

Chapter 55

An Automatic Group Formation Method to Promote Student Interaction in Distance Education Courses

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ABSTRACT

This article proposes an automatic group formation method applying the particle swarm optimization (PSO) algorithm to boost the quality of students' online interactions. The groups were heterogeneous regarding their levels of knowledge and their interests, and three different leadership roles were distributed among group members. A case study with 66 undergraduate students was performed. Discourse analysis was applied using two coding schemes to measure the critical thinking apparent in the students' online discussions and evaluate the socio-cognitive aspects of group interactions. The results provided evidence that groups of undergraduate students formed by the proposed method achieved better scores in most categories analyzed when compared to the randomly formed groups.

INTRODUCTION

Collaborative processes in online learning environments require appropriate computer-supported collaborative learning (CSCL) pedagogy and methods to structure and support groups to effectively build knowledge (Stahl, 2013). Many previous studies have documented the benefits of collaborative group,

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learning mainly in terms of motivation, engagement, and achievement (Arendale & Hane, 2014). In this work, under the auspices of CSCL, we propose a new approach to group formation to improve collaborative learning in distance education courses.

There is an impressive body of literature on methods of group formation in collaborative learning to improve the quality of student interaction. Over the last several decades, group learning has been successfully applied to various educational settings, including interactive, supportive technology for effectively supporting small group collaboration online (Bekele, 2006; Johnson, Johnson, & Holubec, 1986; Johnson, Johnson, & Stanne, 2001; Kumar & Rosé, 2011; Moreno, Ovalle, & Vicari, 2011; Webb, 1992; Yang, Sinha, Adamson, & Rose, 2013).

Many researchers have studied different methods of group formation to enhance knowledge building in educational environments. Depending on the type of group formation, group interactions facilitate the development of cognitive, creative, social, and motivational processes. Therefore, research efforts have been dedicated to identifying which characteristics are fostered by different types of group configuration.

The results of many studies have indicated that diversity among students can bring different perspectives, which boosts creativity (Amabile & Michael, 2016; Aragon & Williams, 2011; Kennedy, Coffrin, De Barba, & Corin, 2015; Nonaka, 2009). The effectiveness of any educational situation is dependent on the association of different student perspectives, experiences, and prior knowledge (Kennedy et al., 2015). For example, Webb (1992) stated that students with lower levels of knowledge in a subject can improve their performance when placed in heterogeneous groups; this is because these students receive more elaborate explanations on the subject from more knowledgeable colleagues. Similarly, those students with more knowledge also benefit, because when explaining the learning contents to other students, it helps them to reorganize their ideas and clarify information on different aspects of the topic. In this sense, learning groups should be heterogeneous with respect to the knowledge levels of their members.

The results of other studies have shown that shared student interests contribute to better motivation and engagement among learners (Lin, Huang, & Cheng, 2010; Pekrun & Linnenbrink-Garcia, 2012; Yang et al., 2013). Many tools in CSCL have been implemented to bring students with common interests together (Karamolegkos, Patrikakis, Doulamis, Vlacheas, & Ni-Kolakopoulos, 2009). In this context, learning groups should be homogeneous regarding student interests.

Another important attribute underpinning group formation in collaborative learning is role diversity and distribution. Harris, Jones, and Baba (2013) asserted that the effective allocation of roles among students is an important requirement for responsible and effective participation in groups. In this sense, another criterion, which should be used in the formation of groups, is distributed leadership.

Distributed leadership consists of the social distribution of leadership, where every leadership function is attributed to a different student (Harris et al., 2013). Leadership is developed and divided among the group participants, so that tasks are conducted through interaction and collective action.

The distributed leadership concept is compatible with group formation theory. According to Johnson et al. (1986), collaborative learning needs to be structured in such a way that group members know that their own success depends on the success of their group members, and vice versa. In other words, collaborative learning settings must be established with the aim of convincing students that their success depends on one another.

Forming leadership groups is a way to encourage students to take shared ownership of their collective learning process (Wenger & Trayner, 2017). Thus, incorporating distributed leadership within groups enhances students' pro-activeness, making them responsible for their own learning and that of others.

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