

# Synthesis of Research on Cooperative Learning

The use of cooperative learning strategies results in improvements both in the achievement of students and in the quality of their interpersonal relationships.

There was once a time when it was taken for granted that a quiet class was a learning class, when principals walked down the hall expecting to be able to hear a pin drop. Today, however, many schools are using programs that foster the hum of voices in classrooms. These programs, called *cooperative learning*, encourage students to discuss, debate, disagree, and ultimately to teach one another.

Cooperative learning has been suggested as the solution for an astonishing array of educational problems: it is often cited as a means of emphasizing thinking skills and increasing higher-order learning; as an alternative to ability grouping, remediation, or special education; as a means of improving race relations and acceptance of mainstreamed students; and as a way to prepare students for an increasingly collaborative work force. How many of these claims are justified? What effects do the various cooperative learning methods have on student achievement and other outcomes? Which forms of cooperative learning are most effective, and what components must be in place for cooperative learning to work?

To answer these questions, I've synthesized in this article the findings of

studies of cooperative learning in elementary and secondary schools that have compared cooperative learning to traditionally taught control groups studying the same objectives over a period of at least four weeks (and up to a full school year or more). Here I present a brief summary of the effects of cooperative learning on achievement and noncognitive outcomes; for a more extensive review, see *Cooper-*

*ative Learning: Theory, Research, and Practice* (Slavin 1990).

## Cooperative Learning Methods

There are many quite different forms of cooperative learning, but all of them involve having students work in small groups or teams to help one another learn academic material. Cooperative learning usually supplements the teacher's instruction by giv-

## Highlights of Research on Cooperative Learning

In cooperative learning, students work in small groups to help one another master academic material. There are many quite different forms of cooperative learning, and the effectiveness of cooperative learning (particularly for achievement outcomes) depends on the particular approach used.

- For enhancing student achievement, the most successful approaches have incorporated two key elements: group goals and individual accountability. That is, groups are rewarded based on the individual learning of all group members.

- When group goals and individual accountability are used, achievement effects of cooperative learning are consistently positive; 37 of 44 experimental/control comparisons of at least four weeks' duration have found significantly positive effects, and none have favored traditional methods.

- Achievement effects of cooperative learning have been found to about the same degree at all grade levels (2-12), in all major subjects, and in urban, rural, and suburban schools. Effects are equally positive for high, average, and low achievers.

- Positive effects of cooperative learning have been consistently found on such diverse outcomes as self-esteem, intergroup relations, acceptance of academically handicapped students, attitudes toward school, and ability to work cooperatively.

—Robert E. Slavin

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**Cooperative learning  
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ing students an opportunity to discuss information or practice skills originally presented by the teacher; sometimes cooperative methods require students to find or discover information on their own. Cooperative learning has been used—and investigated—in every imaginable subject in grades 2–12, and is increasingly used in college.

Small-scale laboratory research on cooperation dates back to the 1920s (see Deutsch 1949; Slavin 1977a); research on specific applications of cooperative learning to the classroom began in the early 1970s. At that time, four research groups, one in Israel and three in the U.S., began independently to develop and study cooperative learning methods in classroom settings.

Now researchers all over the world are studying practical applications of cooperative learning principles, and many cooperative learning methods have been evaluated in one or more experimental/control comparisons. The best evaluated of the cooperative models are described below (adapted from Slavin 1990). These include four Student Team Learning variations, Jigsaw, Learning Together, and Group Investigation.



### **Student Team Learning**

Student Team Learning (STL) techniques were developed and researched at Johns Hopkins University. More than half of all experimental studies of practical cooperative learning methods involve STL methods.

All cooperative learning methods share the idea that students work together to learn and are responsible for one another's learning as well as their own. STL methods, in addition to this idea, emphasize the use of team goals and team success, which can only be achieved if all members of the team learn the objectives being taught. That is, in Student Team Learning the students' tasks are not to *do* something as a team but to *learn* something as a team.

Three concepts are central to all Student Team Learning methods: *team rewards*, *individual accountability*, and *equal opportunities for success*. Using STL techniques, teams earn certificates or other team rewards if they achieve above a designated criterion. The teams are not in competition to earn scarce rewards; all (or none) of the teams may achieve the criterion in a given week. *Individual accountability* means that the team's success depends on the individual learning of all team members. This focuses the activity of the team members on explaining concepts to one another and making sure that everyone on the team is ready for a quiz or other assessment that they will take without teammate help. *Equal opportunities for success* means that students contribute to their teams by improving over their own past performances. This ensures that high, average, and low achievers are equally challenged to do their best and that the contributions of all team members will be valued.

The findings of these experimental studies (summarized in this section) indicate that team rewards and individual accountability are essential elements for producing basic skills achievement (Slavin 1983a, 1983b, 1990). It is not enough to simply tell students to work together. They must have a reason to take one another's achievement seriously. Further, if students are rewarded for doing better

than they have in the past, they will be more motivated to achieve than if they are rewarded based on their performance in comparison to others, because rewards for improvement make success neither too difficult nor too easy for students to achieve (Slavin 1980).

Four principal Student Team Learning methods have been extensively developed and researched. Two are general cooperative learning methods adaptable to most subjects and grade levels: Student Teams-Achievement Divisions (STAD) and Teams-Games-Tournament (TGT). The remaining two are comprehensive curriculums designed for use in particular subjects at particular grade levels: Team Assisted Individualization (TAI) for mathematics in grades 3-6 and Cooperative Integrated Reading and Composition (CIRC) for reading and writing instruction in grades 3-5.

**Cooperative learning usually supplements the teacher's instruction by giving students an opportunity to discuss information or practice skills originally presented by the teacher.**

### **Student Teams-Achievement Divisions (STAD)**

In STAD (Slavin 1978, 1986), students are assigned to four-member learning teams mixed in performance level, sex, and ethnicity. The teacher presents a lesson, and then students work within their teams to make sure that all team members have mastered the lesson. Finally, all students take individual quizzes on the material, at which time they may *not* help one another.

Students' quiz scores are compared to their own past averages, and points are awarded based on the degree to which students can meet or exceed their own earlier performances. These points are then summed to form team scores, and teams that meet certain criteria earn certificates or other rewards. The whole cycle of activities, from teacher presentation to team practice to quiz, usually takes three to five class periods.

STAD has been used in a wide variety of subjects, from mathematics to language arts and social studies. It has been used from grade 2 through college. STAD is most appropriate for teaching well-defined objectives with single right answers, such as mathematical computations and applications, language usage and mechanics, geography and map skills, and science facts and concepts.

### **Teams-Games-Tournament (TGT)**

Teams-Games-Tournament (DeVries and Slavin 1978; Slavin 1986) was the first of the Johns Hopkins cooperative learning methods. It uses the same teacher presentations and teamwork as in STAD, but replaces the quizzes with weekly tournaments. In these, students compete with members of other teams to contribute points to their team scores. Students compete at three-person "tournament tables" against others with similar past records in mathematics. A "bumping" procedure changes table assignments to keep the competition fair. The winner at each tournament table brings the same number of points to his or her team, regardless of which table it is; this means that low achievers (competing with other low achievers) and high achievers (competing with other



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high achievers) have equal opportunities for success. As in STAD, high-performing teams earn certificates or other forms of team rewards. TGT is appropriate for the same types of objectives as STAD.

*Team Assisted Individualization (TAI)* Team Assisted Individualization (TAI; Slavin et al. 1986) shares with STAD and TGT the use of four-member mixed ability learning teams and certificates for high-performing teams. But where STAD and TGT use a single pace of instruction for the class, TAI combines cooperative learning with individualized instruction. Also, where STAD and TGT apply to most subjects and grade levels, TAI is specifically designed to teach mathematics to students in grades 3-6 (or older students not ready for a full algebra course).

In TAI, students enter an individualized sequence according to a placement test and then proceed at their

own rates. In general, team members work on different units. Teammates check each others' work against answer sheets and help one another with any problems. Final unit tests are taken without teammate help and are scored by student monitors. Each week, teachers total the number of units completed by all team members and give certificates or other team rewards to teams that exceed a criterion score based on the number of final tests passed, with extra points for perfect papers and completed homework.

Because students take responsibility for checking each others' work and managing the flow of materials, the teacher can spend most of the class time presenting lessons to small groups of students drawn from the various teams who are working at the same point in the mathematics sequence. For example, the teacher might call up a decimals group, present a lesson, and then send the students back to their teams to work on problems. Then the teacher might call the fractions group, and so on.

#### *Cooperative Integrated Reading and Composition (CIRC)*

The newest of the Student Team Learning methods is a comprehensive program for teaching reading and writing in the upper elementary grades called Cooperative Integrated Reading and Composition (CIRC) (Stevens et al. 1987). In CIRC, teachers use basal or literature-based readers and reading groups, much as in traditional reading programs. However, all students are assigned to teams composed of two pairs from two different reading groups. For example, a team might have two "Bluebirds" and two "Redbirds." While the teacher is working with one reading group, the paired students in the other groups are working on a series of cognitively engaging activities, including reading to one another, making predictions about how narrative stories will come out, summarizing stories to one another, writing responses to stories, and practicing spelling, decoding, and vocabulary. If the reading class is not divided into homogeneous reading

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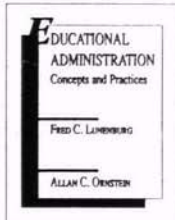
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groups, all students in the teams work with one another. Students work as a total team to master "main idea" and other comprehension skills. During language arts periods, students engage in writing drafts, revising and editing one another's work, and preparing for "publication" of team books.

In most CIRC activities, students follow a sequence of teacher instruction, team practice, team pre-assessments, and quizzes. That is, students do not take the quiz until their teammates have determined that they are ready. Certificates are given to teams based on the average performance of all team members on all reading and writing activities.

#### **Other Cooperative Learning Methods**

##### *Jigsaw*

Jigsaw was originally designed by Elliot Aronson and his colleagues (1978). In Aronson's jigsaw method, students are assigned to six-member teams to work on academic material that has been broken down into sections. For example, a biography might be divided into early life, first accomplishments, major setbacks, later life, and impact on history. Each team member reads his or her section. Next, members of different teams who have studied the same sections meet in "expert groups" to discuss their sections. Then the students return to their teams and take turns teaching their teammates about their sections.

**Cooperative learning methods have been equally successful in urban, rural, and suburban schools and with students of different ethnic groups.**

Since the only way students can learn sections other than their own is to listen carefully to their teammates, they are motivated to support and show interest in one another's work.

Slavin (1986) developed a modification of Jigsaw at Johns Hopkins University and then incorporated it in the Student Team Learning program. In this method, called Jigsaw II, students work in four- or five-member teams as in TGT and STAD. Instead of each student's being assigned a particular section of text, all students read a common narrative, such as a book chapter, a short story, or a biography. However, each student receives a topic (such as "climate" in a unit on France) on which to become an expert. Students with the same topics meet in expert groups to discuss them, after which they return to their teams to teach what they have learned to their teammates. Then students take individual quizzes, which result in team scores based on the improvement score system of STAD. Teams that meet preset standards earn certificates. Jigsaw is primarily used in social studies and other subjects where learning from text is important.

##### *Learning Together*

David Johnson and Roger Johnson at the University of Minnesota developed the Learning Together models of cooperative learning (Johnson and Johnson 1987). The methods they have researched involve students working on assignment sheets in four- or five-member heterogeneous groups. The groups hand in a single sheet and receive praise and rewards based on the group product. Their methods emphasize team-building activities before students begin working together and regular discussions within groups about how well they are working together.

##### *Group Investigation*

Group Investigation, developed by Shlomo Sharan and Yael Sharan at the University of Tel-Aviv, is a general classroom organization plan in which students work in small groups using cooperative inquiry, group discussion, and cooperative planning and projects

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(Sharan and Sharan 1976). In this method, students form their own two- to six-member groups. After choosing subtopics from a unit being studied by the entire class, the groups further break their subtopics into individual tasks and carry out the activities necessary to prepare group reports. Each group then makes a presentation or display to communicate its findings to the entire class.

#### **Research on Cooperative Learning**

Cooperative learning methods are among the most extensively evaluated alternatives to traditional instruction in use today. Outcome evaluations include:

- academic achievement,
- intergroup relations,
- mainstreaming,
- self-esteem,
- others.

##### *Academic Achievement*

More than 70 high-quality studies have evaluated various cooperative learning methods over periods of at least four weeks in regular elementary and secondary schools; 67 of these have measured effects on student achievement (see Slavin 1990). All these studies compared the effects of cooperative learning to those of traditionally taught control groups on measures of the same objectives pursued in all



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classes. Teachers and classes were either randomly assigned to cooperative or control conditions or matched on pretest achievement level and other factors.

Overall, of 67 studies of the achievement effects of cooperative learning, 41 (61 percent) found significantly greater achievement in cooperative than in control classes. Twenty-five (37 percent) found no differences, and in only one study did the control group outperform the experimental group. However, the effects of cooperative learning vary considerably according to the particular methods used. As noted earlier, two elements must be present if cooperative learning is to be effective: *group goals* and *individual accountability* (Slavin 1983a, 1983b, 1990). That is, groups must be working to achieve some goal or to earn rewards or recognition, and the success of the group must depend on the individual learning of every group member.

In studies of methods such as STAD, TGT, TAI, and CIRC, effects on achievement have been consistently positive; 37 out of 44 such studies (84 percent) found significant positive achievement effects. In contrast, only 4 of 23 studies (17 percent) lacking group goals and individual accountability found posi-

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tive effects on student achievement. Two of these positive effects were found in studies of Group Investigation in Israel (Sharan et al. 1984; Sharan and Shachar 1988). In Group Investigation, students in each group are responsible for one unique part of the group's overall task, ensuring individual accountability. Then the group's overall performance is evaluated. Even though there are no specific group rewards, the group evaluation probably serves the same purpose.

Why are group goals and individual accountability so important? To understand this, consider the alternatives. In some forms of cooperative learning, students work together to complete a single worksheet or to solve one problem together. In such methods, there is little reason for more able students to take time to explain what is going on to their less able groupmates or to ask their opinions. When the group task is to *do* something, rather than to *learn* something, the participation of less able students may be seen as interference rather than help. It may be easier in this circumstance for students to give each other answers than to explain concepts or skills to one another.

In contrast, when the group's task is to ensure that every group member *learns* something, it is in the interests of every group member to spend time explaining concepts to his or her groupmates. Studies of students' behaviors within cooperative groups have consistently found that the students who gain most from cooperative work are those who give and receive elaborated explanations (Webb 1985). In contrast, Webb found that giving and receiving answers without explanations were *negatively* related to achievement gain. What group goals and individual accountability do is to motivate students to give explanations and to take one another's learning seriously, instead of simply giving answers.

Cooperative learning methods generally work equally well for all types of students. While occasional studies find particular advantages for high or low achievers, boys or girls, and so on, the great majority find equal benefits for

all types of students. Sometimes teachers or parents worry that cooperative learning will hold back high achievers. The research provides absolutely no support for this claim; high achievers gain from cooperative learning (relative to high achievers in traditional classes) just as much as do low and average achievers (see Slavin, this issue, p. 63).

Research on the achievement effects of cooperative learning has more often taken place in grades 3-9 than 10-12. Studies at the senior high school level are about as positive as those at earlier grade levels, but there is a need for more research at that level. Cooperative learning methods have been equally successful in urban, rural, and suburban schools and with students of different ethnic groups (although a few studies have found particularly positive effects for black students; see Slavin and Oickle 1981).

Among the cooperative learning methods, the Student Team Learning programs have been most extensively researched and most often found instructionally effective. Of 14 studies of STAD and closely related methods, 11 found significantly higher achievement for this method than for traditional instruction, and two found no differences. For example, Slavin and Karweit (1984) evaluated STAD over an entire school year in inner-city Philadelphia 9th grade mathematics classes. Student performance on a standardized mathematics test increased significantly more than in either a mastery learning group or a control group using the same materials. Substantial differences favoring STAD have been found in such diverse subjects as social studies (e.g., Allen and Van Sickle 1984), language arts (Slavin and Karweit 1981), reading comprehension (Stevens, Slavin, Farnish, and Madden 1988), mathematics (Sherman and Thomas 1986), and science (Okebukola 1985). Nine of 11 studies of TGT found similar results (DeVries and Slavin 1978).

The largest effects of Student Team Learning methods have been found in studies of TAI. Five of six studies found substantially greater learning of mathematics computations in TAI than in



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control classes, while one study found no differences (see Slavin 1985b). Experimental control differences were still substantial (though smaller) a year after the students were in TAI (Slavin and Karweit 1985). In mathematics concepts and applications, one of three studies (Slavin et al. 1984) found significantly greater gains in TAI than control methods, while two found no significant differences (Slavin and Karweit 1985).

In comparison with traditional control groups, three experimental studies of CIRC have found substantial positive effects on scores from standardized tests of reading comprehension, reading vocabulary, language expression, language mechanics, and spelling (Madden et al. 1986, Stevens et al. 1987, Stevens et al. 1990). Significantly greater achievement on writing samples was also found favoring the CIRC students in the two studies which assessed writing.

Other than STL methods, the most consistently successful model for increasing student achievement is Group Investigation (Sharan and Sharan 1976). One study of this method (Sharan et al. 1984) found that it increased the learning of English as a foreign language, while Sharan and Shachar (1988) found positive effects of Group Investigation on the learning of history and geography. A third study of only three weeks' duration (Sharan et al. 1980) also found positive effects on social studies achievement, particularly on higher-level concepts. The Learning Together methods (Johnson and Johnson 1987) have been found instructionally effective when they include the assignment of group grades based on the average of group members' individual quiz scores (e.g., Humphreys et al. 1982, Yager et al. 1985). Studies of the original Jigsaw method have not generally supported this approach (e.g., Moskowitz et al. 1983); but studies of Jigsaw II, which uses group goals and individual accountability, have shown positive effects (Mattingly and VanSickle 1990, Ziegler 1981).

## **We now see the usefulness of cooperative learning strategies . . . at a variety of grade levels and in many subjects.**

### *Intergroup Relations*

In the laboratory research on cooperation, one of the earliest and strongest findings was that people who cooperate learn to like one another (Slavin 1977b). Not surprisingly, the cooperative learning classroom studies have

found quite consistently that students express greater liking for their classmates in general as a result of participating in a cooperative learning method (see Slavin 1983a, 1990). This is important in itself and even more important when the students have different ethnic backgrounds. After all, there is substantial evidence that, left alone, ethnic separateness in schools does not naturally diminish over time (Gerard and Miller 1975).

Social scientists have long advocated interethnic cooperation as a means of ensuring positive intergroup relations in desegregated settings. Contact Theory (Allport 1954), which is in the U.S. the dominant theory of intergroup relations, predicted that positive intergroup relations would arise from school desegregation if and only if students participated in cooperative, equal-status interaction sanctioned by the school. Research on



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cooperative learning methods has borne out the predictions of Contact Theory. These techniques emphasize cooperative, equal-status interaction between students of different ethnic backgrounds sanctioned by the school (Slavin 1985a).

In most of the research on intergroup relations, students were asked to list their best friends at the beginning of the study and again at the end. The number of friendship choices students made outside their own ethnic groups was the measure of intergroup relations.

Positive effects on intergroup relations have been found for STAD, TGT, TAI, Jigsaw, Learning Together, and Group Investigation models (Slavin 1985b). Two of these studies, one on STAD (Slavin 1979) and one on Jigsaw II (Ziegler 1981), included follow-ups of intergroup friendships several months after the end of the studies. Both found that students who had been in cooperative learning classes still named significantly more friends outside their own ethnic groups than did students who had been in control classes. Two studies of Group Investigation (Sharan et al. 1984, Sharan and Shachar 1988) found that students' improved attitudes and behaviors toward classmates of different ethnic backgrounds extended to classmates who had never been in the same groups, and a study of TAI (Oishi 1983) found positive effects of this method on cross-ethnic interactions outside as well as in class. The U.S. studies of cooperative learning and intergroup relations involved black, white, and (in a few cases) Mexican-American students. A study of Jigsaw II by Ziegler (1981) took place in Toronto, where the major ethnic groups were Anglo-Canadians and children of recent European immigrants. The Sharan (Sharan et al. 1984, Sharan and Shachar 1988) studies of Group Investigation took place in Israel and involved friendships between Jews of both European and Middle Eastern backgrounds.

#### *Mainstreaming*

Although ethnicity is a major barrier to friendship, it is not so large as the one

## **What group goals and individual accountability do is to motivate students to give explanations and to take one another's learning seriously, instead of simply giving answers.**

between physically or mentally handicapped children and their normal-progress peers. Mainstreaming, an unprecedented opportunity for handicapped children to take their place in the school and society, has created enormous practical problems for classroom teachers, and it often leads to social rejection of the handicapped children. Because cooperative learning methods have been successful in improving relationships across the ethnicity barrier—which somewhat resembles the barrier between mainstreamed and normal-progress students—these methods have also been applied to increase the acceptance of the mainstreamed student.

The research on cooperative learning and mainstreaming has focused on the academically handicapped child. In one study, STAD was used to attempt to integrate students performing two years or more below the level of their peers into the social structure of the classroom. The use of STAD significantly reduced the degree to which the normal-progress students rejected their mainstreamed classmates and increased the academic achievement and self-esteem of all students, mainstreamed as well as normal-progress (Madden and Slavin 1983). Similar effects have been found for TAI (Slavin et al. 1984), and other research using cooperative teams has also shown significant improvements in relationships between mainstreamed academically

handicapped students and their normal-progress peers (Ballard et al. 1977, Cooper et al. 1980).

In addition, one study in a self-contained school for emotionally disturbed adolescents found that the use of TGT increased positive interactions and friendships among students (Slavin 1977a). Five months after the study ended, these positive interactions were still found more often in the former TGT classes than in the control classes. In a study in a similar setting, Janke (1978) found that the emotionally disturbed students were more on-task, were better behaved, and had better attendance in TGT classes than in control classes.

#### *Self-Esteem*

One of the most important aspects of a child's personality is his or her self-esteem. Several researchers working on cooperative learning techniques have found that these methods do increase students' self-esteem. These improvements in self-esteem have been found for TGT and STAD (Slavin 1990), for Jigsaw (Blaney et al. 1977), and for the three methods combined (Slavin and Karweit 1981). Improvements in student self-concepts have also been found for TAI (Slavin et al. 1984).

#### *Other Outcomes*

In addition to effects on achievement, positive intergroup relations, greater acceptance of mainstreamed students, and self-esteem, effects of cooperative learning have been found on a variety of other important educational outcomes. These include liking school, development of peer norms in favor of doing well academically, feelings of individual control over the student's own fate in school, and cooperativeness and altruism (see Slavin 1983a, 1990). TGT (DeVries and Slavin 1978) and STAD (Slavin 1978, Janke 1978) have been found to have positive effects on students' time-on-task. One study found that lower socioeconomic status students at risk of becoming delinquent who worked in cooperative groups in 6th grade had better attendance, fewer contacts with the police, and higher behavioral ratings by teachers in grades 7–11 than did



control students (Hartley 1976). Another study implemented forms of cooperative learning beginning in kindergarten and continuing through the 4th grade (Solomon et al. 1990). This study found that the students who had been taught cooperatively were significantly higher than control students on measures of supportive, friendly, and prosocial behavior; were better at resolving conflicts; and expressed more support for democratic values.

### Useful Strategies

Returning to the questions at the beginning of this article, we now see the usefulness of cooperative learning strategies for improving such diverse outcomes as student achievement at a variety of grade levels and in many subjects, intergroup relations, relationships between mainstreamed and normal-progress students, and student self-esteem. Further, their widespread and growing use demonstrates that cooperative learning methods are practical and attractive to teachers. The history of the development, evaluation, and dissemination of cooperative learning is an outstanding example of the use of educational research to create programs that have improved the educational experience of thousands of students and will continue to affect thousands more. □

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