Clustering Students for Group-Based Learning in Foreign Language Learning

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ABSTRACT

Big data make it possible to mine learning information for insights regarding student performance in foreign language learning (FLL). Group-based learning is a usual method to improve FLL, whose effectiveness is greatly influenced by student groups. The general grouping method is to divide students into groups by their teacher manually, which is not timely or accurate. To overcome the shortcomings of manual methods, this paper proposes an automatic grouping method based on clustering technologies. First, the student profile is built to model the student’s knowledge level, which can be updated based on the results of examinations automatically. Then, to meet the different teaching goals, two student clustering methods are proposed: similarity student clustering and complementation student clustering. At last, the proposed methods are evaluated by comparing the students of clustered groups with those of the manual groups in the learning effectiveness. The experimental results show that the proposed methods are flexible, comprehensive, and timely compared with manual group methods.

Keywords: Big Data, Group-Based Learning, Knowledge Network, Student Clustering, Student Grouping, Student Profile

1. INTRODUCTION

Big data make it possible to mine learning information for insights regarding student performance and learning approaches (Manyika, 2011; West, 2012; Hidalgo-Herrero, 2009; Wang, 2014). By focusing on big data analytics, teachers can study learning in far more nuanced ways (Castro, 2007), which is also helpful to Foreign Language Learning (FLL).

According to human cognition process (Wang, 2007a; Wang 2007b), human cooperation can improve the efficiency of learning (Wang, 2007c). Therefore, more and more organizational
learning methods are applied to Foreign Language Learning (FLL), such as team-based Learning (Michaelsen, 2011; Parmelee, 2012), group-based learning (De Jong, 2011), cooperative learning (Smith, 1996; Slavin, 2011), active learning (Johnson, 1991), and so on, all of which have contributed to the improvement of FLL (Li, 2014).

In these methods, how to group the students is an important issue that greatly influences the effectiveness of teaching and learning. Only when students are divided into appropriate groups, can they cooperate and help each other in the learning process. On the contrary, the inappropriate group will reduce the expected effectiveness of these methods.

The general grouping method is employed to divide students into groups by the teacher manually. Sometimes the teacher is even arbitrary in grouping, which will lead to the following shortcomings:

1. **Not Accurate**: The teacher hardly understands each student entirely, which may lead to the inappropriate groups;
2. **Not Timely**: The knowledge of a student changes with the learning progress, and the teacher may not catch the change or adjust the group timely.

To overcome the above shortcomings of manual grouping method, this paper proposes an automatic grouping method based on clustering technologies. First, the student profile is built to model the student’s knowledge level, which can be updated based on the results of examinations automatically. Then, to meet the different teaching goals, two student clustering methods are proposed: similarity student clustering and complementation student clustering. At last the proposed methods are evaluated by comparing students of clustered groups with those of the manual groups in the learning effectiveness.

The contributions of this paper include:

1. Propose two clustering-based student grouping methods which automatically group students for all kinds of organizational learning, which are flexible, comprehensive, and timely compared with manual group methods;
2. Propose a student profile to model his knowledge level for student clustering, which can be generated automatically based on examinations and improve the real-time of grouping method.

The rest of this paper is organized as follows: Related work is discussed in Section 2. Section 3 proposes a student profile for student clustering. Section 4 proposes two different student clustering methods. In Section 5, experiments are carried out to verify the proposed method. At last, a conclusion is drawn in section 6.

**2. RELATED WORK**

**2.1. User profile**

A user profile, also called as user model, user interesting model, and so on, is the representation of information about a specific user, which is used to store the description of the characteristics of person. This information can be exploited by systems taking into account the persons’ charac-
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