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When Does Cooperative Learning Increase Student Achievement?

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This article reviews research on the achievement effects of cooperative learning instructional methods, in which students work in small groups to learn academic materials. Methodologically adequate field experiments of at least 2 weeks' duration in regular elementary and secondary schools indicate that among cooperative learning methods in which students study the same material together, only methods that provide group rewards based on group members' individual learning consistently increase student achievement more than control methods. Cooperative learning methods in which each group member has a unique subtask have positive achievement effects only if group rewards are provided. Group rewards and individual accountability are held to be essential to the instructional effectiveness of cooperative learning methods.

Over the past 30 years there has been a considerable quantity of research concerning the effects of cooperative, competitive, and individualistic incentive structures on individual and group productivity. A *cooperative incentive structure* is one in which two or more individuals are rewarded based on their performance as a group; a *competitive incentive structure* indicates that two or more individuals are compared with one another, and those performing best are rewarded; and an *individualistic incentive structure* is one in which individuals are rewarded based on their own performance, regardless of others' performances. The research on these incentive structures has been reviewed on several occasions (e.g., Johnson & Johnson, 1974; Michaels, 1977; Miller & Hamblin, 1963; Slavin, 1977). All of these reviewers agreed that research relating different incentive structures to performance produces inconsistent findings. Some studies find that cooperative incentive structures produce the best performance, and others find that competitive or individualistic incentive structures are superior. However, the reviewers disagreed about the conditions under which cooperative incentive structures enhance performance. For example, Miller and Hamblin (1963) held that cooperative incentive structures were most effective for inherently interdependent tasks, whereas competitive or individualistic incentive structures were most effective for independent tasks. Johnson and Johnson (1974) disagreed, maintaining that cooperative incentive structures are best for all but the most mechanical of tasks, such as speeded drills. Michaels (1977) concluded that methodologically adequate studies tended to favor competition over cooperation. Slavin (1977) proposed that in short experiments, cooperation was likely to be associated with greater productivity only if efficient task completion absolutely required coordination of efforts. However, he held that over the course of longer interventions, development of group sanctions favoring performance would ultimately make cooperation more effective whether or not coordination of efforts was critical to task completion.

The latest entry in this continuing discussion is a meta-analysis published recently by Johnson, Maruyama, Johnson, Nelson, and Skon (1981), which came to the same conclusion as the earlier Johnson and Johnson (1974) review: Cooperation is better for productivity than competition or individualization for all

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but rote-decoding tasks. The Johnson et al. review concluded as follows: "the overall effects stand as strong evidence for the superiority of cooperation in promoting achievement and productivity. . . . Educators may wish to considerably increase the use of cooperative learning procedures to promote higher student achievement" (Johnson et al., 1981, p. 58).

This conclusion has been sharply attacked by Cotton and Cook (1982) and by McGlynn (1982), who pointed out that the blanket conclusion that cooperation is most effective for achievement and productivity is contradicted in the meta-analysis itself, which found statistically significant interactions on productivity and achievement outcomes between cooperation/competition and 10 different factors, including type of task, resource sharing, task interdependence, and other factors (Cotton & Cook, 1982).

It is questionable whether an overall generalization concerning the effectiveness of cooperative, competitve, and individualistic reward structures is either feasible or useful. The Johnson et al. meta-analysis and all previous reviews have concluded that different tasks and outcome measures are associated with different results in this area. Under these circumstances, it is probably more useful to focus on research in small well-defined areas of some theoretical or practical importance rather than to attempt to generalize across widely divergent tasks, settings, outcome measures, and other features repeatedly found to have divergent effects on productivity and achievement outcomes.

This article reviews research on cooperative, competitive, and individualistic reward structures in a narrowly defined but practically important area: student achievement in elementary and secondary schools. Less than a third of the studies that constituted the Johnson et al. meta-analysis had individual achievement as a dependent measure. Almost all of the rest of the studies involve group productivity (e.g., the ability of a *group* to solve a problem, maze, or puzzle). Thus, the conclusions of the meta-analysis are strongly influenced by the results of these group productivity studies. This would not be a problem if group productivity resembled individual achievement as an outcome, but these outcomes are fundamentally different. Groups are inherently superior to individuals for solving problems, because if any group member solves the problem, he or she will tell the answer to the rest of the group. In fact, several studies (e.g., Faust, 1959; Marquart, 1955; Ryack, 1965) have compared the problem-solving scores of groups who really worked together to those of "nominal"groups composed of individuals who actually worked separately, but were credited with having solved a problem if any one of them solved it. In each case, the real groups' scores were higher than those of the individuals, but not than those of the "nominal" groups. This would indicate that it is sharing answers per se, not any emergent property of group interaction, that explains the increased productivity of groups in such group problem-solving experiments (see Hill, 1982, for more on this.)

School achievement bears little relationship to group problem solving. Learning is a completely individual outcome that may or may not be improved by cooperation, but it is clearly not obviously improved by cooperation in the same way as group problem solving is superior to individual problem solving. Two or more individuals who take a test together will get a better average score than individuals who take the test by themselves, but how much will each person *learn* from this experience? It may well be that working in a group under certain circumstances does increase the learning of the individuals in that group more than would working under other arrangements, but a measure of group productivity provides no evidence one way or the other on this. Only an individual learning measure that cannot be influenced by group member help can indicate which incentive or task structure is best. If a group produces an excellent lab report, but only a few students really contributed to it, it is unlikely that the group as a whole learned more than they might have learned had they each had to write their own (perhaps less excellent) lab reports.

Considering the range of performance outcomes that have been studied in research on cooperation, individual academic achievement is rather atypical. It is one of very few outcome measures that have meaning or importance only at the level of the individual. Further, the characteristics of elementary and secondary classrooms and the nature of the material taught in these settings have little in common with the tasks and settings of the short-term laboratory studies that constitute most research on cooperative, competitive, and individualistic reward structures. This article reviews the research on the achievement effects of cooperative incentive structures in elementary and secondary schools, with an emphasis on discovering the features of various cooperative programs that make them effective.

Cooperative Learning

In the last 12 years there has been a substantial awakening of interest in applying principles of cooperation to the classroom as a primary means of teaching traditional school subjects. A wide variety of such techniques, called *cooperative learning* methods, have been evaluated in school settings (see Sharan, 1980; Slavin, 1980a; Slavin, 1983). What characterizes these methods is that students spend much of their class time working in small, heterogeneous learning groups, in which they are expected to help one another learn. In all other respects, cooperative learning methods vary considerably.

It is important to note that although this article focuses exclusively on the effects of cooperative learning methods on school achievement, many researchers and practitioners would hold achievement to be an important but secondary goal of these methods. Cooperative learning methods have been found to have strong and consistent positive effects on such outcomes as race relations, attitudes toward academically handicapped classmates, self-esteem, and predisposition to cooperate in other settings (Slavin, 1983). Many would argue that as long as cooperative learning methods do not have negative effects on student achievement, their positive effects on social and attitudinal outcomes would justify their use.

Cooperative Learning Methods

There are two primary components of cooperative learning methods: A *cooperative incentive structure* and a *cooperative task structure.* Cooperative incentive structure, discussed at the beginning of this article, is what most theorists mean when they refer to cooperation (see, for example, Deutsch, 1949). The critical feature of a cooperative incentive structure is that two or more individuals are interdependent for a reward they will share if they are successful as a group. For example, if three people traveling in a car help push the car out of the mud, all of them benefit from each other's efforts (by being able to continue their trip). Either all of them will be rewarded or none of them will be, depending on whether they succeed. Group competition, as in team sports, is also a cooperative incentive structure, because the group's success depends on the efforts of the group members, and all group members share the same consequences (winning or losing).

Cooperative task structures are situations in which two or more individuals are allowed, encouraged, or required to work together on some task, coordinating their efforts to complete the task. Cooperative incentive structures usually involve cooperative tasks, but the two are conceptually distinct. For example, contributors to an edited volume are under a cooperative incentive structure (they all benefit if the book does well) even if they never meet or talk with one another (i.e., they are not under a cooperative task structure).

Cooperative learning methods used in classrooms always involve cooperative tasks, but not all of them involve cooperative incentives. The forms of the tasks and incentives vary considerably across different methods. The task structures used in cooperative learning methods can be divided into two categories: *task specialization* and *group study.* In methods that use task specialization, each group member is responsible for a unique part of the group activity; in group study methods, all group members study together and do not have separate tasks.

The incentive structures used in cooperative learning methods can be summarized in three categories, depending on whether or not rewards are given to groups, and if so, whether they are given on the basis of individual learning or a single group product. In methods that use group rewards for individual learning, rewards such as recognition (e.g., newsletters, certificates), grades, praise, or tangible rewards are given to students in groups who achieve some standard, such as making one of the highest group scores in the class or exceeding a preset criterion. The group score is the average score received by group members on an assessment of individual learning, such as a quiz. In methods that use group rewards for group products, similar group rewards are provided, but they are given based on the quality of a single group worksheet or report to which all group members contributed, rather than on individual learning. Cooperative learning methods that use individual rewards have students work together and instruct them to help one another, but provide only individual grades to students based on their own performance.

Thus, all of the cooperative learning methods can be located in a 3 × 2 table produced by the two factors incentive structure and task structure. This is depicted in Table 1. The methods in the six resulting cells are described below.

Group Study With Group Reward for Individual Learning

Methods in this cell typically involve students working in small groups to master worksheets or other information initially presented by the teacher. Following the group study time, the students are individually assessed, and the group members' scores are summed to form group scores. These are recognized in class newsletters, or qualify the groups for certificates, grades, or other rewards. Cooperative learning methods categorized in this cell include three developed at Johns Hopkins University: Student Teams-Achievement Divisions (STAD; Slavin, 1978a); Teams-Games-Tournament (TGT; DeVries & Slavin, 1978); and Team Assisted Individualization (TAI; Slavin, Leavey, & Madden, in press; Slavin, Leavey, & Madden, Note 4). In STAD, the teacher presents a lesson, and then students study worksheets in four-member teams that are heterogeneous on student ability, sex, and ethnicity. Following this, students take individual quizzes, and team scores are computed based on the degree to which each student improved over his or her own past record. The team scores are recognized in class newsletters. TGT is the same as STAD, except that instead of taking quizzes, students compete against members of other teams who are similar in past performance to add points to their team scores. In TAI, students work in heterogeneous teams, but they work on individualized curriculum materials at their own levels and rates. Teams receive certificates based on the number of units completed and the accuracy of their members' final tests.

Humphreys, Johnson, and Johnson (1982) evaluated a method in which students studied in small groups but were tested individually. Students' grades depended on the average of the group members' test scores. Hamblin, Hathaway, and Wodarski (1971) implemented

Table 1
Categorization of Cooperative Learning Methods by Incentive and Task Structures

Task structure	Incentive structure: Group reward for individual learning	Group reward for group product	Individual reward
Group study (No task specialization)	STAD, TGT, TAI, Humphreys, Johnson, & Johnson (1982) methods, Hamblin, Hathaway, & Wodarski (1971) methods, Lew & Bryant (Note 1) methods	Learning Together, Wheeler & Ryan (1973) methods	Peterson & Janicki (1979) methods, Webb & Kenderski (in press) methods, Starr & Schuerman (1974) methods, Huber, Bogatzki, & Winter (Note 2) methods
Task specialization	Jigsaw II	Group investigation, Wheeler (Note 3) methods	Jigsaw

Note. STAD = Student Teams-Achievement Divisions; TGT = Teams-Games-Tournament; TAI = Team Assisted Individualization. Adapted from *Cooperative Learning* by R. E. Slavin, New York: Longman, 1983. Copyright 1983 by Longman. Reprinted by permission.

methods in which students studied together and received tangible rewards (e.g., candy, toys, books) based on either the average of individual test scores, the highest three scores in the group, or the lowest three scores in the group. Lew and Bryant (Note 1) gave groups special free time if all group members achieved mastery (80%) on tests given weekly.

Group Study With Group Reward for Group Product

In these methods, students are asked to work or study together, and the group produces a single worksheet or test, which is the basis for evaluation of the group. The largest number of such studies involves methods developed by David and Roger Johnson, called "Learning Together" methods (from the title of their book, *Learning Together and Alone,* 1975). In most of the Learning Together studies, students in small, heterogeneous groups worked together to complete a single worksheet and were praised and rewarded as a group. In one of the Learning Together studies (Humphreys, Johnson, & Johnson, 1982), students received grades based on their group's average score on individual tests, so this study is included under the group study, group reward for individual learning category (see above). However, the methods used by Johnson, Johnson, Johnson, and Anderson (1976), Johnson, Johnson, and Scott (1978), and Robertson (1982) did not provide specific group rewards for individual learning, but gave students grades on the basis of the quality of the group worksheet, test, or other product. Wheeler and Ryan (1973) had students work together to produce a single report; as in the Learning Together studies, there was no way to determine how much each group member contributed to the final product.

Group Study With Individual Reward

In the group study method most commonly seen in practice, students work or study in small groups, with no group rewards. Students are graded solely on the basis of their own work. Most studies of cooperative learning at the postsecondary level involve this type of arrangement, and a few such studies (Huber, Bogatzki, & Winter, Note 2; Peterson & Janicki, 1979; Peterson, Janicki, & Swing, 1981; Starr & Schuerman, 1974; Webb & Kenderski, in press) involved elementary and secondary students.

Task Specialization With Group Reward for Individual Learning

Only one study (Ziegler, 1981) appears in this cell. This study used Jigsaw II (Slavin, 1980c), an adaptation of Aronson's (1978) Jigsaw method (see below). In Jigsaw II, each student in a heterogeneous team is given a unique topic on which to become an "expert." The students from different teams with the same topics meet in "expert groups" to discuss their topics, and then return to their teams to teach their teammates what they have learned. Finally, all students are tested on a quiz that covers all topics, and the quiz scores are summed to form team scores. In the Ziegler (1981) study, students received grades based in part on their team scores.

Task Specialization With Group Reward for Group Product

Several cooperative learning studies have evaluated methods that use task specialization, but give group rewards or evaluations based on a single group product or report rather than on individual learning. Sharan, Hertz-Lazarowitz, and Ackerman (1980), Sharan (in press), and Hertz-Lazarowitz, Sapir, and Sharan (Note 5) evaluated a method called Group Investigation (Sharan & Sharan, 1976), in which small groups choose subtopics from a unit being studied by the entire class, and then students within the group choose subtasks within the group topic. The groups then prepare reports on their topics and present them to the rest of the class. Students are evaluated in large part based on the quality of their group presentations or other group products. Wheeler (Note 3) evaluated a method in which students performed separate subtasks in preparing group reports. The groups presenting the best reports received prizes.

Task Specialization With Individual Reward

This cell contains only Aronson's (1978) original Jigsaw model. This method is essentially the same as Jigsaw II (described above), except that instead of receiving grades based in part on the average of group members' quiz scores as in Jigsaw II, students in the original Jigsaw method receive only individual grades based on their own test scores.

Criteria for Inclusion of Studies

This paper reviews all available published and unpublished studies of cooperative learning methods that met the following criteria:

1. A cooperative learning method was compared with a control group that could be considered initially equivalent (because of random assignment or matching plus analysis of covariance), or appropriate single-subject designs were used (Hersen & Barlow, 1976). This requirement excluded a very small number of studies (all unpublished) that failed to use control groups.
2. The study took place in regular elementary or secondary schools for at least 2 weeks (10 class periods). This excluded a large number of studies of cooperative learning interventions that were in place for five class periods or less. Such studies were considered laboratory studies in field settings rather than true field experiments because of their brief durations, use of tasks that are not typical of most school learning tasks (e.g., solving Rasmussen triangles), and artificial procedures (e.g., alternating periods of group work and individual interviews). This requirement also excluded several studies at the postsecondary level and two studies in self-contained special education classes.
3. Achievement measures fairly assessed learning in the experimental and control groups, and the tests used as dependent measures were given to individuals after the group experience. This excluded analyses presented in a small number of studies in which a control group was never exposed to the content studied by the experimental group and assessed by the final test, or in which students in the cooperative group were able to take the final tests in their groups (and could help one another) whereas the students in the control group took the tests by themselves.

Most of the cooperative learning studies partially controlled teacher effects by having the same teachers teach experimental and control classes, or by randomly assigning a large number of teachers to each treatment from among a pool of volunteers.

Field Experimental Research on Cooperative Learning and Achievement

Forty-six studies met the duration, setting, and methodological adequacy criteria outlined above. In two studies (Huber et al., Note 2; Sharan, in press), two different methods were compared with control groups, so these are each presented as two studies, one for each comparison of a cooperative learning method with a control method. The characteristics and results of these studies are summarized in Table 2.

The achievement results of the forty-six studies are presented in the last column of Table 2. A + sign indicates that a statistically significant ($p < .05$) positive achievement effect was found, meaning that the cooperative learning group scored significantly higher than the control group on a test of content to which both were exposed. For studies that used multiple measures of achievement, a + was recorded if at least half of the measures showed significant positive effects for the cooperative treatment and none of the rest showed significant effects favoring the control group. A (+) sign indicates a marginally significant positive effect ($p < .10$), a 0 signifies no differences, and a − sign indicates that a control group significantly exceeded an experimental group in achievement ($p < .05$). The entries in Table 2 are the main effects for the entire samples involved in the studies, unless otherwise noted.

Taken together, the effects of cooperative learning methods on student achievement are clearly positive. Of the 46 studies, 29 (63%) showed cooperative learning methods to have significantly positive (or, in one case, marginally positive) effects on student achievement, 15 (33%) found no differences, and 2 (4%) found significantly higher achievement for a control group than for a cooperative treatment.

However, the overall picture masks important differences between studies. Table 3 illustrates these differences by breaking down the achievement results by type of incentive and type of task (group study vs. task specialization). As can be seen in the top half of Table 3, there is a dramatic difference in

(*text continues on page 438*)

Table 2
Characteristics and Achievement Outcomes of Cooperative Learning Field Experiments

Major reports	*N*	Grade level	Duration (weeks)	Level of random assignment	Location	Subject area	Achievement effects
Group study with group reward for learning							
Student Teams-Achievement Divisions (STAD)							
Slavin, 1978b	205	7	10	Class	Rural town East	Language arts	0
Slavin, Note 6	62	7	10	Class	Urban East	Language arts	+
Slavin, 1980b	424	4	12	Class	Rural East	Language arts	+
Slavin, 1979	424	7–8	12	Class	Urban East	Language arts	0
Slavin & Oickle, 1981	230	6–8	12	Class	Rural East	Language arts	
Black students							+
White students							0
Madden & Slavin, in press	175	3–6	6	Class	Urban East	Mathematics	+
Allen & VanSickle, Note 7	51	9	6	Class	Rural South	Geography	+
Slavin & Karweit, Note 8	569	9	30	Teacher	Urban East	Mathematics	+
Huber, Bogatzki, & Winter, Note 2	170	7	3	Class	Urban Germany	Mathematics	+
Sharan, in press	436	7	16	Teacher	Urban Israel	English as a second language	+
Teams-Games-Tournament (TGT)							
Edwards, DeVries, & Snyder, 1972	96	7	9	Class	Urban East	Mathematics	+
Edwards & DeVries, Note 9	117	7	4	Student	Urban East	Mathematics	0
Edwards & DeVries, Note 10	128	7	12	Student	Urban East	Mathematics	+
						Social studies	0
Hulten, & DeVries, Note 11	299	7	10	Class	Urban East	Mathematics	+
DeVries, Edwards, & Wells, Note 12	191	10–12	12	Class	Suburban South	Social studies	(+)
DeVries & Mescon, Note 13	60	3	6	Student	Suburban East	Language arts	+
DeVries, Mescon, & Shackman, Note 14	53	3	6	Student	Suburban East	Language arts	+
DeVries, Mescon, & Shackman, Note 15	53	3	5	Student	Suburban East	Reading	+
DeVries, Lucasse, & Shackman, Note 16	1742	7–8	10	Teacher	Suburban Midwest	Language arts	+
Combined student team learning program (STAD + TGT + Jigsaw II)							
Slavin & Karweit, 1981	559	4–5	16	Nonrandom (Matched)	Rural East		
Language arts (STAD)							+
Mathematics (TGT)							0
Social studies (Jigsaw II)							0
Reading (STAD, Jigsaw II)							+

Table 2 (*continued*)

Table 2 (*continued*)

Major reports	N	Grade level	Duration (weeks)	Level of random assignment	Location	Subject area	Achievement effects
Team Assisted Individualization (TAI)							
Slavin, Leavey, & Madden, in press							
Experiment 1	506	3–5	8	School	Suburban East	Mathematics	+
Experiment 2	320	4–6	10	Nonrandom (Matched)	Suburban East	Mathematics	+
Slavin, Leavey, & Madden, Note 4	1317	3–5	24	Nonrandom (Matched)	Suburban East	Mathematics	+
Other							
Humphreys, Johnson, & Johnson, 1982 (Learning Together with Group Reward for Learning)	44	9	6	Student	Suburban Midwest	Science	+
Hamblin, Hathaway, & Wodarski, 1971							
Experiment 1	38	4	3	Nonrandom: Latin square	Urban Midwest	Spelling, mathematics, reading	+
Experiment 2	60	5	3	Nonrandom: Latin square	Urban Midwest	Mathematics	+
Lew & Bryant, Note 1	27	4	9	Nonrandom: ABABA'B design	Suburban East	Spelling	+
Group study with reward for group product							
Learning Together							
Johnson, Johnson, Johnson & Anderson, 1976	30	5	4	Student	Urban Midwest	Language arts	0
Johnson, Johnson, & Scott, 1978	30	5–6	10	Student	Suburban Midwest	Mathematics	–
Robertson, 1982	166	2–3	6	Class	Suburban East	Mathematics	0
Other							
Wheeler & Ryan, 1973	88	5–6	4	Student	Suburban Midwest	Social studies	0
Peterson & Janicki, 1979	100	4–6	2	Student	Rural Midwest	Mathematics	0
Group study with individual reward							
Peterson, Janicki, & Swing, 1981	93	4–5	2	Student	Rural Midwest	Mathematics	0
Webb & Kenderski, in press	107	7–8	3	Nonrandom (Matched)	Urban California	Mathematics	0
Starr & Schuerman, 1974	48	7	3	Class	Suburban Midwest	Life science	0
Huber, Bogatzki, & Winter, Note 2	204	7	3	Class	Urban Germany	Mathematics	0

Table 2 (*continued*)

Major reports	*N*	Grade level	Duration (weeks)	Level of random assignment	Location	Subject area	Achievement effects
			Task specialization with group reward for learning				
Jigsaw II							
Ziegler, 1981	146	6	8	Class	Urban Canada	Social studies	+
			Task specialization with group reward for group product				
Group investigation							
Sharan, Hertz-Lazarowitz, & Ackerman, 1980	217	2–6	3	Nonrandom (Matched)	Urban Israel	Social studies	Grade 2, +; 3, 0; 4, +; 5, 0; 6, +
Hertz-Lazarowitz, Sapir, & Sharan, Note 5	67	8	5	Nonrandom (Matched)	Urban Israel	Arabic language and culture	0
Sharan, in press	467	7	18	Teacher	Urban Israel	English as a second language	+
Other							
Wheeler, Note 3	88	5–6	2	Student	Rural town South	Social studies	+
			Task specialization with individual reward				
Jigsaw							
Lucker, Rosenfield, Sikes, & Aronson, 1976	303	5–6	2	Nonrandom (Matched)	Urban Southwest	Social Studies	
Black and Hispanic students							+
Anglo-American students							0
Baird, Lazarowitz, Hertz-Lazarowitz, & Jenkins, in press							
Experiment 1	113	10–12	6	Nonrandom (matched)	Rural town West	Biology	0
Experiment 2	83	10–12	3	Class	Rural town West	Geology	0
Experiment 3	69	10–12	2	Class	Rural town West	Genetics	—
Gonzales, Note 17	182	3–4	20	Nonrandom (matched)	Rural California (bilingual classes)	Social studies	0

Note. Geographical designations refer to areas of the United States. 0 indicate no differences; + indicates a statistically significant ($p < .05$) positive achievement effect; (+) indicates a marginally significant ($p < .10$) positive effect; − indicates that a control group significantly exceeded an experimental group in achievement. Adapted from *Cooperative Learning* by R. E. Slavin, New York: Longman, 1983. Copyright 1983 by Longman. Reprinted by Longman. Reprinted by permission.

achievement outcomes among the group study methods depending on their use of rewards. Of 27 studies that used group study and group rewards for individual learning, 24 (89%) found positive effects on student achievement, whereas 3 (11%) found no differences. In contrast, none of the nine studies of group study methods that did not use group rewards for individual learning found positive effects on student achievement. One (Johnson, Johnson, & Scott, 1978) found that an individualistic control group learned more than the cooperative experimental group, and the rest found no differences.

The results for studies that used task specialization are less clear because of the much smaller number of studies (10) that used this task structure. However, there is an interesting pattern to the findings. The only study to use task specialization and group rewards for individual learning (Ziegler, 1981) found strong effects on student achievement, which were maintained in a 5-month follow-up. Three of the four task specialization studies in which students were rewarded on the basis of a group product found positive achievement results. In contrast, there is little evidence to indicate that the original Jigsaw method (which uses no group rewards) increases student achievement more than control methods. The one Jigsaw study to find positive achievement effects (Lucker, Rosenfield, Sikes, & Aronson, 1976) found them only for a small subsample of minority students in a very brief study (2 weeks). No positive effects were found for Anglo-Americans in that study, or for Anglo-American or minority students in the other Jigsaw studies. Thus, this evidence suggests that the effects of task specialization methods on achievement depend on the use of group rewards, regardless of whether the rewards are based on individual learning or group performance.

Component Analyses

The evidence summarized in Table 2 presents strong support for the observation that group rewards for individual learning are critical to the effectiveness of cooperative learning

Table 3
Achievement Outcomes of Cooperative Learning Studies by Categories of Incentive and Task Structures

	Incentive structure							
	Group reward for individual learning		Group reward for group product		Individual reward		Total	
Task structure	*n*	%	*n*	%	*n*	%	*n*	%
Group study (No task specialization)								
Positive	24	89	0	0	0	0	24	67
No effect	3	11	3	75	5	100	11	31
Negative	0	0	1	25	0	0	1	3
N of studies	27		4		5		36	
Task specialization								
Positive	1	100	3	75	1	20	5	50
No effect	0	0	1	25	3	60	4	40
Negative	0	0	0	0	1	20	1	10
N of studies	1		4		5		10	
Total								
Positive	25	89	3	38	1	10	29	63
No effect	3	11	4	50	8	80	15	33
Negative	0	0	1	13	1	10	2	4
N of studies	28		8		10		46	

Note. Adapted from *Cooperative Learning* by R. E. Slavin, New York: Longman, 1983. Copyright 1983 by Longman. Reprinted by permission.

methods. Restricting attention to the group study methods, the presence or absence of group rewards for individual learning clearly discriminates methods that increase student achievement from those that do no better than control methods. Component analyses and comparisons of similar methods further bear out the importance of this factor. Slavin (1980b) varied rewards (team vs. individual) and tasks (group vs. individual) in a study of STAD. The results of this study indicated that providing recognition based on team scores (the mean of the members' improvement scores) increased student achievement regardless of whether or not the students were allowed to study together. The students who could study in groups but received no group rewards learned less than all other students, including those who studied individually and received only individual rewards. This study also found that when students in interacting groups were working toward a team reward, they helped each other substantially more than when they could work together but received no team rewards. Huber et al. (Note 2) also compared STAD with group study without group rewards and with individual study. They found that STAD students learned more than the group study and individual work students, but there were no differences between the group study and individual study conditions. Finally, a study of TGT (Hulten & DeVries, Note 11) found that providing recognition based on team scores (the mean of the members' game scores in the TGT tournaments) improved achievement whether or not students were permitted to study together. Group study itself had no effects on student achievement. Thus, these component analyses add three more evaluations of methods that use group study but not group rewards. In no case did students in the group study conditions learn more than those in control conditions, and in one case (Slavin, 1980b) they learned less. However, in all three studies, the addition of specific group rewards based on members' learning made the methods instructionally effective.

The importance of group rewards for individual learning is also shown in a comparison of the four Learning Together studies. Johnson et al. (1976, 1978) and Robertson (1982) evaluated a group study method in which students worked in small groups to complete a single group worksheet. The groups were "praised and rewarded" for working together, but there was no way for group members to see exactly how much each student learned or contributed to the group worksheet. Individual student learning was not a criterion for rewards. The Johnson et al. (1978) study found greater learning for a control group than for the cooperative learning group, and there were no differences between experimental and control groups in the Johnson et al. (1976) and Robertson (1982) studies.

In contrast, Humphreys et al. (1982) evaluated an experimental treatment that was identical to that used in the earlier Learning Together research in every respect but one; instead of being praised and rewarded as a group for completing a single worksheet, students studied together but took individual quizzes. They then received grades based on the average of their group's quizzes. Students in this treatment learned significantly more than students in an individualistic control group similar to the control groups used in the earlier Learning Together studies. Since the use of grades based on the average group members' learning is the only feature distinguishing the Humphreys et al. method from the other Learning Together methods, it can be inferred that it was the group reward for individual learning that made the difference.

The pattern of results for the studies that used a group study task, both across the different methods and within the component analyses, support an unexpected conclusion: The opportunity for students to study together makes little or no contribution to the effects of cooperative learning on achievement. Providing an opportunity for group study without providing further structure in the form of individual assessment and group reward has not been found (among the studies that meet the criteria for inclusion applied in this article) to increase student achievement more than having students work separately. In two cases (Johnson et al., 1978; Slavin, 1980b), allowing students to work together without giving them a group goal or making them dependent on one another's achievement in some other way resulted in lower achievement than was seen in conditions in which students worked alone. On the other hand, studies of group study methods in which students could earn group rewards based on group members' individual academic performance were relatively consistent in showing the superiority of these methods to individualistic, competitive, or traditional control methods. There is some suggestion that group rewards based on group members' learning increase student achievement even in the absence of group interaction (Hulten & DeVries, Note 11; Slavin, 1980b).

Setting and Design Differences Between Studies

It could be argued that setting and design differences between studies may explain some differences in achievement outcomes. Table 4 summarizes the outcomes of the cooperative learning studies broken down by important methodological characteristics.

As is apparent in Table 4, grade level has little bearing on study outcomes. Positive effects were only slightly more likely to be found at the elementary level (Grades 2–6) than at the secondary (Grades 6–12) level. Study duration (longer or shorter than 7 weeks) and study sample size (less than or greater than the median, 117.5) each had some effect on study outcomes. Longer and larger studies were more likely than shorter or smaller ones to find positive effects. Also, studies that used random assignment of classes, teachers, or schools, or single-subject designs, were somewhat more likely than those using matching or random assignment of students to find positive achievement effects.

However, these methodological differences do not affect the substantive conclusions. For example, 10 of the 11 smaller-than-median group reward for individual learning studies found positive effects on student achievement, whereas none of the 7 smaller-than-median studies of group study that did not use rewards based on individual learning found positive effects. Nine of the 10 shorter-than-median studies of group study with group reward for individual learning found positive achievement effects, but none of the other 8 shorter-than-median studies found positive effects.

Discussion

Cooperative Incentives Versus Group Tasks

The most striking conclusion from the cooperative learning research reviewed here is that among methods that do not use task specialization, it is the cooperative incentive structure that substantially explains the effectiveness of the cooperative learning methods. There is no evidence as of yet that group study

Table 4
Summary of Effects of Cooperative Learning on Achievement Broken Down by Setting and Design Characteristics

Characteristic	Effects on achievement: Positive *n*	Positive %	No effect *n*	No effect %	Negative *n*	Negative %	No. of studies
All studies	29	63	15	33	2	4	46
Elementary (Grades 2–6)	16	57	6	39	1	4	23
Secondary (Grades 6–12)	13	70	9	26	1	4	23
Shorter than 7 weeks	12	48	12	48	1	4	25
Longer than 7 weeks	17	81	3	14	1	5	21
Sample size ≤ 117	11	48	10	44	2	9	23
Sample size > 117	18	78	5	22	0	0	23
Random assignment of students	6	50	5	42	1	8	12
Random assignment of classes/teachers/schools	15	68	6	27	1	5	22
Nonrandom assignment (matching)	5	56	4	44	0	0	9
Single-subject designs	3	100	0	0	0	0	3

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per se makes any difference in student achievement. Perhaps this should not be surprising. The theory on which cooperative learning is based is a theory of incentive structures, not of task structures. Almost all of the early laboratory studies on cooperation involved giving money, prizes, or grades to individuals operating under various sets of cooperative, competitive, or individualistic rules. Deutsch's (1949) theory of cooperation and competition clearly assumes that the performance outcomes of these incentive systems depend on the relationship between others' behaviors and one's own rewards. Later theoretical statements (e.g., Johnson & Johnson, 1974; Slavin, 1977) also clearly focused on the reward consequences of actions taken to help or hinder others in cooperative, competitive, and individualistic incentive systems. Task interdependence (Miller & Hamblin, 1963) and type of task (Johnson & Johnson, 1974; Slavin, 1977) have been considered as conditioning or enabling components of a cooperative reward structure. Theories of task structures that would support an expectation that individuals working together without cooperative goals would perform or learn better than individuals working separately have had little impact on research. Thus, it should not come as a surprise that the cooperative learning research does not find that students working in small groups learn better, unless the group members are given clear incentives for doing well as a group.

Individual Accountability

It is apparent from the results of the cooperative learning research reviewed here that cooperative incentives themselves are not sufficient to increase student achievement. Group study methods that provide group rewards based on the quality of a group product have not been found to improve student achievement. The second ingredient that is apparently needed to make cooperative learning methods instructionally effective is *individual accountability.* That is, the best learning efforts of every member of the group must be necessary for the group to succeed, and the performance of each group member must be clearly visible and quantifiable to the other group members. In group study with reward for group product, groups are evaluated on the basis of a single worksheet, test, or project. As a result, it is possible for a single group member to do all the work. Contributions of less able group members may be considered useless at best by the group; at worst, they may be considered interruptions. Methods that fall in this category (principally the Johnson and Johnson (1975) Learning Together methods) instruct groups to encourage the participation of all members and have group members sign the group worksheet to indicate that they participated in and understood the group task. However, this may be inadequate to motivate the group members to encourage and help all members to learn the material. Ultimately, the most efficient strategy may be to poll the group's membership on each worksheet item, and to accept the answer agreed on by the more able group members. If a student asks for an explanation of the answer, it is probably inefficient to provide it. Webb's (1982) process studies of cooperating groups indicate that giving and receiving elaborated explanations are the best predictors of individual learning in group study tasks; receiving no answers or brief answers ("terminal responses") is negatively associated with learning gain. If there is little incentive for group members to provide such explanations, there is little reason to expect that they will do so. There is evidence to suggest that students believe that the purpose of worksheets is to finish them, not to learn from them (Anderson, Note 18). To expect students to altruistically care how much their classmates are learning from a worksheet is to ask a great deal.

In contrast, in group study methods in which groups are rewarded based on the sum or average of individual learning performances, there is good reason for students to care about the learning of their groupmates, because their own rewards depend on their partners' learning. A study by Hamblin et al. (1971) clearly showed that the students who learned the most from a cooperative learning experience were the ones on whom the group's success depended. When groups were given tangible rewards based on the average of the highest three scores in the group, high achievers learned much more than average or low achievers. When the rewards were given based on the average of the lowest three scores, low achievers achieved the most.

Analogously, when group success depends on the learning of all group members, all group members will learn, as is evidenced by the consistent positive achievement results of group study with group reward for individual learning.

Individual accountability in cooperative learning methods can be created in two principal ways. Averaging individual learning performances, discussed above, is one. The other is to give each student in the group a unique task. Task specialization methods are inherently high in individual accountability, because the group's success depends on the adequacy of each group member's contribution. However, the results of the task specialization studies suggest that individual accountability by itself is insufficient to increase student achievement. Group rewards are also needed. Without group rewards, there is little reason for group members to care about their groupmates' learning. In a method such as Jigsaw, students are interdependent for information, but they have little incentive to make sure that their groupmates have learned the information they have provided to them.

Thus, there are two factors that must be present if cooperative learning methods are to be more instructionally effective than traditional methods: group rewards and individual accountability. All but 4 of the 32 field experiments that used this combination of factors found significantly higher achievement for the cooperative groups than for control groups. Only 1 of the 14 studies that failed to include both group rewards and individual accountability found positive achievement effects, compared with control conditions.

Why Do Group Rewards and Individual Accountability Increase Student Achievement?

Peer norms and sanctions. The causal mechanism linking use of group rewards and individual accountability to increased student achievement in cooperative learning that has the greatest empirical as well as theoretical support is that provision of rewards based on group performance creates group member norms supporting performance. That is, if group success depends on the learning performance of all group members, group members try to make the group successful by encouraging each other to excel. Even though rewards given to groups are likely to be less finely tuned to individual performance than rewards given to individuals (see Slavin, 1977), group members are hypothesized to create a very sensitive and effective reward system for each other when the efforts of all group members are required for group success. Under these conditions, group members pay a great deal of attention to one another's efforts and socially reinforce efforts that help the group achieve its goal (see Deutsch, 1949). They are likely to pay attention to one another's learning efforts and to reinforce one another for outstanding learning performance, and to apply social disapproval to group members who are goldbricking or clowning instead of learning.

The occurrence of peer norms supporting classmates' achievement has been documented in several of the STAD and TGT studies in which students who have experienced cooperative learning are much more likely than control students to agree with such statements as, "other children in my class want me to work hard" (Edwards & DeVries, Note 10; Hulten & DeVries, Note 11; Madden & Slavin, in press; Slavin, 1978b). Students' perceptions that their classmates want them to excel probably have a strong effect on their own motivations to do so, and contrast sharply with the situation in classrooms in which individual competition for grades leads students to express norms against academic excellence (see Coleman, 1961; Slavin, Note 19). Peer norms for or against academic efforts may be more important for many students than teacher or parent pressure to achieve, especially for adolescents and for lower-class students (see Spilerman, 1971). In such cases, changing peer norms to favor academic efforts may be especially important.

In theory, group rewards based on group performance, however defined, should create group member norms favoring performance. However, this theory only applies to group member behaviors that are actually critical for the group to be successful. Therefore, it is hypothesized that in cooperative learning, only if the group reward is based on the sum of individual learning performances will interpersonal sanctions be directed at increasing the academic performance of *all* group members. If, for example, groups are judged based on a single worksheet or test produced by the group, pro-performance norms may be produced, but they should (in theory) apply only to the performance of those group members deemed by the group to have the most to contribute to the group product.

Conclusions

The results of the field experimental research on cooperative learning methods support the following conclusions:

1. Cooperative learning methods that use group rewards and individual accountability consistently increase student achievement more than control methods in many academic subjects in elementary and secondary classrooms.

2. Cooperative learning methods that use group study but not group rewards for individual learning do not increase student achievement more than control methods; there is no evidence that studying in groups per se is more or less effective than studying individually. The effects of group study depend entirely on the incentive structure used.

3. Cooperative learning methods that use task specialization and group rewards (however defined) apparently increase student achievement more than control methods, but methods that use task specialization and individual rewards do not have this effect. However, because the number of task specialization studies is small, more research of this kind will be needed before firm conclusions can be drawn.

As in earlier reviews of the general relationships between cooperative, competitive, and individualistic incentive structures and performance, the evidence summarized in this article makes it clear that research on these incentive structures must be directed at understanding the conditions under which they are most and least effective. Even in considering a relatively narrow set of outcome, setting, and implementation characteristics (studies of cooperative learning effects on individual student learning in elementary and secondary schools in field experiments of at least 2 weeks' duration), there are still important systematic differences in outcomes depending on even finer distinctions, in particular the use of group rewards based on individual learning performance.

For practitioners, the research summarized in this article clearly suggests that student achievement can be enhanced by use of cooperative learning methods that use group study and group rewards for individual learning, and possibly by other cooperative learning methods that maintain high individual accountability for students. However, as noted earlier, cooperative learning methods have been found to have positive effects on a wide range of social and emotional outcomes, such as student self-esteem, race relations, and acceptance of mainstreamed academically handicapped students (see Slavin, 1983). These noncognitive outcomes do not appear to depend to the same extent on particular incentive or task structures, and for many practical applications, these outcomes might justify the use of cooperative learning methods as long as they do not reduce student achievement.

The challenge for future research on cooperative learning and student achievement will be to understand more about how cooperative incentives function as motivators, to understand how cooperative incentives interact with variously constructed tasks to enhance student achievement, and to understand how these cooperative incentives and tasks affect actual student behavior within cooperating groups. Also, there is a continuing need for development and evaluation of new cooperative learning methods, both to solve practical problems of instruction and to expand the range of operationalizations of cooperative learning. This review would have been impossible if there had not been a wide range of cooperative learning methods evaluated in classroom settings. It is to be hoped that new methods and modifications of existing methods will be evaluated in the next several years to further increase the range of instructional alternatives in this important area.

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