Learning Analytics

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INTRODUCTION

Reinforcement of the technology-enhanced education transformed education and training into a data-intensive domain. The software systems implemented in the education institutions(e.g. student information systems, library systems, university timetabling systems, attendance monitoring systems, lecture capture/media streaming systems, ePortfolios, assessment systems, curriculum maps, personal tutor system, student engagement system, social learning platforms etc.) made available large amounts of data related to the learning/teaching processes, etc. Educational data reflects not only the students' background, but also the students' performance. Each action carried out by students in different educational activities is stored and can be analyzed. The amount of data stored in different systems is impressive, for this reason the big data related technologies (Hadoop, Cloud etc.) are increasingly present in the IT infrastructure of education institutions.

As in many other data-intensive domains, the interest for data analysis through various business intelligence solutions is growing in the education domain. Improvement of educational activities by continuous analysis of collected data is a common practice in many educational institutions. More and more software tools are used for: modeling students' learning behavior (in order to understand how students are engaged into online activities and how their performance can be increased), identification and evaluation of students' performance factors (in order to predict performance/lack of performance), prediction of dropout and retention at very early stages, monitoring students' progress and comparing them to their peers, in order to increase professors' awareness during learning activities, personalizing the educational processes mainly by choosing specific learning content, or improving feedback and assessment services, in order to increase students' awareness about the progress and their contribution in learning activities. By applying different business analytics methods, all these applications were associated to a new emerging field of technology-enhanced education, named learning analytics.

Learning analytics (LA) contributes to the quality assurance and improvement in education institutions (Sclater, Peasgood, & Mullan, 2016). The students and teachers could improve their learning and teaching processes. Also, the administrators could use LA as diagnostic tool for identifying issues and for improving the modules and degree programmes design. LA can lead to the development of new quality metrics and standards in the education domain and to demonstrate the compliance of education institutions to them. Some of the main positive effects of LA are the boosting of retention rates (LA allows to identify

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students at risk and efficiently act with advices and support at very earlier stages) and the adoption of the adaptive learning, through the personalization of educational experiences. Students have the opportunity to take control over their own learning, having the possibility to monitor their current performance in real-time and help them to make informed choices about what to study. LA survey results (Newland, Martin, & Ringan, 2015; Sclater et al., 2016) show a clear adherence of stakeholders to LA adoption initiatives.

Although there is a growing interest for LA, the progress in the implementation of LA applications is still inconclusive, mainly due to the reduced maturity of technology-enhanced education and the lack of specific LA expertise. According to the HeLF survey (Newland et al., 2015), nearly half of UK higher education institutions have not yet implemented LA and about a third are working for LA implementation. The most common applications are the students' retention and the learning process enhancement. Responsibility for LA implementation is undertaken by different departments (Quality, Planning, Registry, IT Services, eLearning, Academic Development, Learning Services, Academic etc.). Three quarters of senior management have limited levels of understanding of the possible LA benefits and outcomes.

Another study undertook in the Danube Region of Europe (Bodea et al., 2016; Dascalu, Bodea, Stancu & Purnus, 2016) reveals that only 55.9% of the professors use a learning management system (LMS) in class, especially for content sharing and communication via forums and chats and social networks for keeping the connection with their students. Most of them (81.3%) consider the development of a social learning platform with LA functionalities as very relevant initiative for Danube Region. Regarding the students, most of those who participated to the survey use LMS in classes (75.2%), in order to share content (82.5%), to be assessed (48.5%) and collaborate (40.2%). Most students consider forums, webinars and chats to foster online collaboration. The majority of students (88%) consider the development of a social learning platform to be relevant or very relevant for the Danube Region and more than half (58.6%) see advanced learning analytics as a mandatory feature of such a platform.

The article starts by defining LA, with relevant views on the literature. A discussion about the relationships between LA, educational data mining and academic analytics is included in the background section of the article. In the main section of the article, the learning analytics, as an emerging trend in the educational systems is described, by discussing the main issues, controversies, problems on this topic. The final part of the article presents the future research directions and the conclusion.

BACKGROUND

There are various definitions of Learning Analytics (van Harmelen & Workman, 2012; Siemens, 2010; Cooper, 2012; Ferguson et al., 2015). According to the definition proposed by the Society for Learning Analytics Research (SoLAR), LA involves "measurement, collection, analysis and reporting of data about students and learning contexts in order to understand and optimize learning and the environments in which it takes place" (van Harmelen et al., 2012). LA means "intelligent use of data produced by students and analysis of existing patterns in the data, finding information and social connections to predict and advice on learning paths" (Siemens, 2010). At the same time, the cultural values of contemporary society have changed: according to Harvard Business Review, the online learning environments are seen as the great educational revolution (Tamny, 2013). LA aims to explain the impact of cultural changes on the learning process and to optimize it accordingly. LA is, therefore, more than metrics; it is a process (Bischel, 2012). LA represents the usage of analytic techniques on educational data,

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