iMoodle: An Intelligent Moodle Based on Learning Analytics

Ahmed Tlili[1(✉)], Fathi Essalmi[1], Mohamed Jemni[1], Maiga Chang[2], and Kinshuk[3]

[1] Research Laboratory of Technologies of Information and Communication & Electrical Engineering (LaTICE), Tunis Higher School of Engineering (ENSIT), University of Tunis, Tunis, Tunisia
ahmed.tlili23@yahoo.com, fathi.essalmi@isg.rnu.tn, mohamed.jemni@fst.rnu.tn

[2] School of Computing and Information Systems, Athabasca University, Athabasca, Canada
maiga.chang@gmail.com

[3] University of North Texas, 3940 N. Elm Street, G 150, Denton, TX 76207, USA
kinshuk@ieee.org

Abstract. Online learning is gaining an increasing attention by researchers and educators, since it makes students learn without being limited in time or space like traditional classrooms. However, this type of learning faces several challenges include the difficulties for teachers to control the learning process and keep track of their students' learning progress. Therefore, this paper presents an ongoing project which is an intelligent Moodle (iMoodle) that uses learning analytics to provide dashboard for teachers to control the learning process and make decisions. It also aims to increase the students' success rate with an early warning system for identifying at-risk students as well as providing real time interventions of supportive learning content as notifications.

Keywords: Learning analytics · Moodle · Online learning
Intelligent tutoring systems · At-risk students

1 Introduction

Distance educational systems have gained an increasing use within institutions in the 21st century since they offer e-learning options to students and improve the quality of traditional courses in classrooms. These e-learning systems, such as Modular Object-Oriented Dynamic Learning Environment (Moodle), provide students different types of activities, such as preparation of assignments and engagement in discussions using chats and forums. Moodle is one of the most well-known open-source e-learning systems which allows the development of interactive online courses [1].

However, the distributed nature of distance learning has raised new challenges. For instance, unlike classrooms, it becomes much harder for teachers in distance learning to supervise, control and adjust the learning process [2]. In massive open online courses,

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where thousands of students are learning, it is very difficult for a teacher to consider individual capabilities and preferences. In addition, the assessment of course outcomes in Learning Management Systems (LMSs) is a challenging and demanding task for both accreditation and faculty [1]. Anohina [3] stated that it is necessary to provide a system intelligent and adaptive abilities so it could effectively take the teacher role. Researchers suggested using Learning Analytics (LA) to present important information about students online for teachers [2].

LA is often integrated into online learning environments, including Moodle, through the use of plugins. However, plugins usually require a considerable effort, most often involving programming, to adapt or deploy them [2]. This can limit their use by teachers. In addition, to the best of our knowledge, no plugin is reported online which provides real-time interventions for students for a better learning process. Therefore, this paper presents, in the next section, iMoodle – an intelligent Moodle based on a newly developed online LA system named Supervise Me in Moodle (SMiM), which: (1) provides dashboards for teachers to easily help them supervise their students online; (2) predicts at-risk students who may fail to pass their final exams; and, (3) provides real time interventions, as notifications, by providing supportive learning content for students while learning.

2 Framework for Intelligent Moodle (IMoodle)

Figure 1 presents the framework of the implemented iMoodle. During the learning process, the students' traces are collected in an online database and automatically analyzed in order to extract knowledge and provide real time interventions. A learning analytic system SMiM is developed using web technologies and integrated into Moodle as a Moodle block where teachers can easily access it and keep track of their students in each enrolled course. SMiM has three layers as follows:

(1) Privacy layer keeps students' traces safe with the login and password authentication method. In this context, to access the reports and information provided by SMiM, the teacher should have his/her session already active on iMoodle (i.e., the teacher has already entered his/her credentials to access iMoodle and chosen his/her courses). If not, the teacher will be redirected to the authentication interface.
(2) Analysis layer uses both data mining and visualization techniques to extract useful information for teachers. SMiM uses association rules mining based on Apriori algorithm, to identify early in the semester at-risk students within iMoodle who would likely fail their final exams of a particular course, hence increase academic success by providing early support.
(3) Reporting layer provides reports and real time interventions for the identified at-risk students while learning. SMiM provides dashboards for teachers to aid them control the learning process online and keep track of their students. In addition, if students failed to correctly finish a particular learning activity, iMoodle provides real time interventions, as notifications, by providing additional learning content support for students to further enhance their knowledge.

Furthermore, through the use of predictive modeling techniques, it is possible to forecast students' success in a course and identify those that are at-risk. Therefore, iMoodle, based on SMiM system, uses a predictive model (discussed in the analysis layer) as an early warning system for identifying at-risk students in a course and inform the teacher.

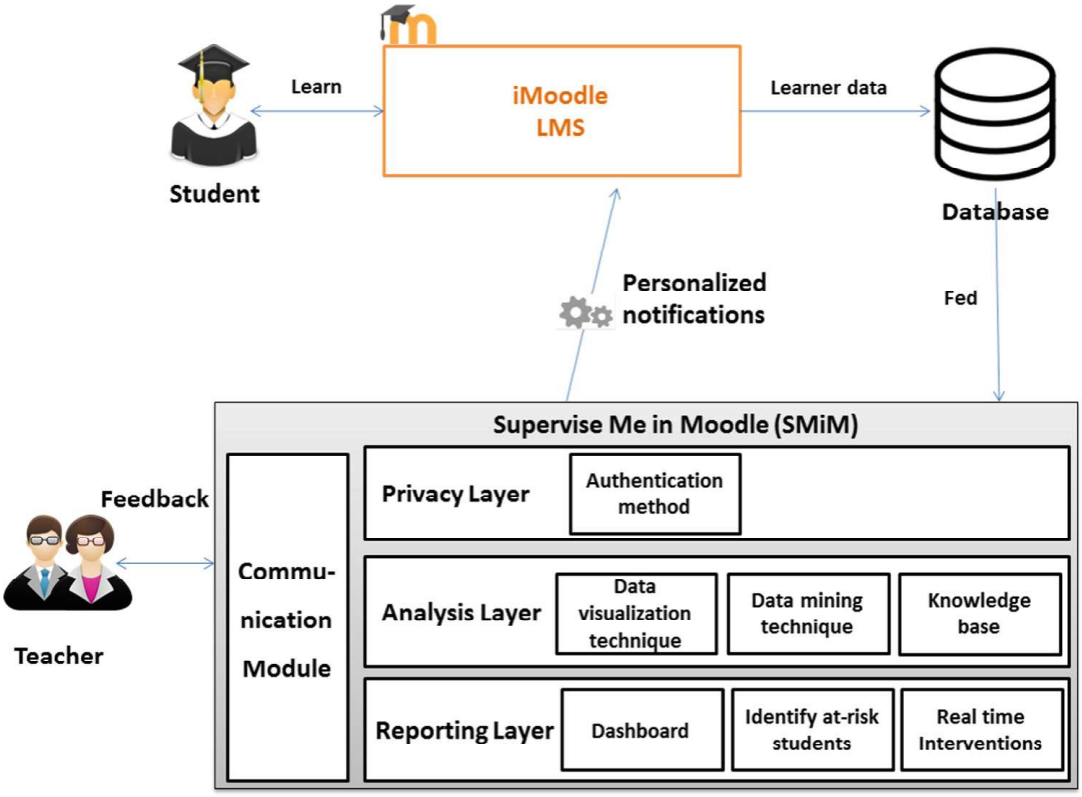


Fig. 1. The developed iMoodle Framework.

3 Conclusion

This paper presented a new intelligent version of Moodle (iMoodle) which aims to help teachers control the learning process online and keep track of their students. Future work could focus investigating the efficiency of iMoodle using the intervention layer in reducing the number of at-risk students and increasing academic success, in comparison with a classic Moodle.

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