quality and efficiency for the assessment activity. In the Proposal section, we describe a proposal for an Adaptive Assessment Tool that will be part of an adaptive learning system [5], now in development in the Department of Computer Science of the University of Salamanca (Spain). Finally, in the last section we give our conclusions and further work.

IMPORTANCE OF THE ASSESSMENT ACTIVITY

Conceptualizing the learning process to its basic elements, we can identify at last the following elements:
1. The educational material to be taught by the teacher in a classroom.
2. The teaching and learning activities that take place in a classroom.
3. The assessment activity to measure the student learning and,
4. The report of the score results given by the teachers to the students. This conception is well suitable for the traditional educative process.

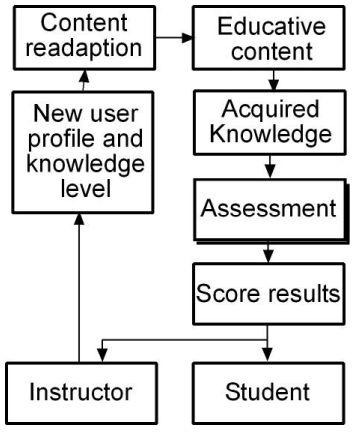

FIGURE I
ASSESSMENT IN THE E-LEARNING PROCESS

However, this is a more complex process in which there are several factors that should be taken into account like student learning styles, the technical implications, the adaptive educative content, the learning and knowledge management,

feedback, motivation, etc. Traditionally, assessment activity has been seen like task aside of the e-learning process and there is a danger in focusing research on assessment specifically [4], as this tends to isolate the assessment process from teaching and learning in general.

In figure I, we characterize the importance of assessment in the learning flow. As we can note, the tests and evaluations not only are an integral part of the learning process, but also is an element that complete and close a circular activity, contributing as a feedback source for: the users (giving the scores and feedback), for the instructors (by giving support and feedback) and for the instructional designer (to update the contents of the learning system) as well. This circular conceptualization of the learning process allow us to see the significance of the assessment because it helps to the adaptation of the system by setting a new user knowledge level, evaluating and determining new learning profiles, assign the user grades and, in consequence, performing user content re adaptation. This is how we see the importance of the assessment task for the adaptation process.

As Kendle and Northcote assert [4], the evaluation should be one of the first considerations of design when you prepare an online course, integrating it in the program and not considered by apart.

I. Importance for the Educative Content and the Adaptation Process.

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 [1], 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:

- Convenient Feedback: the web site shows the results of the assessment and gives the feedback to the user to improve their scores.
- Once the lesson taken and the corresponding evaluation was carried out, the educative content could be readapted to the new knowledge level of the user by imparting new lessons, based upon the results of the assessment.
- From the last feature, we could establish user-tailored content information to give the student the convenient, adapted and meaningful information, improving the learning experience.
- Gives flexibility, enables group work when the test is designed to be made for several individuals, have the potential to be interactive, learners can assess assessments remotely and could be ease to use [4].

II. Importance for the User.

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 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 [7].

In addition, we have to consider another and emerging approach for online assessment that refers to group collaboration, sharing and learning where students are able to see solutions to authentic problems from many other students. It is necessary to mention that a fast, instantly and effective feedback is very important to the learners, also to have access to multiple attempts, take charge of their own learning and track their own progress. Removing the need for fixed delivery dates and locations normally required in traditional tests is seen as a benefit for the students [4].

Conclusively, we would like to mention an assessment categorization:

- Formative assessment: this is an assessment that helps to give a convenient feedback and motivation to the student and do not have scores. Also brings convenient feedback to designers of materials.
- Summative assessment: this is a scored assessment and gives a result to measure outcomes and success of the learner.
- Norm assessment: use the achievements of a group to set the standards for specific grades and is used in most universities.
- Criterion assessment: establish the standard (criterion) and mark students against it.
- There is another kind of assessment called alternative assessment. Here, the integration of the assessment activity with learning processes and real-life performance as opposed to display of “inert knowledge”. Know as authentic assessment it is very much based on the *constructivist* approach that enables students to demonstrate knowledge by working on authentic task, putting students un control of their own learning [1] and helping the students to develop the necessary skill for autonomous (and lifelong) learning.

III. Importance for the Teachers and Assessors.

Most of the online learning systems and learner management systems are automated and linked between them, This give to the instructors/assessors the way to perceive the benefits to include a documented and consistent assessment process where the technology allows ease of monitoring the learner process and the provision of immediate feedback. All those features improve the quality of assessment process [4].

Another factor of importance is that the teachers could have time saving since the system could have the characteristic to automate the marking. Other critical factor when online assessment is applied is to minimize the academic dishonesty. To avoid this, a widely used method is to have an online database of assessment as a part of a test bank that allows generating random tests from randomised

items. Online assessment allows improving the assessment process, support flexibility, saves time in the long term and allows quick feedback to learners, creates consistent and standardised assessment, the progress can be monitored, the assessment activity can be documented, it is financially attractive and learners can be assessed equally [4].

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, also, the assessment action could activate other activities that could improve the entire instructional process.

Such activities could be the recording of the lessons taught and evaluated to set a new user knowledge level and the new user profile by taking in account the learning style.

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:

The LTS (Learning Technology Standard) specification 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) [5]. Among the learning technologies standards we must to mention the IMS Specifications that are part of the LTS specification, developed 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 [2]. This framework covers among others, the following aspects:

- IMS Learning Resources Metadata Specification: describe learning resources for searching and discovering, with foundation in the IEEE LOM.
- 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 [6].

Those specifications allow the creation of many types of educational designs following a consistent notation to develop a system that could have a homogeneous implementation in several courses or learning contexts, giving the systems extra characteristics like compatibility and exchangeability. In addition, those specifications define an abstract data model using XML, supporting the deployment of item banks and well documented content format.

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 valuation 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.

The implementation of the adaptability in the assessment activity by giving the instructor:

- Tools to design the assessment with several types of resources (text, graphics, video, animations) to improve the student´ understanding in the examination
- Design different types of assessment
- Define content structures and groups of students
- Manage the assessments and the questions linked to each assessment
- Define the grades for each question and assessment
- Define and manage the schedule for the assessment that will be taken.

The Australian Quality Training Framework defines some desirable components of ‘quality’ in assessment: validity, reliability, flexibility, and fairness [4]. In addition, this framework highlights requirements such as assessment information to candidates; standards of performance required in the workplace; sufficiency of evidence; provision of feedback to candidates; equitable assessment processes and language, literacy, and numeracy considerations in assessment.

In addition, Kendle and Northcote [4] have criteria to guide the design and development of effective qualitative online assessment tasks:

- Variety: including both quantitative and qualitative methods.
- Authenticity: using open-ended tasks that simulate workplace tasks, as well as appropriate quantitative tasks.
- Collaboration: allowing for interaction between learners and others, and using appropriate communication technologies.
- Feedback: ensuring appropriate feedback mechanisms are possible using peer feedback and peer tutoring.
- Online resources: making full use of available quantitative packages as well as other internet resources.
- Learner responsibility: providing options and opportunities for accountability within assessment task.

To obtain the desired results of the assessment activities, Hayes provides a list of expectations for online assessment and states that assessment should [4]:

- Be clearly related to the aims and objectives of the subject
- Occur at integrated moments along the learning continuum
- Embody students utilising authentic, real life skills and processes

- Include provision of proactive skills support if required, and
- Allow for students to make choices and be informed of their learning progress

PROPOSAL

Now, we want to outline an adaptive assessment tool (AAT) that could be part of an adaptive learning environment (ALE). We want to emphasize that this AAT is a proposal to the HyCo model, which define some modules integrated to deliver adaptive units of learning based in open standards and conforming an open system, using some technologies, which are described next.

I. The HyCo Model

For our proposal, it is important to describe the HyCo (Hypertext Composer) model because we want to define and construct an assessment tool that will be an integral element of this system.

HyCo is an authoring tool to compose semantic learning objects for web-based E-learning systems, by creating hypermedia educational resources and to access to that content (figure II). This authoring tool uses learning technology standards or specifications to save these semantic objects that are delivered in web e-learning environments as encapsulated packages in order to ensure their reusability, interoperability, durability, and accessibility. These learning objects are close to the semantic web field because they combine hypermedia and semantic capabilities. The aim of the HyCo is to use these semantic learning objects in order to define learning domains for the ALE. In addition to provide an e-learning environment where teachers have tools to create didactic materials and students carry out their knowledge acquisition through the most suitable adaptive learning technique giving the student's characteristics, the learning activities provided and the learning objects' features [5].

This system use open standards technologies such Java, XML and the IMS specifications to ensure multiplatform adaptability making their elements reusable, durable and accessible. To acquire those characteristics, it is necessary to separate the educative content and its presentation, so the HyCo platform save the contents in XML files, allowing the introduction of LTS (Learning Technology Standard), particularly the IMS specification.

The fact of separating the content and the presentation forces to offer to the authors a way to generate an independent result of the authoring tool. In this way, HyCo has an output gallery that supports HTML, PDF, TXT, RTF and PS output formats.

II. Used Technologies

First, we would like to describe the necessary technologies and concepts used in this tool:

- ALE: Adaptive Learning System. This system conform its learning components to build the most suitable adaptive learning experience.
- Learning Designs: This is a sequence of educative activities. This 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.

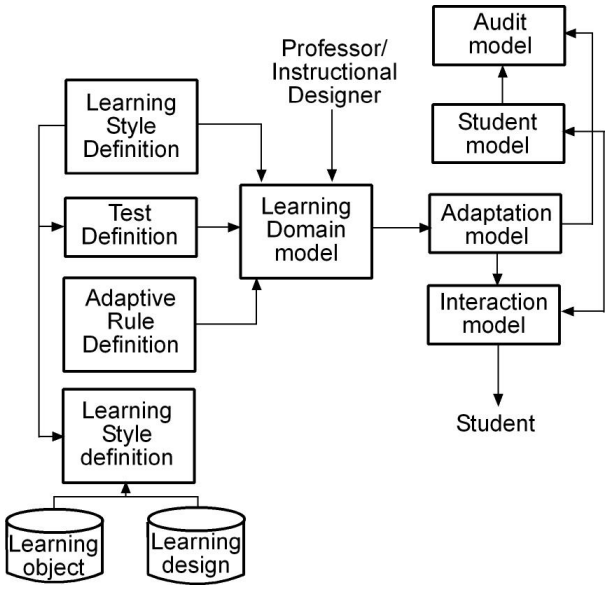

FIGURE II
HYCO MODEL [5]

III. Proposal model for an Adaptive Assessment Tool (AAT)

In the figure III, we outline the main components and the processes to develop an AAT, based on the HyCo model (figure II) taking into account the most important modules to configure our AAT model. The idea is to show the expected flow to develop an adaptive unit of learning according to the products made by the HyCo platform, but in this case, we will talk about an adaptive assessment as the adaptive unit of learning.

- **Learning Objects:** The teacher or the instruction designer makes a series of test questions that will integrate an educative resource. In this process, all the

IMS metadata that can be inferred from the original resource are defined, becoming into a SLO. After that, a XML file is generated, specifically for each SLO, designed exclusively for assessing purposes. This file is

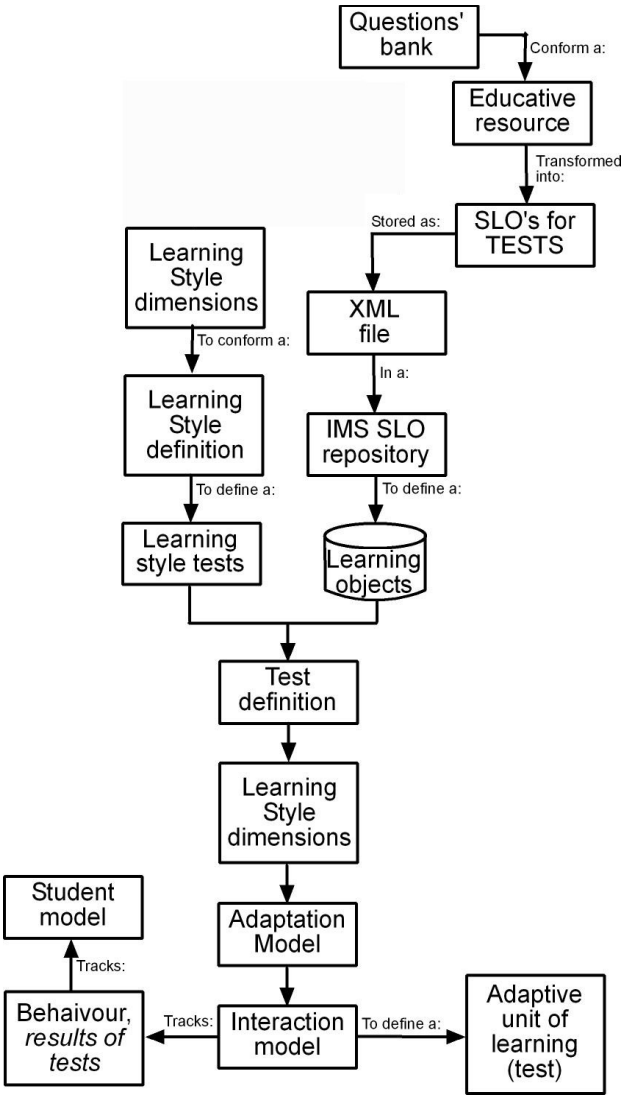

FIGURE III
ASSESSMENT ACTIVITY INTO THE HYCO MODEL

stored in an IMS Metadata SLO repository, allowing us to have learning objects in form of assessment questions that comply with the IMS QTI specification and that can be attached to learning activities of learning designs, being compatible with specific learning style tests, defined below.

- **Learning Style Tests:** On the other side, we have to take into account the learning styles of the students. Felder and Silverman Learning Style Model and the Kolb's Experiential Learning Theory [5] are two well know examples. The former proposes ten dimensions: two related to the way students receive the information (sensorial, intuition), and the other eight related to the way the information is processed (visual-verbal; inductive-deductive; active-reflexive; sequential-global). Kolb's approach also takes into account the way the information is perceived (theorist and activist dimensions), and the way the information is processed (reflectors and pragmatist dimensions). However, the idea is not to prescribe any learning style, but provide authors with a flexible structure where different learning style approaches can be described and used to characterize the learning styles of learners and activities. Once the learning style approach is selected, a learning style test could be defined. Each of these tests could assembly a series of assessment items into a specific test for a specific learning style definition.
- **Test Definition:** When the learning objects (assessment items) and the learning style tests are defined, a test definition could be made in concordance with a learning style definition. We want to recall that, as it is described in the HyCo model, there are four kind of test: learning style test, current knowledge and initial and final knowledge. The formers are included in a unit of study.
- **Delivery:** To complete the release of the AAT we must encapsulate it into a framework that integrate other elements to complete the adaptation for the student:
  - **Learning Design:** This process integrate objectives and prerequisites for the test.
  - **Learning style:** When we identify the student learning style, we can select a definition test for a specific learning style, in concordance with the learning style of the student.
  - **Adaptation Rules:** categorize the student stereotypes, defining adaptive statements and techniques.
- **Interaction Model:** Delivers an adaptive unit of learning, including mainly the learning material and the test this module tracks the behaviour of the student during the interaction with the system when the learning activities are visited and the results of the test.
- **Updating the Student Model:** Integrates the results of the interaction model, storing the learning style and the acquired knowledge for each the student.

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 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.

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.

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.

We want to adopt the model developed for the HyCo platform to integrate the assessment module into it, to do that we will:

- Develop an application where the professor or instructional designer could integrate the test questions, following the same two-phases that in the HyCo process, to integrate an XML file as output associated with a repository of learning objects in metadata format, following the IMS specifications.
- On the other side, we 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.
- After that, following the integration with the HyCo system, the test is attached with other learning activities in the Learning Domain Model.
- The adaptation model is 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 behaviour 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.

Among the IMS specifications, namely the IMS QTI, devoted entirely to the area of the assessment, which we will analyze and evaluate to the development of the AAT for the HyCo (Hypertext Composer), developed in the Institute of Educational Sciences in the University of Salamanca, Spain.

ACKNOWLEDGMENT

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