Evaluation of Student Performance in Adaptive E-Learning Processes with Active Tutorship

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ABSTRACT

This paper describes the implementation of adaptive technology in a specific, Open Source, Learning Management System (LMS). After a preliminary study about the adaptive features already built-in and the capabilities ready to perform a suitable student modeling, the research team extended those capabilities with a specific data model, student model, and tutoring engine to perform automatic monitoring and sequencing of Learning Objects for each particular learner. Testing activities has proven the efficiency method in content and course delivery and given the opportunity to further develop a predicting tool based on data mining student modeling. This provides an efficient tool in tutorship activities. This paper describes some best practices developed during a Tempus IV Project granted by EU.

Keywords: Active Support, Activity Locking, Adaptive, Data Mining, e-Learning, Learning Management System (LMS), Learning Styles, Open Source, Predicting, Student Modeling, Testing, Tutorship, Validation

1. INTRODUCTION

Nowadays, due to the lack of face-to-face contact, e-learning instructors are facing troubles knowing who students are, how they behave in the virtual courses, what issues they find, what probability they have of passing the subject. Instructors and students need to have feedback which helps them to improve the learning process.

The road to follow in order to build an effective “future classroom” can not overlook two main aspects:

- Learning analytics;
- Personalized learning environments.
In this area of expertise, a “data mining approach” could be useful in order to assess the student behavior in the course, better understanding his way of learning, his starting skills and select the most suitable learning path to achieve his learning goal.

Designing appropriate tools for teaching and learning is a feasible approach to reduce the barriers that teachers might face when adopting technology in their teaching (Marx, Blumenfeld, Krajcik, & Soloway, 1998; Putnam & Borko, 2000). The research team strongly believes that data mining techniques can be used, as analytical tools, to extract meaningful knowledge from a large data set of an LMS (Learning Management System).

Even if the learning path is well-thought and designed (manually or automatically), it may not suitably adapted to any students’ learning styles or, also, is empirically demonstrated that students requires extra-motivation to pass the final exam (Zorrilla, García, & Álvarez, 2010; Douglas, 2008; Graf, Kinshuk, & Liu, 2008).

It is a fact that modern LMS have some built-in monitoring tool to track student activities in the course (n° of access, time spent in each learning object, grades achieved, message read/written, forums activities, etc.). Those data, associated with huge amount of data-logs and webservers log files, represent an hidden very valuable asset to discover the student behavior in the course.

The analysis of student behavior, could be useful for effectiveness of course-design, to predict students’ performance and their final mark, to group the students according to preferred learning styles, and, in general, to improve the learning experience (Krichen, 2007).

Recently, there has been much debate about the use and benefits of Virtual Learning Environments (VLE). VLE fail to actively support users and help them to learn in an appropriate “way” in which they could identify the right and useful knowledge or skill gaps and address them dynamically. A number of approaches to tutoring systems have been developed in the past with various levels of success, but not a great deal of work has been done to generate “dynamic” learning environments that adapt to the specific learning needs of the users and are able to actively promote and improve learning scores towards identified outcomes.

Different learners may have different characteristics, prior knowledge, starting skills, motivation or needs. This diversity commonly requires the management of different information to different learners in a different format. Taking this in count, it is strategic to develop adaptive educational systems which consider the various characteristics of each student when presenting information and/or practice opportunities in order to make the learning process as effective, efficient, and motivating as possible.

Educational requirements for adaptive systems can be identified (De Crook, 2002) as following:

- Information should adapt to what a learner already knows (prior knowledge) or can do (prior skill);
- Information should adapt to a learners’ learning capabilities;
- Information should adapt to a learners’ learning preferences or style;
- Information should adapt to a learners’ performance level and skills (i.e. system should provide feedback);
- Information should adapt to a learners’ interests;
- Information should adapt to a learners’ personal circumstances (location, time, etc.);
- Information should adapt to a learners’ motivation.

The research path explained in this paper is about defining the right processes in the application of Data Mining methods to Decision Support Systems, with the goal to best aid instructors in course designing and tutorships. DM and DSS are typically orientated to define and measure the KPI (Key Performance Indicators), understand their behavior and process, summarize, report and distribute the relevant information on time in business environment but, in this case, it perfectly fit the goals in the educational environment.
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