Team Learning: A Pilot Study

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Introduction

Teachers must put effort, creativity, and ingenuity into the science classroom and curriculum in order to ensure the material will remain fresh and interesting for the students and for themselves. In one case an organic chemistry teacher used a "Team Learning" method in order to keep the material stimulating for his students and to overcome some of the difficulties teachers face (Dinan & Frydrychowski, 1995). This experiment in new curriculum involved using teams over the course of a semester to teach the required material.

Dinan and Frydrychowski (1995) found that this method seemed to increase the effectiveness of learning and student interest in the subject. Other results showed students were arriving earlier for classes, and that students were missing fewer classes over all. While Dinan and Frydrychowski's (1995) study shows the team learning method to work well at the college level, there is no research to show if it would work well at the high school level. As a result the researcher chose to do a pilot study in this area to determine if the use of this method would have any positive effects at the high school level and if further research was warranted.

Literature Review

Science teaching methods have been traditionally rooted in behaviorism, where the "aim is to transmit knowledge experts [teachers] have acquired" (Spencer, 1999, p.567). According to Spencer (1999), these methods have been shown to be ineffective in developing the critical thinking and problem solving skills of students. Through the gathering of this knowledge has come the realization that students must be engaged as active learners (Spencer, 1999). As a result, educators have sought to implement active learning through a variety of methods with cooperative learning being one of the most widely utilized methods (Culatta, 1994).

According to Roger Johnson and David Johnson (1991a), there are five defining elements of cooperative learning: positive interdependence, face-to-face promotive interaction, individual and group accountability, interpersonal and small group skills, and group processing. Cooperative learning is defined by these aforementioned elements but is further defined by the different types of learning groups: informal, formal and base. Informal learning groups are designed to last for a few minutes or for an entire class (Marzano et al., 2000). These groups are the least structured and are very short-term (Johnson et al., 1991a). Formal learning groups are much more structured and intended to last for the duration of an assignment, which may last for several days or up to a few weeks (Johnson et al., 1991a). Finally, base learning groups are used for long-term assignments and are designed to last the duration of a semester or even an academic year (Marzano et al., 2000).

Small-group instruction has been shown to decrease dropout rates, retain non-traditional students, and reduce gender and racial bias (Dinan et al., 1995). When performance requires multiple skills, judgments, and experiences, teams outshine the performance of individuals acting alone and students are able to become more successful (Katzenback et al., 1994). However, when cooperative learning is overused, students may have insufficient time to practice the skills and processes they need to master (Marzano et al., 2000). Furthermore, Marzano et al. (2000) suggests that when cooperative groups are not well structured the method is being misused. Therefore, for the cooperative learning method to be most effective, it is key for the educator to neither overuse nor misuse the method.

As a result of these positive effects of cooperative learning, it is important to look at how teachers can practically implement the method in their classrooms. "Team learning" is one such manner in which formal and base groups can be utilized throughout a semester as a method of cooperative learning. Dinan et al. (1995) suggest using a team learning method in the teaching of chemistry. This method was initially implemented in an introductory level organic chemistry class (Dinan et al., 1995). Dinan et al. (1995) found that team members tended to motivate attendance and preparation, provided learning assistance for each other, and handled discipline problems. Dinan et al. (1995) also found the majority of students were arriving early for class, as early as five minutes, in order to have extra time with their groups. According to this study, 82% of the students who were in the class felt they learned more effectively than when they were in a straight lecture class (Dinan et al., 1995). While Dinan and Frydrychowski's (1995) research

shows the team learning method to be an effective cooperative learning method at the college level, there is no research showing whether this method would be effective at the high school level. Therefore, the purpose of this paper is to determine if this method is effective at the high school level and if further research is warranted in this area.

Methodology

In conducting this research, a high school Anatomy teacher (Teacher A) was consulted at a medium sized public high school in the Piedmont area of North Carolina. The demographic breakdown of this school from the 10th day membership in 2000-2001 reported 563 minority students and 1102 white students. Teacher A assisted in recruiting Teachers B & C who taught Environmental Science and Earth Science respectively at the same high school. Teachers were asked to select at least two classes in which they could implement the "team learning" method. Teacher A chose to work with two honors anatomy classes. Teacher B chose to work with four Environmental Science classes and Teacher C chose to work with two Earth Science classes.

In the classes chosen, objectives in the form of homework or reading were given to students the day before the methods were to be utilized in the classroom. When the students in the Team classes entered the classroom, they were given an individually taken content quiz. Then the students were given ten minutes to work in groups and take the exact same quiz as a group. During the group quiz time the teacher looked over the individual quizzes to find any inconsistencies in answers, and areas where students had difficulty understanding. The class then reviewed the quizzes together, and the teacher opened the floor for questions on the objectives, and supplied new information if necessary. A third quiz, different from the first two, was then given at the end of class as a posttest to see if any learning had taken place. The researcher also observed at least one class of each teacher.

When the control class entered the classroom they were given the same quiz the "team learning" classes received at the beginning of class. These students then received normal educational instruction from their teacher. At the end of class the teacher then gave the same quiz the "team learning" students received at the end of class as a posttest. The teachers also developed, distributed, administered and collected the quizzes. The collected quizzes were given, with a grading key, to the researcher to be graded.

Teachers A, B, and C were interviewed after they had completed their jobs in the study. Informed consent letters were given to a randomly selected group of students in all the classes

that were part of the research, by the teacher. The consent forms were required for the selected students to participate in interviews.

Discussion

The first question for this research was whether the team learning method would have any effect on achievement. This was answered by finding the statistical difference between the percent improvements from quiz one to quiz two. It was found that students who were exposed to the team learning method did not have a significantly greater improvement on quiz scores. This suggests that team learning does not increase improvement on quizzes or learning. Further analysis through Factorial ANOVA showed that class type and teacher have no significant effect on their own (class type significance= 0.058, teacher significance= 0.865); however, the interaction between teacher and class type resulted in a significant effect on student achievement (teacher*class type significance= 0.0005). This suggests that while the teacher and the class type alone do not have a significant effect on improvement, the interaction of teacher and class type do have an effect on improvement.

This was suggested through an Independent t-test analysis done on each teacher's classes. There was a significant difference between the two types of classes' mean percent improvement scores for each teacher. Teacher A had a significant difference of 0.036, with the mean percent improvement score for the control classes higher. In Teacher B's case there was a significant difference of 0.050 and for Teacher C it was a difference of 0.002 between their control and experimental classes. For both of these teachers the significant differences indicated that the mean percent improvement scores for the team learning classes were greater. These results suggest that team learning does increase improvement on quizzes and may also increase learning. This may suggest positive results from using team learning at the high school level.

The students' interview notes showed students preferred the team learning method to a normal control class. Many felt they learned more, or understood the material more clearly. Some felt it was less difficult because they had more minds to work with and thus were more likely to get the right answer and understand the concepts. A select few were worried about one person doing all the work, but the majority felt all would contribute in some way. The teachers' interview notes also showed a partiality for the team learning method. However, all teachers felt that it would not be a good method if it were utilized everyday. Furthermore, all teachers felt they would indeed use the method again in their classrooms.

There are possible sources for error within this research study. Each teacher has a different control teaching method and thus should not necessarily be compared or grouped together. Also when observing teachers in the classroom, the researcher noticed that some used very visual aspects to teach their control or normal class with overheads or the white board. Finally, as all teachers utilized the method on different days, and there were three different subjects, the same material was not covered on the quizzes. This may have some effect on the results and should be considered when doing another study.

In conclusion, this pilot study shows team learning could be a very effective method in the high school classroom. The somewhat positive results found in the percentage improvement scores and the preference shown for it by students and teachers is cause to continue further study and investigation. Students enjoy it, the teacher easily implements it, the percent improvement on quizzes for some teachers is significant, and the effects of working in cooperative groups are also known to be significant. Therefore, team learning may perhaps be a very effective and positive way to increase student scores and promote a greater amount of learning.

Bibliography

Culatta, E. (1994). New modes for making scientists. Science, (266)5186, 875-888.

Dinan, F.J. & Frydrychowski, V.A. (1995). A team learning method for organic chemistry. Journal of Chemical Education, (72)5, 429-431.

Johnson, D.W., & Johnson, R.T. (1991a). Learning together and alone: Cooperative, Competitive, and Indidvidualistic Learning (3rd ed). New Jersey: Prentice Hall.

Katzenback, J.R., & Smith, D.K. (1994). The Wisdom of Teams. New York: Harper Business.

Marzano, R.J., Gaddy, B.B., & Dean, C. (2000). What works in classroom instruction. Aurora, CO: McRel.

Slavin, R.E. (1989). Research on cooperative learning: Consensus and controversy. Educational Leadership, (47)4, 52-54.

Spencer, J.N. (1999). New directions in teaching chemistry: A philosophical and pedagogical basis. Journal of Chemical Education, (76)4, 566-569.