Chapter 11

Role of Learning Analytics in Enhancing Teaching and Learning

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ABSTRACT

Data analytics, tools and techniques are no more confined to research organizations. These tools are being adopted by many organizations to generate business intelligence for improving decision making. Higher education institutions (HEIs) are beginning to use data analytics for improving their services and for increasing student grades and retention. Educational learning analytics are used to research and build models in several areas that can influence online learning systems. While use of analytics and data mining in education is increasing, sorting out fact from fiction and identifying research possibilities and practical applications are not easy. This chapter intends to help policymakers and administrators of HEIs understand how learning analytics have been used and can be applied for educational improvements.

INTRODUCTION

Increasing use of online learning offers opportunities to integrate assessment and learning. With this integration, information needed to improve future instruction can be gathered in real time. With online learning, students get multiple opportunities to exploit the power of technology for assessment. The same technology can be used to support learning activities and for assessment. An online system can collect much more and detailed information about how students learn. The system can capture students input and collect evidence of their problem-solving sequences, knowledge, and strategy use. This input can be in the form of inputs selected by student, the number of attempts made by the student, the number of hints and feedback given, and the time spent across various parts of the problem solved. Besides students, this detailed learning data also has potential value for the broad education community. With increasing number of activities occurring over the web, the amount of data online activities generate is increasing exponentially. Commercial companies have pioneered in developing techniques for harvest-
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In a broader sense, analytics programs evaluate large data sets to provide decision makers with information that can help determine the best course of action for an organization. Learning analytics (LA) uses similar approach but with specific goal of improving learning outcomes. This improvement could be measured by student grades, retention, or completion. LA collects and analyzes various connected pieces of digital information that students leave as they interact with various information systems. The purpose of this analysis is to find any correlations between student activities and learning outcomes. To do so, LA compares a student’s activity with their peers in the class to create a model for how each student is likely to behave. In this way, by analyzing the vast quantities of data that mot HEIs already collect, LA attempts to find patterns that can be used to improve learning. The most common use of learning analytics is to identify academically weak students. And to enable targeted interventions to help them achieve better outcomes. LA tools can also be used to identify specific units of study in a course that course students’ difficulty generally and to modify learning activities to improve learning of all students (U.S. Department of Education, 2012).

The objective of this chapter is to explore data analytics in the commercial world and how data analytics techniques are being applied in education. The chapter will examine the challenges being encountered and the potential of such efforts for improving student outcomes and the productivity of higher education systems. This contribution will be helpful for education policymakers and administrators to understand how analytics work and how they can be applied within online learning systems to support education-related decision making.

LEARNING ANALYTICS: CONCEPT, TOOLS, AND TECHNIQUES

Companies historically have used data for decision making. Business intelligence (BI). BI techniques can help discover historical patterns and trends from data and can create models that that predict future trends and patterns. In broad sense, analytics comprises applied techniques from computer science, mathematics, and statistics for extracting usable information from very large datasets.

Organizations now face data from multiple sources with unstructured text and image data. New techniques are needed to work on this vast amount of data (also called big data). Big data is defined relative to current or typical capabilities of technology. For example, Manyika et al. (2011) defines big data as “Datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze.” Big data captured from users’ online behaviors can provide important insights about the users’ knowledge, intentions, and interests and to create models for predicting future behaviors and interests (U.S. Department of Education, 2012).

Educational Data Mining (EDM) and Learning Analytics (LA)

Specifically, big data have two applications in the education i.e. educational data mining and learning analytics. These two fields have had different research histories and are developing as distinct research