

Chapter 5

An Educational Data Mining Application by Using Multiple Intelligences

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ABSTRACT

The aim of this chapter is to illustrate both uses of data mining methods and the way of these methods can be applied in education by using students' multiple intelligences. Data mining is a data analysis methodology that has been successfully used in different areas including the educational domain. In this context, in this study, an application of EDM will be illustrated by using multiple intelligence and some other variables (e.g., learning styles and personality types). The decision tree model was implemented using students' learning styles, multiple intelligences, and personality types to identify gifted students. The sample size was 735 middle school students. The constructed decision tree model with 70% validity revealed that examination of mathematically gifted students using data mining techniques may be possible if specific characteristics are included.

INTRODUCTION

Data mining has been used in different areas such as Marketing, Banking, Insurance, Telecommunication, Health, Industry, Internet, Science and Engineering, and provided significant improvements in these areas. Recently, one of these areas is the educational environment. Educational data mining (EDM) literature has shown that it can represent new and significant contributions to educational research. Recently, various

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data mining methods have been implemented to different educational environment such as traditional, e-learning, computer-based learning etc. In this context, this study aimed to illustrate both uses of data mining methods and to present a study that implemented data mining methods in traditional education. By using data mining techniques, Aksoy, Narli, and Aksoy (2018) aimed to examine mathematically gifted students in terms of their learning styles, multiple intelligences, personality types, genders and grade levels in order to help teachers and educators to determine potential gifted students. Educational data mining literature and a short review of the characteristics included in the study will be described in next sections.

THEORETICAL BACKGROUND

Educational Data Mining

Data mining can be defined as: applications of different algorithms, to identify patterns and relationships in a data set. It is similar to mining to obtain ore from the sand. That is, it can be considered that sand is data and ore is knowledge. Although it should be defined as knowledge mining, it is defined as ‘data mining’ to emphasize large amounts of data. “Data mining is an inductive, analytic, and exploratory approach, which is concerned with knowledge discovery through identification of patterns within large sets of data” (Angeli, Howard, Ma, Yang, & Kirschner, 2017, p. 226).

Data mining performs two functions: one is to identify regularities among data records (e.g., concept cluster, concept comparison, and discrimination), another to find relations among variables in the data that will predict unknown or future values of the variables. Unlike descriptive and inferential statistical analyses that rely on means and standard deviations, data mining uses both logical and mathematical (deterministic, and parametric and nonparametric statistical) reasoning to analyze data records (Liu & Ruiz, 2008).

As a result of the application of data mining techniques to educational data, the educational data mining (EDM) field has emerged. EDM is defined as “an emerging discipline, concerned with developing methods for exploring the unique types of data that come from educational settings, and using those methods to better understand students, and the settings in which they learn” by the International Educational Data Mining Society (2011, p. 601).

Data mining has attracted a great deal of attention in the information industry in recent years, due to the wide availability of huge amounts of data and the imminent need for turning such data into useful information and knowledge (Han & Kamber, 2006). The education sector also has huge amounts of data and needs such techniques. Therefore, many educators and scholars have begun to pay more attention to applying data mining techniques to educational data. Romero and Ventura (2007) summarized the role of data mining in the education sector as: “The application of knowledge extraction techniques to educational systems in order to improve learning can be viewed as a formative evaluation technique. Formative evaluation is the evaluation of an educational program while it is still in development, and for the purpose of continually improving the program. Data mining techniques can discover useful information that can be used in formative evaluation to assist educators establish a pedagogical basis for decisions when designing or modifying an environment or teaching approach.”

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