DOCUMENT RESUME

ED 266 960 SE 046 472

AUTHOR Johnson, Roger T.; Johnson, David W.
TITLE Encouraging Student/Student Interaction. Research Matters...To the Science Teacher.
INSTITUTION National Association for Research in Science Teaching.
PUB DATE 86
NOTE 3p.
PUB TYPE Information Analyses (070) -- Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cooperation; Elementary Secondary Education; Individualized Instruction; *Interaction; *Peer Relationship; *Science Education; *Science Instruction; *Teaching Methods
IDENTIFIERS *Science Education Research

ABSTRACT

Reports on over 600 research studies which compare learning in cooperative, competitive, and individualistic goal structures have been collected at the Cooperative Learning Center at the University of Minnesota. From these studies it has been concluded that having students work together is much more powerful than having students work alone, competitively, or individually. Some of the findings from these studies are presented and discussed. For example, students are motivated to learn material when they work together and also develop more positive attitudes while working together. These and other findings suggest that science teachers should structure much of their science class in small, heterogeneous, cooperative groups. (JN)

NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING

Research Matters...To the Science Teacher

ENCOURAGING STUDENT/STUDENT INTERACTION

Roger T. Johnson
David W. Johnson

How should students interact with one another in science class? This question has been neglected by those studying teaching. While science teachers are encouraged to plan carefully the interactions between students and material (specific curriculum, specific content) and there is growing concern about the teacher/student interaction, the peer culture of the classroom remains relatively unexplored. Perhaps because we tend to overestimate our own influence on learning as teachers, we have grossly underestimated the power of appropriate student/student interaction on a range of learning outcomes.

There are three basic ways that students can interact with each other. Students can compete with each other to see who are the best students in the class; students can work individually on their own toward an established criterion; or students can work together, cooperatively, taking responsibility for each other's learning as well as their own. Many students in the United States tend to see school as a competitive place where it is important that you do better than the other students. Over the last fifteen years, teachers have been encouraged to structure individualized learning in which students work alone at their own pace.

Reports on over 600 research studies, dating back to the late 1800's, which compare learning in cooperative, competitive and individualistic goal structures have been collected at the Cooperative Learning Center at the University of Minnesota. From these studies it has been concluded that having students work together cooperatively is much more powerful than having students work alone, competitively or individually (Johnson & Johnson, 1982; Johnson, Maruyama, Johnson, Nelson & Skon, 1981). Some of the findings include:

- More students learn more material when they work together, cooperatively, talking through the material with each other and making sure that all group members understand, than when students compete with one another or work alone, individualistically.
- More students are motivated to learn the material when they work together, cooperatively, than when students compete or work alone, individualistically (and the motivation tends to be more intrinsic).
- Students have more positive attitudes when they work together cooperatively than when they compete or work alone, individualistically. Students are more positive about the subject being studied, the teacher, themselves as learners in that class, and are more accepting of each other (male or female, handicapped or not, bright or struggling, or from different ethnic backgrounds) when they work together cooperatively.

The positive effects of cooperative learning in science go beyond the immediate gains in achievement, motivation, self-esteem and acceptance of differences. Students learning in a cooperative goal structure also develop skills in communication, leadership and conflict resolution that are basic to productive, working teams.

There is more to cooperative learning than a seating arrangement or sharing lab equipment (Johnson & Johnson, 1985). Cooperation requires a sense of positive interdependence and a "sink or swim together" perception, where one person's contributions are celebrated by all group members. A shared group goal and often a shared group reward (bonus points for group success) is essential to encourage cooperation. Individual accountability is also important in cooperative learning groups. All group members need to understand the material and be able to explain the group's answers.

It is clear that many students do not have basic skills in interacting with other people in a work group. These collaborative skills need to be taught (i.e., active listening, checking other group members for understanding, etc.) Current research on student/student interaction is focused more on internal dynamics of cooperative groups and less on comparisons with competitive and individualistic goal structures. A few findings from these studies are summarized here.

1. It appears that constructive argument is important to a cooperative group and enhances learning. The use of controversy, disagreement and discussion in groups is encouraged.
2. There is increasing evidence that students who "talk through" material with peers learn it in a more effective way than students who just read or listen to material.
3. A number of studies focus on the effects of positive interdependence on learning of groups. It appears that the stronger the "we sink or swim together" feeling in a group, the more likely the group will be successful and that all members will master the material.

4. A number of current studies indicate that sending students to the computer in small groups that "cannot touch the key until they all agree" is a more powerful way to learn at the computer than having each student working alone at his or her own computer.
5. It appears that **retention of information** is enhanced in the cooperative setting and that students who work in cooperative relationships are more likely to have a conscious strategy for how they got to the answer. It would appear that initial strategies for problem solving are often intuitive when seeking an answer and are invented when students try to explain to each other the rationale for their answers.

The implications for science teachers from this research area would be to structure much of the science class cooperatively with the teacher only teaching enough to get the groups operating and then monitoring and interacting with small (2 to 4 students) cooperative groups. It may be useful to encourage all the students to verbalize significant content in the groups and to encourage constructive argument. Teachers should "mix" the class members in heterogeneous groups (male/female, handicapped and nonhandicapped, different ethnic backgrounds, etc.), so that students get beyond their initial stereotypes and are able to treat each other as "other science students" and fellow group members. Such grouping should improve the attitudes toward science of student populations not presently positive about science.

We need to acknowledge the academic influence students have with each other, and enlist the help of students to set norms in schools so students will encourage each other to learn in science. In this way, the classroom will become a place where students care about each other's learning and are successful.

BIBLIOGRAPHY

Johnson, D. W., & Johnson, R. T. (1983). The socialization and achievement crisis: Are cooperative learning experiences the solution? In L. Bickman (Ed.), *Applied Social Psychology Annual.* 4. Beverly Hills, CA: Sage Publications.

Johnson, D. W., & Johnson, R. T. (1987). *Learning together and alone: Cooperative, competitive and individualistic learning.* Englewood Cliffs, NJ: Prentice Hall.

Johnson, D. W., Johnson, R. T., Holubec, E., & Roy, P. (1984). *Circles of learning.* Alexandria, VA: Association for Supervision and Curriculum Development.

Johnson, D. W., Maruyama, G., Johnson, R. T., Nelson, D., & Skon, L. (1981). Effects of cooperative, competitive, and individualistic goal structures on achievement: A meta-analysis. *Psychological Bulletin,* 89, 47-62.

Johnson, R. T., & Johnson, D. W. (1982). What research says about student-student interaction in science classrooms. In M. Rowe (Ed.), *Education in the 80's: Science.* Washington, DC: National Education Association.

The National Association For Research in Science Teaching is an organization that seeks to improve science teaching through research. For further information, contact the NARST Executive Secretary:

Dr. Glenn Markle
401 Teacher College
University of Cincinnatti
Cincinnatti, Ohio 45221

For further information about this research area, please contact Dr. Roger T. Johnson at:

University of Minnesota
202 Pattee Hall
Minneapolis, Minnesota 55455