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ABSTRACT

Cooperative learning generally refers to students working together to achieve academic objectives and the instructional procedures that structure the students' collaborative efforts. Jigsaw is a cooperative learning model that involves small gruops of 5-6 students teaching each other subject matter about which they have become "experts" with success dependent upon student cooperation. Previous studies have shown Jigsaw to be an ineffective cooperative technique. In this study, a variation of Jigsaw called Jigsaw II was used to see if the modified version would produce superior academic results when compared to a more conventional whole-class instructional process. Two ninth grade geography classes at a U.S. Department of Defense high school in Germany were the treatment groups. The two classes were assigned randomly to Jigsaw II (n=23) and to conventional, whole class (n=22) instructional treatments. Based on pretest and posttest results, the study concluded that superior academic achievement may be reached through proper employment of Jigsaw II. Two instructional conditions must be met for small group cooperative learning to be consistently effective. First, students in a learning group must work toward a group goal and reward that can be achieved only if they work together cooperatively. Second, students must be publicly accountable to their peers for their individual contributions to the achievement of the group's goal. A 19-item list of references is included, and two resources for teachers interested in cooperative learning techniques are suggested. (DB)

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COOPERATIVE LEARNING AND ACHIEVEMENT IN SOCIAL STUDIES: JIGSAW II

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Cooperative Learning and Achievement in Social Studies: Jigsaw II

Cooperative learning techniques usually demonstrate superior effects in terms of instructional outcomes important to social studies teachers. These outcomes are improved student motivation and time on task, attendance, attitude toward school, friendship between students of different social groups (e.g., race, gender, handicap status, nationality), helping relationships between students of different groups, and academic achievement (Slavin 1983). Academic achievement is the most critical instructional outcome for most secondary social studies teachers, and cooperative learning techniques usually have demonstrated relatively greater effectiveness than various whole class instructional procedures. These positive achievements have been observed for students over a wide range of ability. However, learners with histories of learning difficulties appear to benefit the most (Slavin 1981).

Defined generally, cooperative learning refers to students working together to achieve academic objectives and the instructional procedures which structure the students' mutual efforts. Newmann and Thompson (1987) reviewed research on cooperative learning in the secondary grades and compared the results for five different cooperative learning techniques: Student Teams/Achievement Divisions (Slavin 1986), Teams-Games-Tournament (Slavin 1986), Learning Together (Johnson and Johnson 1975), Group Investigation (Sharan and Sharan 1976), and Jigsaw

(Aronson 1978; Slavin 1986). Newmann and Thompson reported that 68% of the comparisons between the cooperative learning techniques and more conventional instruction showed superior achievement effects for the cooperative techniques. Student Teams/Achievement Divisions was the most successful (89%), followed by Teams-Games-Tournament (75%), Learning Together (73%), Group Investigation (67%), and Jigsaw (17%).

Jigsaw obviously was the least effective in the studies Newmann and Thompson reviewed. In most experiments, Jigsaw was no more effective in terms of academic achievement than more conventional instruction. Slavin (1989) reviewed a larger set of cooperative learning studies and concluded as did Newmann and Thompson that Jigsaw is the least effective academically of the well-known cooperative learning techniques. However, Jigsaw is often more effective than more conventional, non-cooperative instruction in producing desirable affective outcomes, such as helping relationships. Slavin (1983, 1989) has emphasized that cooperative learning techniques must meet certain conditions to be consistently effective academically: (a) a group goal that can be achieved only through cooperation and (b) individual accountability for students' contributions to the achievement of the group goal. Newmann and Thompson hypothesized that the Jigsaw treatments were relatively less effective because they did not meet these criteria.

As originally conceptualized and operationalized by Aronson (1978), Jigsaw requires students to work in small groups of 5 to

6 members. Each student in a group is given information to which no one else in the group has access, thus making each student an "expert" on his or her segment of the subject matter. However, all students in the group are expected to learn all the subject matter assigned to the members. After receiving their assignments, the students in the classroom reorganize into "expert" groups to study the subject matter and prepare to teach it to the members of their respective "home" groups. After preparation, they return to their "home" groups and take turns teaching each other what they have learned. After the small group instruction, students are tested over the subject matter and receive individual grades or other rewards. Students need to cooperate to be successful. However, Aronson's version of Jigsaw does not meet Slavin's requirements, because there is neither a group goal nor individual accountability for contributing to the achievement of a group goal.

Slavin (1986) developed a variation of Jigsaw which he called Jigsaw II. Like Aronson's Jigsaw, each student in Jigsaw II teaches his or her peers a particular part of the subject matter after preparing to teach it in an "expert" group. However, there are several differences between Jigsaw II and Jigsaw. All students in a group receive the same instructional materials containing the same content. After instruction, students are tested individually and team scores are produced using each student's test performance. A technique called "Equal Opportunity Scoring" is used to produce scores based on

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individual students' performances relative to their previous performances. Grades are not necessarily determined by this process. Public group recognition (e.g., certificate of achievement) is provided based on the group's total academic achievement. Slavin's variation of Jigsaw meets the group reward and individual accountability criteria.

The Newmann and Thompson (1987) and Slavin (1989) research reviews did not clarify how Jigsaw was operationalized in the studies reviewed. We analyzed the studies (Gonzalez 1981; Hertz-Lazarowitz, Sapir, and Sharan 1981; Lazarowitz, Baird, Hertz-Lazarowitz, and Jenkins 1985; Moskowitz, Malvin, Schaeffer, and Schaps 1983; Okebukola 1985; Rich, Amir, and Slavin 1986; Tomblin and Davis 1985), most of which were unpublished, plus another one (Palmer and Johnson 1989). In all the studies except Okebokula's, the Jigsaw treatment was similar to Aronson's original version of Jigsaw, thus not meeting the group reward and individual accountability criteria. Okebokula's study presented insufficient information to determine whether the criteria were met. In six of the studies, Jigsaw was no more effective in terms of academic achievement than the non-cooperative comparison treatments and in one study it was less effective (Tomblin and Davis 1985). In the study by Okebokula (1985), Jigsaw was more effective than the non-cooperative treatments but less effective than Teams-Games-Tournament and Student Teams/Achievement Divisions.

The available research does not assess the effectiveness of

Slavin's version of Jigsaw, Jigsaw II. Before concluding that Jigsaw is no more effective than other non-cooperative instructional procedures, more research is needed. This study tested the hypothesis that Jigsaw, modified along the lines Slavin recommended (i.e., Jigsaw II), would produce superior academic results when compared to a more conventional whole-class instructional process.

METHODOLOGY

Subjects

Two comparable, heterogeneously grouped, ninth grade World Regions geography classes at a United States Department of Defense Dependents High School in Germany were the treatment groups. The two classes were randomly assigned to Jigsaw II (n = 23) and conventional, whole class (n = 22) instructional treatments. Both classes were composed of students from a wide range of academic ability levels, including students enrolled in the school's learning disabilities program. The average age in each class was 14 years, eight months. There were approximately equal numbers of boys and girls in each class. The ethnic diversity of the classes (i.e., non-Hispanic Euro-Americans, African-Americans, Hispanic-Americans, Asian-Americans) mirrored the general school population.

The students at this Department of Defense Dependents High School differed from most of their stateside counterparts in that almost none who began their high school careers at this school would finish high school there. The students were dependent children of the United States military personnel stationed in the area. The overseas tour of duty for military personnel is generally three years. Often, as a result of transfers, students might stay as little as a few months. Because of this, the school's population is always in a state of flux. The socioeconomic status of students varied, generally along military pay and grade lines, ranging from senior non-commissioned officers to colonel.

Treatment

The experimental period was nine weeks and encompassed a complete, nine-chapter study of Asia (Swanson 1987). A typical chapter included the narrative description of its topic (e.g., "The Land and People of Southeast Asia"), as well as a social studies skills feature (e.g., "Reading a Weather Chart"). From the beginning of the experimental period the two groups proceeded through the three units (South Asia, East Asia, and Southeast Asia) at a rate of one chapter per week. Both classes used the same text, were provided the same enabling activities and materials (e.g., lectures, compass work, or map reading drill), and took the same tests that accompanied the textbook.

Jigsaw II. The experimental, cooperative groups were organized according to the Jigsaw II student team learning model (Slavin, 1986). Students were assigned to four-member teams balanced in terms of high, average, and low past achievement. The students were told that several times each week they would be meeting in cooperative groups. The groups might be their "home" teams or their "expert" groups, depending on what they were studying or discussing. Jigsaw II was selected rather than another cooperative learning technique, in part, because students play a major role in planning and implementing instruction with teacher guidance. In all other ways, class materials, subject matter, and enabling activities were identical to those given the comparison class.

A typical cycle of team activity for the cooperative groups through one textbook chapter was as follows. (1) Students were given their general assignment and expert topics. They then read the assigned material. (2) Students met in the "expert" groups and prepared to teach the content to their respective "home" team members. (3) Experts returned to their "home" teams and taught their topics to their teammates. (4) Students took the standardized chapter test individually and received two scores. The first score represented each student's individual test score for grading purposes, and the second was his or her contribution to the team score based on improved individual performance. (5) Team scores based on total improvement points were computed and posted. Strong team performances were then publicly recognized.

Improvement points were determined by using a system known as Equal Opportunity Scoring (Slavin 1986). EOS awards improvement points (ten points maximum) based on improvement differences between test scores and base scores. In this study, a student's initial base score was his or her last unit test score. The ten point limit worked well in this study, allowing sufficient latitude for steady improvement by low and average achievers. High achievers were also able to score maximum points because a perfect score earned ten points. The minimum number of improvement points that could be earned was zero. Base scores were adjusted weekly.

Comparison Group Treatment. The comparison class received instruction in a more traditional format: assigned readings, enabling activities, whole-class discussion, and tests. Although the same materials and enabling activities were used in both treatment conditions, time allocated to particular activities varied. For example, the Jigsaw II class spent less time in lecture and whole class discussion than the comparison class because of the time required to work in cooperative, small groups. With the exception of occasional unplanned cooperation during various class projects, the comparison group members were independent agents. Each was solely responsible for whatever classroom task he or she had been given. The information each received was teacher controlled.

Measures

Pretests. Students were assigned to the classes by the school administration. Assignment decisions were determined principally by students' programs of study and the need to balance class size. Since students could not be assigned randomly to the treatment groups, we administered three pretests to assess the extent to which the two classes were equivalent at the beginning of the experiment. First, students took a 135-

item, multiple-choice and matching pretest provided by the textbook's publisher over the upcoming nine-week study of Asia. A high internal consistency reliability coefficient of .92 was computed for the subject matter pretest. Second, the Henmon-Nelson Test of Mental Ability (Lamke and Nelson 1973) was given to measure any discernable difference in the mental abilities of the two classes. The Henmon-Nelson test was chosen because it has established validity and reliability, is easy to administer and score, and requires only 30 minutes to complete. Third, the 75-item, multiple-choice Competency-Based Geography Test, Secondary Level, Form I (National Council for Geographic Education 1983) was used to estimate students' general geographic knowledge and skills prior to the experimental study. During development of the test, the reliability of Form I was computed to be a satisfactory .84 (Bettis 1983).

Posttest. The posttest was the sum of the nine chapter tests on Asia provided with the textbook (Swanson 1987). The weekly chapter tests were similar in content and form to the pretest, but they covered the content in greater detail. Each test contained knowledge, comprehension, and simple application items. The nine chapter test scores for each student were summed and a percentage correct was computed. The subjects' overall percentages were used in the data analysis to compare the two classes' achievement. No reliability estimate is available.

DATA ANALYSIS

Pretests

The two classes were assessed in terms of general geographic knowledge and skills, intelligence, and text specific knowledge of Asia. The three pretests produced highly consistent results. See Table 1. The Competency-Based Geography Test, the Henmon-Nelson Test of Mental Ability, and the text-based content pretest produced virtually identical scores in both classes. Even though all possible differences were not assessed, these three measures support the position that the two classes were academically equivalent.

[Insert Table 1 about here.]

Posttest

The posttest scores were analyzed with a t-test for independent means. The achievement of the Jigsaw II experimental class was higher than the comparison class at a statistically significant level ($t = 2.77$, $df = 43$, $p < .01$). See Table 2. We judged that the 5.2% score difference was also practically significant. The effect size of this difference was .81 and was computed by subtracting the mean of the comparison group from the mean of the experimental group and dividing by the standard deviation of the comparison group (Cohen 1977). Stated another way, 79% of the Jigsaw students exceeded the mean score of the comparison class students.

[Insert Table 2 about here.]

The subjects' posttest answer sheets were destroyed inadvertently before the reliability of the test was assessed. We believe the lack of a reliability estimate is not a serious problem for two reasons. First, the nine-chapter posttest was similar in content and format to the pretest which was highly reliable. Second, if the posttest was not very reliable, the consequence would be to reduce the observed difference between the experimental and comparison classes, thus shrinking the observed effect size (Bohrnstedt 1970). Since a substantial effect was observed (ES = .81), the posttest was probably adequately reliable. Alternatively, the true effect was larger than the substantial large effect observed. In any case, the test was sufficiently reliable to detect a substantial effect in favor of the Jigsaw II treatment.

CONCLUSIONS

The result of this study of Jigsaw II was consistent with the generally superior academic achievement effects reported in the cooperative learning studies reviewed by Newmann and Thompson (1987) and Slavin (1989). It was inconsistent with the achievement effects reported by most of the Jigsaw studies. In this study, Aronson's original version of Jigsaw (1978) was modified to incorporate a group goal that could be achieved only with the contributions of all group members. It was also modified through Equal Opportunity Scoring to make it feasible for all students to contribute to the achievement of the group goal and to facilitate holding individual group members publicly accountable to their peers for their contributions to the group effort. These modifications were consistent with Slavin's (1986) recommendations and some other cooperative learning techniques (e.g., Student Teams/Achievement Divisions, Teams-Games-Tournament). In light of this study and its consistency with the larger cooperative learning research base, we concluded that Jigsaw as modified (i.e., Jigsaw II) tends to produce higher levels of academic achievement than more conventional whole-class, non-cooperative instructional procedures in secondary social studies classes.

This experiment, focused on Jigsaw II, supports Slavin's claims about the instructional conditions which must be met for small group, cooperative learning to be consistently effective. First, students in a learning group must work toward a group goal and reward which can be achieved only if they work together cooperatively. Second, students must be publicly accountable to their peers for their individual contributions to the achievement of the group's goal. See the End Note for cooperative learning guides for classroom teachers. Well-planned cooperative learning techniques, such as Jigsaw II, are feasible, effective ways for social studies teachers to increase their students' academic achievement.

END NOTE

Two excellent resources for teachers who want to use cooperative learning techniques, including Jigsaw II, are Slavin's Using Student Team Learning (1986) and Cooperative Learning: Theory, Research, and Practice (1990). Both are available from the Team Learning Project, Center for Research on Elementary and Middle Schools, The Johns Hopkins University, 3505 North Charles Street, Baltimore, Maryland, 21218 (telephone 301-338-8248).

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Table 1

Pretest Mean Scores for the Two Classes

Test	Experimental		Control	
	$\bar{X}$	s	$\bar{X}$	s
Competency-Based Geography	47.9	5.3	47.8	8.8
Text Content Pretest	56.8	12.7	56.9	12.3
Henmon-Nelson	110.3	21.1	110.0	15.2

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Table 2

T-Test for Independent Means Using Posttest Scores

	Experimental Group	Control Group	T-Test	df	p
Number (n)	23	22			
Mean ($\bar{X}$)	86.2	81.0	2.77	43	.01
Standard Deviation (s)	6.1	6.4			