Chapter 16
A Conceptual Educational Data Mining Model for Supporting Self–Regulated Learning in Online Learning Environments

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ABSTRACT

Self-regulated learning is attracting tremendous researches from various communities such as information communication technology. Recent studies have greatly contributed to the domain knowledge that the use self-regulatory skills enhance academic performance. Despite these developments in SRL, our understanding on the tools and instruments to measure SRL in online learning environments is limited as the use of traditional tools developed for face-to-face classroom settings are still used to measure SRL on e-learning systems. Modern learning management systems (LMS) allow storage of datasets on student activities. Subsequently, it is now possible to use Educational Data Mining to extract learner patterns which can be used to support SRL. This chapter discusses the current tools for measuring and promoting SRL on e-learning platforms and a conceptual model grounded on educational data mining for implementation as a solution to promoting SRL strategies.

INTRODUCTION

With increased adoption of online learning environments by most institutions of higher learning to offer online courses, investigating how students' behavior in online courses is increasingly becoming important. Online learning environments lack the face-to-face instructor interactions that students in the traditional classroom setups where attendance, engagement, motivation and performance for students are monitored by lecturers. Monitoring the levels of engagement for online learners therefore is only possible through making inferences from the use of log data using machine learning algorithms. The analyses can then be used by instructors and educators to make policies that will enable early interventions for online learners whose degree of engagement is often lower compared to that of traditional classroom setup (Hussain, Zhu, Zhang, & Abidi, 2018). Educational Data Mining and Learning Analytics fields have become extremely valuable for decision makers in institutions of learning. Educational Data Mining and learning analytics provide opportunities of exploring complex datasets offers the potential to explore huge datasets stored in various educational environments such as Learning Management Systems (LMS), Web Based Training System (WBT-System) and Massive Open Online Courses (MOOC) system with the intention of detecting patterns and insights that can used by decision makers in understanding learners and learning environment where learning and teaching occurs. EDM techniques can be applied on datasets from educational environments to determine online learning behavior of students. These computer based learning environments provide virtual platforms where learners interact with content through online learning systems.

Most institutions of higher learning are adopting e-learning for online courses or a support for the face-to-face sessions in blended learning approach so as to curb the challenge of large backlog of students to be admitted (Hadullo, Oboko, & Omwenga, 2018; Luna, Castro, & Romero, 2017; Vovides, Sanchez-Alonso, Mitropoulou, & Nickmans, 2007). As a result there is increased number of students undertaking e-learning courses, (Bogarín, Cerezo, & Romero, 2018; Broadbent & Poon, 2015; Hashemyolia et al., 2014).

Despite the benefits to e-learning, existing literature indicates challenges that need to be addressed. First, offering adequate support and guidance to learners undertaking online learning (Kizilcec, Pérez-Sanagustín, & Maldonado, 2017; Terras & Ramsay, 2015). Offering individualized support and guidance may not easily be achieved because of large number of students enrolling on e-learning (Cristóbal Romero & Ventura, 2017). To provide adequate support and guidance to e-learners we need to leverage on automated tools developed through Educational Data Mining (EDM) to replace inadequate and ineffective human intervention (Romero & Ventura, 2017). Secondly, compared to classroom teaching where learners are confined in a classroom together with lecturers at certain periods; online learners are not restricted in managing their own schedules and learning process - what time to study and how long to engage in learning. The success of e-learning depends on the learner's ability to take control of their own learning process (Nikolaki, Koutsouba, Lykesas, Venetsanou, & Savidou, 2017). The theory through which learners take control of the learning process is referred to as "Self-Regulated Learning (SRL)". Self-Regulated learners are those who have the ability to take charge in managing their own learning and assume an active role in achieving their academic goals (Zimmerman, 1990). With no restrictions on time to go online and learn and the existing freedom requires having students who can control their learning process. When learners are left on their own, individually or collectively, they don't naturally regulate and therefore they need interventions/scaffolds to stimulate them to regulate (Järvelä & Hadwin, 2013). Since e-learning environments place the learner as the controller of learning process (Johnson &

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