

Chapter 18

A Research of Applying Learning Diagnosis Diagram in Online Learning Diagnosis

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ABSTRACT

In Taiwan, when students learn in experiment-related courses, they are often grouped into several teams. The familiar method of grouping learning is “Cooperative Learning.” A well organized grouping strategy improves cooperative learning and increases the number of activities. This study proposes a novel pedagogical method by adopting the Learning Diagnosis Diagram to obtain students’ knowledge structure. According to each knowledge structure of student, this study proposes dynamic grouping to solve problems in the conventional once-and-for-all grouping strategy. The dynamic grouping method achieves the best complementary groups for further learning stages.

Two courses were applied to conduct the proposed Two-phase Cooperative Learning. Complementary grouping method and more interaction among team members are helpful for increasing the effect of learning. Evaluation results indicate that the proposed method significantly improves the learning achievement of all learners.

INTRODUCTION

In laboratory courses, the learning steps are often various and complicated. Students must design experimental processes, arrange experimental materials, record and analyze data in the learning

activities. Students often need partners to help them to finish their works. In Taiwan, when students learn in experiment-related courses, they are often grouped two or three students into one teams. They need to finish their assignments with their team members. Each team member shall manage to accomplish his own task. The familiar method of grouping learning is “Cooperative Learning.”

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Cooperative learning (Johnson & Johnson, 1989; Rysavy & Sales, 1990) differs markedly from conventional pedagogical approaches. In individual learning, students usually study the parts of interest from their own favorite teaching materials. In this case, the learning pace is up to the student himself/herself but irrelevant to other students.

In cooperative learning, group members achieve learning goals together through interdependence and mutual help. Cooperative learning can facilitate learners greatly. Some essential factors for cooperative learning activities are active, visible collaboration, sharing of the decision process when formulating group projects, highly structured work groups, and reciprocal commitment among students and teachers (Bagley & Hunter, 1992), and responsibility sharing, positive interdependence, individual accountability, interpersonal and small group skills, and group process (Johnson & Johnson, 1989).

Many factors of team members affect learning performance in cooperative learning activities, including, learning achievement (Tsai, Hwang, Tseng & Hwang, 2008), interpersonal relationships (Verderber & Verderber, 1995), cognitive style (Triantafillou, Pomportsis & Demetriadis, 2003), learning style (Dunn, Dunn & Price, 1985; Kolb, 1984), learning motivation, etc. Simultaneously analyzing the effect of every factor on the cooperative learning activities is extremely difficult. This study focuses on learning achievement and interpersonal relationship and uses the two factors to group student complementally.

Regarding achievements and abilities, one consideration for cooperative learning is complementary grouping. Webb (1982; 1984) researched learners with different abilities based on different groupings of high, medium, low abilities, and the group with a mixture of high, medium, and low abilities. The evaluation result demonstrates that mutual help in the mixing group benefits learners with high and low ability more than those with medium ability. Groupings with similar char-

acteristics, for example high or low capability, similar interests or performance, etc, often lead to unsatisfactory cooperative learning results. Therefore, the heterogeneous groups have better learning performance in the cooperative learning activities.

Previously, group division of cooperative learning was based on grade or the manner of study. If learners are left to divide into groups themselves, learners with similar characteristics well tend to group themselves together. However, such a division might lead to a situation in which students have similar areas of confirmed knowledge and thus are unable to help each other acquire new knowledge. Another important consideration when putting individuals together in heterogeneous groups is learner academic achievements, which are mainly evaluated according to their overall academic performance. Learners with different scores are grouped together. However, academic performance alone is inadequate for representing learner knowledge structure. These grouping processes can result in careless mistakes, since learners with the same scores do not necessarily have the same knowledge structure. Consequently, this study analyzes the status of the knowledge structure of each student, and proposes a novel grouping method that is supplemented by students' knowledge structure to achieve mutual compensation among students to enhance study effects.

The grouping of cooperative learning proposed by past research have usually only focused on how to group the learners effectively once-and-for-all (Asif, 2004; Bruce, Harden & Reese, 2004). Group members do not change after effectively grouping learners until the end of their studies. Grouping in this way neglects that the condition of the groups change as time goes by, such as the level of heterogeneity among the group members, and their difficulty in getting along with each other. "Dynamic Grouping" is a conventionally adopted algorithm applied in clusters and network fields (Chang & Chen, 2003; Hwang, Weng, Fang &

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