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ABSTRACT

Student Team Learning instructional techniques (Teams-Games-Tournament, Student Teams-Achievement Divisions, and Jigsaw II) have been extensively researched in six-to-twelve-week classroom experiments and found to have many positive effects. This study examines the effects of the techniques when they are used as the primary instructional method for a full semester in language arts, math, and social studies. The subjects were 388 fourth- and fifth-grade students in five elementary schools, two of which served as experimental schools and three as controls. The experimental groups scored significantly higher on four of seven Comprehensive Test of Basic Skills (CTBS) subscales than did the control groups. No significant differences were found for affective variables measured, except that the experimental groups named significantly more "friends in school." (Author/MP)

AN EXTENDED COOPERATIVE LEARNING EXPERIENCE IN ELEMENTARY SCHOOL

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Introductory Statement

The Center for Social Organization of Schools has two primary objectives: to develop a scientific knowledge of how schools affect their students, and to use this knowledge to develop better school practices and organization.

The Center works through four programs to achieve its objectives. The Studies in School Desegregation program applies the basic theories of social organization of schools to study the internal conditions of desegregated schools, the feasibility of alternative desegregation policies, and the interrelation of school desegregation with other equity issues such as housing and job desegregation. The School Organization program is currently concerned with authority-control structures, task structures, reward systems, and peer group processes in schools. It has produced a large-scale study of the effects of open schools, has developed Student Team Learning Instructional processes for teaching various subjects in elementary and secondary schools, and has produced a computerized system for school-wide attendance monitoring. The School Process and Career Development program is studying transitions from high school to post secondary institutions and the role of schooling in the development of career plans and the actualization of labor market outcomes. The Studies in Delinquency and School Environments program is examining the interaction of school environments, school experiences, and individual characteristics in relation to in-school and later-life delinquency.

This report, prepared by the School Organization program, investigates the effects of using student team learning techniques as the primary instructional method for a full semester in two elementary schools.

Abstract

Student Team Learning instructional techniques (Teams-Games-Tournament, Student Teams-Achievement Divisions, and Jigsaw II) have been extensively researched in six-to-twelve-week classroom experiments and found to have many positive effects. This study examines the effects of the techniques when they are used as the primary instructional method for a full semester in language arts, math, and social studies.

The subjects were 388 fourth- and fifth-grade students in five elementary schools, two of which served as experimental schools and three as controls. The experimental groups scored significantly higher on four of seven CTBS subscales than did the control groups. No significant differences were found for affective variables measured, except that the experimental groups named significantly more "friends in school."

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Over the past several years, there has been increasing attention and research directed at understanding the effects of cooperative learning on student achievement, socialization, self-esteem, and other variables. The team "cooperative learning" refers to instructional strategies in which students work in small, cooperative groups or teams to master academic materials. The research on cooperative learning has been recently reviewed by Slavin (in press) and by Sharan (1979).

The most extensively researched of the cooperative learning strategies are a set of techniques referred to collectively as Student Team Learning (see Slavin, in press a). These include Teams-Games-Tournament, or TGT (DeVries and Slavin, 1978), Student Teams-Achievement Divisions, or STAD (Slavin, 1978a), and Jigsaw II, a modification of Aronson's (1978) Jigsaw Teaching model. All three techniques have been evaluated in a series of field experiments, and all three have been found to increase student achievement, mutual concern among students, liking of school, positive race relations, and self-esteem when compared to control conditions. However, these studies have involved only one of the three techniques at a time, none lasting longer than twelve weeks. A few researchers (Slavin, in press a; Sharan, 1979; Johnson and Johnson, 1975) have advocated the use of cooperative learning strategies over substantial portions of the school day as the primary instructional method in most classrooms. This study evaluated the use of all three of the Student Team Learning techniques (TGT, STAD, and Jigsaw II) with the same group of children at the same time in a semester-long program to determine if such intensive and extensive use of the techniques enhances or diminishes the effectiveness of improving student achievement, attitudes, and self-esteem.

Method

Subjects.

The subjects were 388 fourth and fifth grade students taught by seventeen teachers in five elementary schools in a rural Maryland school district. A sixth school was initially assigned to the control group, but was dropped from the analysis when it was found that the school's mean achievement was significantly lower than that of the other five schools. All five schools had open-space construction, but used few elements of open schooling. All schools did have students change classes for main subjects, most often mathematics and reading, to have homogeneous classes for these subjects.

Design.

The teachers were assigned by school to the experimental conditions. Ten teachers in two schools were assigned to the experimental group, and seven teachers in three different schools to the control group. The two groups of schools were matched in overall average scores on the Iowa Test of Basic Skills, which is used in the Maryland Accountability Testing Program. Pretests were used in the analysis as the covariates for their corresponding posttests to control for any initial differences on any of the measures.

Treatments.

Control. The control teachers were asked to teach their usual subjects in their usual ways. Possible "Hawthorne" effects were controlled by using intensive behavioral observations of the control classes as well as the experimental classes.

Experimental. The experimental teachers were given a teacher's manual and a brief (three hour) period of training in the use of the three team learning techniques. They were instructed to use Student Teams-Achievement Divisions (STAD) for all their language arts instruction, Teams-Games-Tournament (TGT) for all their mathematics instruction and Jigsaw II for all their social studies instruction. Some teachers also used team learning strategies occasionally in their science and reading classes. Thus, the bulk of each student's instructional day was occupied by the team learning methods. The characteristics of these methods are described below (complete descriptions appear in Slavin, 1978b).

Student Teams-Achievement Divisions (STAD). In STAD, as in all of the Student Team Learning methods, students were assigned to 4-5 member teams that were heterogeneous on student academic performance and sex. These teams were given the task of making sure that each team member had mastered the material being presented by the teacher. The class followed a regular schedule of teacher presentation of concepts, team work on practice worksheets, and individual quizzes. The quiz scores were transformed into points according to a system in which each score is compared to those of other students in the class of comparable past performance, and these points were summed to form team scores. The highest scoring teams were recognized in a weekly class newsletter. In this study, STAD was used in language arts. The teachers were provided with worksheets and quizzes based on the objectives taught in all schools in the district.

Teams-Games-Tournament (TGT). TGT is the same as STAD, except that instead of taking quizzes, students played academic games with members of other teams to add points to their team scores. Students competed as representatives of their teams with other students at their own level of past performance. Team composition, teacher presentation, team practice,

and newsletters were the same as in STAD. In this study, TGT was used in mathematics. The teachers were provided with worksheets and games based on the book used throughout the school district.

Jigsaw II. Jigsaw II is a modification of Aronson's (1979) Jigsaw Teaching Method. Team assignment in Jigsaw II was the same as for TGT and STAD. Each week, the Jigsaw II students studied chapters in their regular social studies texts. Each student on a team had a different "topic" relating to the chapter on which he or she was to become an "expert." Following a reading period, students met with members of other teams who had the same topic in "expert groups" to discuss their topics. Following these meetings, students returned to their teams and taught them their topics, after which the students took quizzes covering all topics. The quiz scores were then made into team scores as for STAD. Teachers were provided with the topics and the quizzes.

Students were in different teams for each of the three subjects (language, math, and social studies). Thus, each student was on three teams and received three newsletters each week.

Measures.

Academic Achievement. Academic achievement was assessed by the Comprehensive Test of Basic Skills. Seven subscales of the CTBS were given: reading vocabulary, reading comprehension, language mechanics, language expression, mathematics computation, mathematics concepts and applications, and social studies. Form S of the CTBS was given as a pretest, and Form T as a posttest. Because none of the curriculum materials provided to teachers were made in reference to the CTBS, the CTBS was seen as a fair (though somewhat insensitive) test of general learning in the experimental and control classes.

Student Attitudes. Student attitudes were assessed by scales developed

school, liking of others, feeling of being liked, and perception of peer support for academic achievement. The scales had a five-choice Likert-type format, consisting of statements with the following response possibilities: YES! yes ? no NO! This set of responses was taken from Clifford's (1976) Academic Achievement Accountability Scale.

Academic Achievement Accountability. This is a twelve-item scale developed by Clifford (1976) to assess the degree to which students feel that their grades are due to their own efforts (internal locus of control with regard to grades).

Anxiety. The anxiety measure was the State-Trait Anxiety Inventory for Children (Spielberger, 1970). Only the twenty trait anxiety questions were administered.

Sociometric Items. Three sociometric items were administered as pre- and posttests. These were as follows: 1) "Who are your best friends in school?" 2) "Which of your friends do you spend time with outside of school?", and 3) "If you were going to be working on a project with other children, which children would you not want to have in your group?" For each question, students were given twenty lines and instructed to list as many names as they wished. The number of names listed in the first two questions were considered assessments of the number of friends each student felt he or she had, a measure of social cohesion. The number of names listed in the third question assessed the degree of bad feeling in the school toward other students.

Self-Esteem. Three subscales of the Coopersmith Self-Esteem Inventory (Coopersmith, 1975) were used as a measure of student self-esteem. These are general self-esteem (26 items), social self-esteem (8 items) and academic self-esteem (8 items). Each item consisted of a self-description (such as "I'm easy to like"), and a choice of responses as follows: "Like me," "not sure," and "unlike me."

Results

Academic Achievement

Table 1 presents means and standard deviations of the seven CTBS subscales. The pre- to posttest gains are not interpretable, due to differences in difficulty of the different test forms; control-experimental differences are the important ones. These data were analyzed by means of multiple regression analyses, where for each measure the posttest was regressed on the pretest score and a vector for treatment. The R^2 for this analysis was compared to that for an equation without the treatment variable, and the resulting incremental R^2 was tested for statistical significance. These results are presented in Table 2.

Tables 1-2 About Here

As is clear from Tables 1-2, the experimental groups scored significantly higher on four of the seven CTBS subscales than did the control groups, controlling for their respective pretests. In no case did control achievement exceed that of the experimental groups, although there is a slight trend in that direction for social studies.

Because of the differences in difficulty between the pre- and posttest scales, grade equivalents rather than raw scores are the best indicators of the magnitude of gains. For the measures on which significant effects were found, the differences in grade equivalents were as follows. For reading comprehension and mathematics computation, the experimental group exceeded the control group in grade equivalent gains by 0.2 grade equivalents. For the language subscales, the differences are much larger; the experimental group gained 1.0 grade equivalents more than did the control group

in language mechanics, and 0.9 grade equivalents more in language expression.

Affective Measures

Table 3 presents means and standard deviations for the affective variables. The four student attitude scales and Academic Achievement Accountability were coded on a scale from one (NO!) to five (YES!). Anxiety and self-esteem were coded 1-3, and the sociometric results are the actual numbers of classmates named for each question. Data analysis for these variables was the same as for the achievement measures. These results are summarized in Table 4.

Tables 3 and 4 About Here

As shown in Tables 3 and 4, there were no significant differences between the experimental and control groups on any of the affective variables except the number of classmates each student named as "friends in school." On this measure, the experimental students named significantly more friends ($F\ 1,385) = 17,92, p < .001$).

Discussion

In general, the achievement results of the present study parallel those of the earlier separate TGT and STAD studies. Positive effects of the combined treatments on language arts, reading, and mathematics performance were found. For the affective variables, most of the anticipated effects were not found. Positive effects of the treatments on most of the affective variables assessed in this study have been typically found in the earlier studies, but they have been more commonly found in studies in junior high schools than in the earlier grades, where lower scale

reliabilities, often extreme ceiling effects, and other factors make questionnaire scales less sensitive to attitudinal changes.

For academic achievement, the effects that were found were in general the ones that were most confidently expected. The language mechanics, language expression, and reading vocabulary effects were almost certainly due to the use of STAD, which has been previously found to increase language achievement more than control treatments (Slavin, 1977; Slavin, in press; Slavin & Oickle, forthcoming). The effects on mathematics computation can be assumed to be due to TGT, which has also been found in previous studies to improve mathematics achievement (Edwards, DeVries, and Snyder, 1972; Hulten and DeVries, 1975). Because the curriculum materials were developed independently of the standardized tests, the effects found in language, reading, and mathematics may be seen as conservative indicators of greater learning on the part of the experimental groups. A criterion-referenced test would have been more sensitive to actual treatment effects, but would have biased the analysis against the control group, whose curriculum was not controlled in any way.

The failure to find any differences in social studies was not surprising, as there was little overlap between the content taught in the district schools and that assessed by the CTBS. The program made no direct attempt to influence reading comprehension, so it is again not surprising that no differences were found on this measure. The failure to find differences in mathematics comprehension is interesting. Slavin (in press) and Sharan (1979) have pointed out that the Student Team Learning Techniques, especially TGT and STAD, are designed to motivate students to drill and practice basic skills, not to gain higher-order

understanding of concepts. This is in contrast to group investigation models such as that of Sharan and Sharan (1976), in which higher-order understanding is a primary goal. Sharan, Lazarowitz, and Ackerman (in press) found that their methods increased achievement on the higher cognitive levels, but not on skill or factual items. These contrasting findings may suggest the use of a combination of the mastery-oriented Student Team Learning methods and the understanding-oriented group-investigation methods.

The failure to find treatment effects on any of the affective variables except "friends in school" may be due to ceiling effects. The study took place in rural schools where students tend to have quite positive attitudes toward school, toward their teachers, and toward themselves. The responses to the questionnaire scales consisted almost exclusively of agreements with positive items plus heavy use of the ? (Don't Know) category. The one set of items in which ceiling effects were not a problem was the sociometric items, where students could name as many as twenty classmates for each item. The "friends in school" analysis demonstrated that students who were in the experimental groups felt that they had substantially more friends in school than did those in the control classes. However, the larger number of friendships in school did not apparently affect friends out of school or reduce the number of students that were named as nonfriends.

The primary importance of the present study is that it demonstrated that team learning methods can be used over a substantial portion of the school day for a semester and still produce positive effects on student achievement. At the end of the project the teachers and students were

still using and enjoying the methods, and the students were quite disappointed that the project had to end. This result provides further evidence that team learning methods can be an effective replacement for traditional instructional methods, not merely a supplement to them. Further research should seek to evaluate team learning methods over still longer periods and to follow up the classes to see if the effects are maintained, but the present study is an important first step in testing the limits of Student Team Learning as a complete classroom organizational plan.

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Table 1

Means and Standard Deviations of Academic Achievement Measures

Measure*	Control		Experimental	
	Pre	Post	Pre	Post
Reading Vocabulary				
$\bar{X}$	24.14	26.81	22.17	26.47
S	8.82	9.02	8.43	8.60
Reading Comprehension				
$\bar{X}$	26.57	25.42	24.82	23.66
S	10.05	9.98	9.84	10.31
Language Mechanics				
$\bar{X}$	13.10	13.24	14.01	14.89
S	4.23	4.94	3.90	4.17
Language Expression				
$\bar{X}$	21.19	21.29	20.05	22.03
S	7.63	8.05	7.13	6.99
Math Computations				
$\bar{X}$	29.75	29.22	26.77	27.73
S	10.43	11.63	9.24	10.67
Math Concepts & Applications				
$\bar{X}$	29.01	29.34	26.43	27.54
S	10.76	10.61	10:12	9.23
Social Studies				
$\bar{X}$	19.18	21.08	18.47	19.91
S	7.54	8.05	7.60	7.55

*Note that pretest means are Form S of the CTBS, posttests are Form T. Due to differences in form difficulties, pre to post gains cannot be directly computed. See text for an explanation.

Table 2

Results of Multiple Regression Analyses

For Academic Achievement Measures

Measure	R^2 Total	R^2 inc.	F
Reading Vocabulary	.720	.006	7.63**
Reading Comprehension	.707	.000	<1
Language Mechanics	.604	.008	8.88**
Language Expression	.632	.011	11.72**
Math Computation	.682	.003	3.95*
Math Concepts & Applications	.656	.000	<1
Social Studies	.539	.002	1.26

* $p < .05$

** $p < .01$

Note. Degrees of freedom for all analyses are 1,385.

Table 3

Means and Standard Deviations of Affective Measures

Measure	Control		Experimental	
	Pre	Post	Pre	Post
Liking of School				
$\bar{X}$	19.34	19.40	21.91	22.08
S	6.66	8.89	7.65	8.24
Liking of Others				
$\bar{X}$	28.86	31.98	29.07	31.85
S	5.20	2.55	4.52	2.73
Feeling of Being Liked				
$\bar{X}$	24.55	24.68	24.39	24.22
S	6.43	7.28	5.60	5.57
Peer Support				
$\bar{X}$	23.44	23.37	23.65	23.17
S	4.50	5.67	5.22	5.32
Achievement Accountability				
$\bar{X}$	47.22	46.59	47.52	46.22
S	8.32	6.76	7.28	7.51
Anxiety				
$\bar{X}$	36.83	36.61	36.41	35.77
S	7.86	8.10	6.95	7.03
Friends in School				
$\bar{X}$	11.69	11.32	10.58	12.76
S	5.76	6.07	5.32	6.61
Friends out of School				
$\bar{X}$	4.78	4.80	3.52	3.84
S	3.71	3.64	2.89	2.94
Non-Friends				
$\bar{X}$	7.28	7.68	5.19	6.13
S	6.03	5.69	5.98	5.40
General Self-Esteem				
$\bar{X}$	57.94	57.77	57.11	58.15
S	8.53	9.02	7.58	8.00
Social Self-Esteem				
$\bar{X}$	17.84	17.78	17.61	17.63
S	3.01	3.39	2.87	2.66
Academic Self-Esteem				
$\bar{X}$	17.42	17.01	17.54	17.56
S	3.51	3.48	3.29	3.28

Table 4

Results of Multiple Regression Analyses for Affective Measures

Measure	R^2 Total	R^2 Inc.	F
Liking of School	.365	.003	1.53
Liking of Others	.021	.001	<1
Feeling of Being Liked	.378	.001	<1
Peer Support	.171	.001	<1
Achievement Accountability	.211	.001	<1
Anxiety	.392	.001	<1
Friends in School	.404	.028	17.92**
Friends out of School	.130	.006	2.52
Non-Friends	.191	.005	2.18
General Self-Esteem	.432	.003	1.99
Social Self-Esteem	.303	.000	<1
Academic Self-Esteem	.303	.005	2.61

*p<.05
**p<.01

Note. Degrees of freedom for all analyses are 1,385.