The Essential Elements of Cooperative Learning

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ALMOST 10 years ago, I worked in a school district with a science teacher who was using an instructional technique she called TGT. When the other teachers in the district found out that TGT stood for Teams Games and Tournaments, they wondered what in the world she was doing playing games with her science students. Some even questioned her sanity. We didn't know at the time that she had been the only science teacher in the district selected to undergo training in cooperative learning at Johns Hopkins University. For that matter, we didn't even know what cooperative learning was.

Now, a decade later, most teachers at least know what cooperative learning is. Many even use cooperative learning methods in their own classrooms. I have used it in teaching high school and college biology students for the last several years and have found these methods to be an excellent addition to more traditional instructional techniques. Cooperative learning has not revolutionized education and probably never will, but teachers are finding that it can be an effective classroom tool.

Cooperative learning has been defined as a classroom learning environment in which students work on academic tasks in small, heterogeneous groups (Parker 1985). There has been a great deal of research completed in the area of cooperative learning, and there can be little doubt about these techniques' effectiveness in improving academic achievement (Brophy 1986, Parker 1985, Slavin 1984). As the research evidence has mounted, cooperative learning proponents have developed a series of techniques that may be described as elements of cooperative learning. The elements to be addressed in this paper include:

1. Cooperative task structures
2. Cooperative incentive structures
3. Individual accountability
4. Heterogeneous grouping.

It is possible that each of these elements is necessary for maximizing achievement.

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Cooperative Task Structures

Cooperative task structures are situations in which two or more students are encouraged or required to work together toward completion of some task. Group members must coordinate their efforts to complete the task. According to Slavin (1983) and others, cooperative learning always includes a cooperative task structure. A concept closely related to the cooperative task structure is positive goal interdependence, which occurs when students perceive that they can only achieve their goals when the other members of their group achieve their individual goals (Lew, Mesch, Johnson & Johnson 1986). There are two possible cooperative task structures: task specialization and group study. In task specialization, each group member is given responsibility for a unique part of the activity (Slavin 1984). Methods that use task specialization include Jigsaw (Aronson, Blaney, Stephan, Sikes & Snapp 1978), Jigsaw II (Slavin 1986), Coop—Coop (Kagan 1985) and Group Investigation (Sharan & Hertz-Lazarowitz 1980). In group study, all members study together and do not have separate responsibilities (Slavin 1984). Methods that include group study are Student Teams—Achievement Divisions (Slavin 1978), Teams Games and Tournaments (DeVries & Slavin 1978) and Learning Together (Johnson & Johnson 1987). Although there is no strong evidence whether task specialization or group study is the superior technique (Slavin 1983), task specialization does give a certain responsibility to each group member, which helps insure that all participate. An advantage of group study is that all group members study and become equally familiar with the same information.

Cooperative Incentive Structures

Cooperative incentive structures provide some type of group reward based on group products or individual learning (Slavin 1983). The cooperative incentive structure is closely related to positive reward interdependence, in which all members of a group receive a reward only if all succeed (Johnson & Johnson 1987). Cooperative learning researchers seem to agree that some form of incentive structure is necessary for effective cooperative learning. Virtually

all current cooperative learning methods include this component. One exception is the original Jigsaw method, in which students are evaluated individually at the end of their group study. The exact method of establishing the cooperative incentive varies, with the two most popular variations being:

1. Group scores based on the individual scores of group members (Student Teams–Achievement Divisions, Teams Games and Tournaments, Jigsaw II)
2. Group scores based on a group project or other product (Learning Together, Coop–Coop, Group Investigation)

Individual Accountability

Individual accountability evaluates students by monitoring the learning of each individual. Major researchers seem to agree that individual accountability is necessary for true cooperative learning situations. According to Johnson and Johnson (1987), individual mastery of the learning material is the purpose of cooperative learning or any other instructional method, and every student's performance should be assessed. According to Slavin (1987), individual accountability is one of the elements necessary to make cooperative learning more effective than traditional approaches, and the success of a group should depend on the individual success of its members.

Heterogeneous Grouping

Heterogeneous grouping of students is another widely accepted element of cooperative learning and is often included as part of the definition. Cooperative learning groups are typically heterogeneous in ability and other characteristics, whereas traditional learning groups are typically homogeneous (Johnson & Johnson 1987). Heterogeneous grouping is used in virtually all the various methods of cooperative learning (Slavin 1981). Typically, the teacher begins by assigning students with high, low and average abilities to groups (Slavin 1981). Some researchers prefer a slightly different structure that includes only two levels of ability. This is due to a tendency for high ability students to help the lowest students in their groups, but not necessarily those in the middle (Webb 1985). Factors other than ability or achievement that may be included to increase heterogeneity include sex, racial or ethnic background, age, attitude toward subject matter and leadership ability. In spite of the nearly universal acceptance of heterogeneous grouping as an element of cooperative learning, there is little clear evidence of its effectiveness. One of the problems in assessing the effectiveness of heterogeneous grouping (and of cooperative learning in general) is that there are many effects other than achievement. These include improved relationships between different racial and ethnic groups and between handicapped and nonhandicapped students (Slavin 1983).

Discussion

Research evidence on the effectiveness of cooperative learning on academic achievement will continue to mount in the future. The importance of the individual elements should become clearer as more information is gathered. This, in turn, should lead to even more effective cooperative learning methods. There are specific areas of research open as well. It will be important to determine if cooperative learning might actually be deleterious to some students, including those who are gifted, of very low ability or extremely introverted. Some individuals may simply learn better on an individual or competitive basis. It will also be important to further refine the methods by which cooperative learning is evaluated. After all, one of the purposes of cooperative learning is to teach cooperation among students. Typical evaluation techniques, especially those for determining achievement, are individualized and competitive, and may be inappropriate for assessment of cooperative learning.

Cooperative Learning Methods

1. *The Jigsaw Approach* (Aronson, Blaney, Stephan, Sikes & Snapp 1978)—In this method, each student is given a topic on which to become an expert. These students meet with experts from other groups, then return to teach their teammates. After the material is studied, students are quizzed individually.
2. *Jigsaw II* (Slavin 1986)—This is an adaption of *The Jigsaw Approach* in which individual scores are combined at the end in some manner to yield a team score.
3. *Student Teams–Achievement Divisions* (*STAD*) (Slavin 1978)—In this approach, the teacher prepares a lesson and students study worksheets, quiz each other, then take individual tests. The results are combined into team scores by the teacher.
4. *Teams Games and Tournaments* (*TGT*) (DeVries & Slavin 1978)—This method is similar to STAD except there is a group competition (tournament) at the end of the unit for a team score.
5. *Learning Together* (Johnson & Johnson 1987)—Groups of students study a topic and produce a worksheet or test, which is the basis for evaluating the group. Students are also evaluated individually.
6. *Coop–Coop* (Kagan 1985)—Teams of students choose topics for study and then break them

into subtopics. Each individual is responsible for learning and teaching about a subtopic. The team then makes a presentation on the topic to the whole class.

7. *Group Investigation* (Sharan and Hertz-Lazarowitz 1980)—Groups of students choose general topics to study. Individuals or pairs of students then study subtopics, using approaches that they feel are appropriate. A class representation on the subject follows.

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NABT is seeking individuals who have "achieved distinction in teaching, research or service in the biological sciences" for recognition as Honorary Members. Those selected become lifetime members and receive notice in NABT publications and at the annual banquet held during the national convention. Nominations should be forwarded to Honorary Membership Committee Chair Ivo E. Lindauer, University of Northern Colorado, Greeley, CO 80639.

Nominations may be made by any NABT member and must include: A description of the candidate's qualifications, a detailed biographical summary and supporting letters from at least nine other NABT members. Consider the following criteria: Is the candidate well known by others in biology education; What impact has the candidate's work had on biology education in the past 10 years; What effect has the candidate and his/her work had on students and teachers?

Distinguished Service Award

NABT is looking for suggestions for recipients of our Distinguished Service Award, established to commemorate the 50th anniversary of NABT in 1988.

Nominees should be nationally recognized scientists who have made major contributions to biology education through their research, writing and teaching. In addition, consideration should be given to their abilities as cogent speakers who might participate in the national convention program (for example, the address during the annual banquet) at which they will be recognized.

The candidate will be selected by the Honorary Membership Committee no later than December 31 for presentation at the following year's national convention.

These nominations should be sent to Ivo E. Lindauer, University of Northern Colorado, Greeley, CO 80639.

The deadline for both nominations is June 1, 1992.