

# Chapter 15

## Learning Analytics in Higher Education

**Rushil Raghavjee**

*University of KwaZulu-Natal, South Africa*

**Prabhakar Rontala Subramaniam**

*University of KwaZulu-Natal, South Africa*

**Irene Govender**

*University of KwaZulu-Natal, South Africa*

### ABSTRACT

*It is known that big data has penetrated several if not all spheres of life. In higher education, the ability to take these large amounts of data and process it into something meaningful for academic decision making is commonly referred to as learning analytics. This chapter provides an overview of learning analytics and its importance, as well as identifying academic data sources, techniques used for learning analytics and prediction, and data visualisation techniques used to present analysis for better understanding and eventual decision making. It also includes a discussion of learning analytics frameworks for research and some identified research challenges.*

### INTRODUCTION

According to the South African Council on Higher Education, one of the key objectives of higher education institutions in South Africa is to produce quality students with good knowledge of a particular subject to enable them to perform competently in the working world (CHE, 2013). Over the past two decades, it has become increasingly

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important to accomplish this objective with the use of technology. The availability and advancement in mobile technologies, digital storage, and data processing allow students to easily capture, record, view and interact with course content from any location (Gikas & Grant, 2013; Lai & Hong, 2015). Over the past decade, students are opting for digital textbooks (Lewin, 2009; Rockinson-Szapkiw, Courduff, Carter, & Bennett, 2013) while communication with peers and teachers are done through social media applications, communication applications, and learning management systems (Morreale, Staley, Stavrositu, & Krakowiak, 2015).

While technology and social media networks are effective tools to use in higher education, some research has found that learning can be adversely affected when students use this technology for social and entertainment purposes rather than what it was meant for (Douglas, Angel, & Bethany, 2012; McCoy, 2016). Studies by Linden (2008) and McCoy (2016) have shown that the use of technology does not necessarily lead to significant improvement in student performance. From an academic perspective, technology implementation can result in not only an increase in administrative overhead but also multiple teaching approaches to consider (Gregory & Lodge, 2015).

There are several factors that contribute towards student performance including pre-requisite achievements, past academic performance (both in secondary schooling and tertiary institutions), competency in and use of tools and technologies, time spent on Learning Management Systems and other course resources (Avcı & Ergün, 2019; Geiser & Santelices, 2007; Nwosu, John, Izang, & Akorede, 2018). With the increased reliance on technology in the academic environment, an additional avenue has become available to monitor and regulate student progress in order to ensure the continuous improvement of student academic performance.

South Africa is facing a situation where there is a continuous increase in student intake at Universities while the available resources are stagnant (Badat, 2016; Benvenuti & Cohen, 2008). This lack of sufficient resources makes the ability to physically monitor student academic activities and performance difficult. One way of accomplishing the monitoring of student performance is through the analysis of data from several sources such as attendance registers, learning management system logs, student biographical data and students' previous test results, to name a few. However, the vast amount of data generated in isolation, which is kept mainly for record purposes, is not used optimally by the relevant decision makers (Daniel, 2015). The objective of learning analytics applications is to integrate these data sources, allowing for better analysis of the data, leading to better decision making for both teachers and students. Learning analytics, according to Siemens and Long (2011), is defined as the collection, analysis and reporting of student data (as well as its context) with the intention of understanding and improving the student's academic environment and the learning that occurs within said environment.

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