CHAPTER 9

# Cooperative Learning and Achievement: Theory and Research

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Research on cooperative learning is one of the greatest success stories in the history of educational research. Although there is some research on this topic from the early days of the last century, the amount and quality of that research greatly accelerated in the early 1970s and continues today, more than a quarter-century later. Hundreds of studies have compared cooperative learning to various control methods on a broad range of outcome measures, but by far the most frequent objective of this research is to determine the effects of cooperative learning on student achievement. Studies of the achievement effects of cooperative learning have taken place in every major subject, at all grade levels, and in all types of educational settings in many countries. Both field studies and laboratory studies have produced a great deal of knowledge about the effects of many types of cooperative interventions and about the mechanisms responsible for these effects. Further, cooperative learning is not only a subject of research and theory; it is used at some level by millions of teachers. One national survey (Puma, Jones, Rock, & Fernandez, 1993) found that 79% of elementary teachers and 62% of middle school teachers reported making some sustained use of cooperative learning. By 1998, a study by Antil, Jenkins, Wayne, and Vadasy found that 93% of teachers sampled reported using cooperative learning, with 81% reporting daily use.

Given the substantial body of research on cooperative learning and the widespread use of cooperative learning techniques, it might be assumed that there is little further research to be done. Yet this is not the case. There are many important unresolved research questions on this topic, and a great deal of development and evaluation is still needed. In its fullest conception, cooperative learning provides a radically different approach to instruction, whose possibilities have been tapped only on a limited basis.

According to David Johnson and Roger Johnson (1999), two of the leading authorities in the field, "cooperative learning exists when students work together to accomplish shared learning goals" (p. 1). Though conceptually straightforward, the functional definition of cooperative learning is the subject of considerable discussion and will be at issue throughout this chapter.

Although there is a fair consensus among researchers about the positive effects of cooperative learning on student

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achievement, as well as a rapidly growing number of educators using cooperative learning in all levels of schooling and many subject areas, there remains much confusion, even controversy, about why and how cooperative learning methods affect achievement and, most important, under what conditions cooperative learning has these effects. Different groups of researchers investigating cooperative learning effects on achievement begin with different assumptions and conclude by explaining the achievement effects of cooperative learning in terms that are substantially unrelated or contradictory. In earlier work, Slavin (1989, 1992, 1995) identified motivationalist, social cohesion, cognitive-developmental, and cognitive-elaboration as the four major theoretical perspectives on the achievement effects of cooperative learning.

The motivationalist perspective presumes that task motivation is the single most impactive part of the learning process, asserting that the other processes such as planning and helping are driven by individuals' motivated self-interest. Motivationalist-oriented scholars focus more on the reward or goal structure under which students operate, even going so far as to suggest that under some circumstances interaction may not be necessary for the benefits of cooperative goal structures to manifest (Slavin, 1995). By contrast, the social cohesion perspective (also called social interdependence theory) suggests that the effects of cooperative learning are largely dependent on the cohesiveness of the group. This perspective holds that students help each other learn because they care about the group and its members and come to derive self-identity benefits from group membership (Hogg, 1987; Johnson & Johnson, 1989, 1999; Turner, 1987). The two cognitive perspectives focus on the interactions among groups of students, holding that in themselves these interactions lead to better learning and thus better achievement. Within the general cognitive heading, developmentalists attribute these effects to processes outlined by scholars such as Piaget and Vygotsky. Work from the cognitive elaboration perspective asserts that learners must engage in some manner of cognitive restructuring (elaboration) of new materials in order to learn them. Cooperative learning is said to facilitate that process. One reason for the continued lack of consensus among cooperative learning scholars is that each perspective tends to approach the topic without deference to the body of similar work from other perspectives and without attending to the larger picture.

Historically, it has been useful that divergent paths of research have developed around this topic. First, the sheer amount of interest and energy that has been directed toward understanding this complex set of processes reflects a general consensus concerning the enormous implications of cooperative learning for education practice. Second, as a result, a great many possible explanations and scenarios have been explored. It should be little surprise, however, that no single explanation has been sufficient to describe fully the functioning of cooperative learning. Depending on the nature of the tasks, objectives, and students involved, any of the major perspectives can rightfully claim some explanatory power in relating students' learning to the functioning of cooperative learning.

Although disagreement among cooperative learning perspectives may have served to accelerate advancement in the field from an academic view, this disagreement has resulted in problems of confusion, skepticism, and divergent expectations among policy makers, administrators, practitioners, and the general public. Already there are a few voices advising caution. There is, for example, growing frustration among practitioners with the many different cooperative approaches that have passed through their campuses but that have inconsistently yielded the promised results (Battisch, Solomon, & Delucci, 1993). There is also pressure at the policy level. Lawmakers have begun to demand increasingly rigorous evidence of effectiveness in the reform models that receive federal and other funding. In order not to jeopardize the tremendous opportunity that is currently available in the form of public, professional, and political trust, it has become imperative that cooperative learning scholarship move beyond competitive attempts to resolve the individual terms of what we now know is a complex equation. We must move toward a unified theory, which in bringing together dissident theoretical perspectives may teach us how best to configure cooperative learning for large-scale classroom implementation under common sets of conditions.

In 30 years of intense activity in cooperative learning scholarship, there has never been an accepted cohesive model of the relationships among the important variables involved in cooperative learning. This chapter offers as a framework for discussion and continued debate a theoretical model of cooperative learning processes that intends to acknowledge the contributions of work from each of the major theoretical perspectives. It places them in a model that depicts the likely role that each plays in cooperative learning processes. This work further explores conditions under which each may operate and suggests research and development needed to advance cooperative learning scholarship so that educational practice may truly benefit from the lessons of 30 years of research.

The alternative perspectives on cooperative learning may be seen as complementary, not contradictory. For example, motivational theorists would not argue that the cognitive

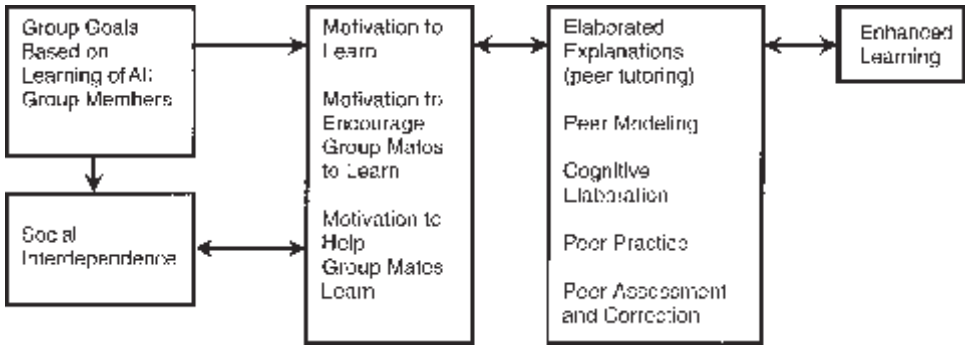


**Figure 9.1** Functional relationships among the major interaction components of group learning.

theories are unnecessary. Instead, they assert that motivation drives cognitive process, which in turn produces learning. They would argue that it is unlikely that over the long haul students would engage in the kind of elaborated explanations found by Webb (1989) to be essential to profiting from cooperative activity, without a goal structure designed to enhance motivation. Similarly, social cohesion theorists might hold that the utility of extrinsic incentives must lie in their contribution to group cohesiveness, caring, and prosocial norms among group members, which could in turn affect cognitive processes.

A simple path model of cooperative learning processes, adapted from Slavin (1995), is diagrammed in Figure 9.1. It depicts the main components of a group-learning interaction and represents the functional relationships among the major theoretical approaches to cooperative learning.

This diagram of the interdependent relationships among each of the components begins with a focus on group goals or incentives based on the individual learning of all group members. That is, the model assumes that motivation to learn and to encourage and help others to learn activates cooperative behaviors that will result in learning. This would include both task motivation and motivation to interact in the group. In this model, motivation to succeed leads to learning directly and also drives the behaviors and attitudes that lead to group cohesion, which in turn facilitates the types of group interactions—peer modeling, equilibration, and cognitive elaboration—that yield enhanced learning and academic achievement. The relationships are conceived to be reciprocal, such that as task motivation leads to the development of group cohesion, that development may reinforce and enhance task motivation. By the same token, the cognitive processes may become intrinsically rewarding and lead to increased task motivation and group cohesion.

Each aspect of the diagrammed model is well represented in the literature on theoretical and empirical cooperative learning. All have well-established rationales and some supporting evidence. What follows is a review of the basic theoretical orientation of each perspective, a description of the cooperative-learning mode that each prescribes, and a discussion of the empirical evidence supporting each.

## FOUR MAJOR THEORETICAL PERSPECTIVES

### Motivational Perspectives

Motivational perspectives on cooperative learning presume that task motivation is the most important part of the process and hold that the other processes are driven by motivation. Therefore, scholars with this perspective focus primarily on the reward or goal structures under which students operate (see Slavin, 1977, 1983a, 1995). From a motivationalist perspective (e.g., Johnson & Johnson, 1992; Slavin, 1983a, 1983b, 1995), cooperative incentive structures create a situation in which the only way group members can attain their own personal goals is if the group is successful. Therefore, to meet their personal goals, group members must both help their group mates to do whatever enables the group to succeed, and, perhaps even more important, to encourage their group mates to exert maximum efforts. In other words, rewarding groups based on group performance (or the sum of individual performances) creates an interpersonal reward structure in which group members will give or withhold social reinforcers (e.g., praise, encouragement) in response to group mates' task-related efforts (see Slavin, 1983a). One intervention that uses cooperative goal structures is group contingencies (see Slavin, 1987), in which group rewards are given based on group members' behaviors.

The theory underlying group contingencies does not require that group members actually be able to help one another or work together. That their outcomes are dependent on one

another's behavior is expected to be sufficient to motivate students to engage in behaviors that help the group to be rewarded, because the group incentive induces students to encourage goal-directed behaviors among their group mates (Slavin, 1983a, 1983b, 1995). A substantial literature in the behavior modification tradition has found that group contingencies can be very effective at improving students' appropriate behaviors and achievement (Hayes, 1976; Litow & Pumroy, 1975).

The motivationalist critique of traditional classroom organization holds that the competitive grading and informal reward systems of the classroom create peer norms opposing academic efforts (see Coleman, 1961). Because one student's success decreases the chances that others will succeed, students are likely to express norms that high achievement is for "nerds" or "teachers' pets." However, when students work together toward a common goal, they may be motivated to express norms favoring academic achievement, to reinforce one another for academic efforts.

Not surprisingly, motivational theorists build group rewards into their cooperative learning methods. In methods developed at Johns Hopkins University (Slavin, 1994, 1995), students can earn certificates or other recognition if their team's average scores on quizzes or other individual assignments exceed a preestablished criterion (see also Kagan, 1992). Methods developed by David Johnson and Roger Johnson (1994) and their colleagues at the University of Minnesota often give students grades based on group performance, which is defined in several different ways. The theoretical rationale for these group rewards is that if students value the success of the group, they will encourage and help one another to achieve.

### *Empirical Support for the Motivational Perspective*

Considerable evidence from practical applications of cooperative learning in elementary and secondary schools supports the motivationalist position that group rewards are essential to the effectiveness of cooperative learning—with one critical qualification. Use of group goals or group rewards enhances the achievement outcomes of cooperative learning if and only if the group rewards are based on the individual learning of all group members (Slavin, 1995). Most often, this means that team scores are computed based on average scores on quizzes that all teammates take individually, without teammate help. For example, in Student Teams-Achievement Divisions (STAD; Slavin, 1994) students work in mixed-ability teams to master material initially presented by the teacher. Following this, students take individual quizzes on the material, and the teams may earn certificates based on the degree to which team members have improved over their own past records. The only way the team can succeed is to ensure that all team members have learned, so the team members' activities focus on explaining concepts to one another, helping one another practice, and encouraging one another to achieve. In contrast, if group rewards are given based on a single group product (e.g., the team completes one worksheet or solves one problem), there is little incentive for group members to explain concepts to one another, and one or two group members may do all the work (see Slavin, 1995).

In assessing the empirical evidence supporting cooperative learning strategies, the greatest weight must be given to studies of longer duration. Well executed, these are bound to be more realistically generalizable to the day-to-day functioning of classroom practices. A review of 99 studies of cooperative learning in elementary and secondary schools that involved durations of at least 4 weeks compared achievement gains in cooperative learning and control groups. Of 64 studies of cooperative learning methods that provided group rewards based on the sum of group members' individual learning, 50 (78%) found significantly positive effects on achievement, and none found negative effects (Slavin, 1995). The median effect size for the studies from which effect sizes could be computed was +.32 (32% of a standard deviation separated cooperative learning and control treatments). In contrast, studies of methods that used group goals based on a single group product or provided no group rewards found few positive effects, with a median effect size of only +.07. Comparisons of alternative treatments within the same studies found similar patterns; group goals based on the sum of individual learning performances were necessary to the instructional effectiveness of the cooperative learning models (e.g., Fantuzzo, Polite, & Grayson, 1990; Fantuzzo, Riggio, Connelly, & Dimeff, 1989; Huber, Bogatzki, & Winter, 1982). The significance and implications of group goals and individual accountability is discussed in detail later in this chapter.

## Social Cohesion Perspective

A theoretical perspective somewhat related to the motivational viewpoint holds that the effects of cooperative learning on achievement are strongly mediated by the cohesiveness of the group. The quality of the group's interactions is thought to be largely determined by group cohesion. In essence, students will engage in the task and help one another learn because they identify with the group and want one another to succeed. This perspective is similar to the motivational perspective in that it emphasizes primarily motivational rather than cognitive explanations for the instructional effectiveness of cooperative learning. However, motivational theorists

hold that students help their group mates learn primarily because it is in their own interests to do so.

Social cohesion theorists, in contrast, emphasize the idea that students help their group mates learn because they care about the group. A hallmark of the social cohesion perspective is an emphasis on team-building activities in preparation for cooperative learning, and processing or group self-evaluation during and after group activities. Social cohesion theorists have historically tended to downplay or reject the group incentives and individual accountability held by motivationalist researchers to be essential. They emphasize, instead, that the effects of cooperative learning on students and on student achievement depend substantially on the quality of the group's interaction (Battisch et al., 1993). For example, Cohen (1986, pp. 69–70) stated that "if the task is challenging and interesting, and if students are sufficiently prepared for skills in group process, students will experience the process of groupwork itself as highly rewarding. . . . [N]ever grade or evaluate students on their individual contributions to the group product."

Cohen's (1994a) work, as well as that of Shlomo Sharan and Yael Sharan (1992) and Elliot Aronson and his colleagues (e.g., Aronson, Blaney, Stephan, Sikes, & Snapp, 1978), may be described as social cohesiveness theories. Cohen, Aronson, and the Sharans all use forms of cooperative learning in which students take on individual roles within the group, which Slavin (1983a) called *task specialization* methods. In Aronson's Jigsaw method, students study material on one of four or five topics distributed among the group members. They meet in expert groups to share information on their topics with members of other teams who had the same topic, and then take turns presenting their topics to the team. In the Sharans' Group Investigation (GI) method groups take on topics within a unit studied by the class as a whole, and then further subdivide the topic into tasks within the group. The students investigate the topic together and ultimately present their findings to the class as a whole. Cohen's adaptation of De Avila and Duncan's (1980) Finding Out/Descubrimiento program has students play different roles in discovery-oriented science activities.

One main purpose of the task specialization used in Jigsaw, GI, and Finding Out/Descubrimiento is to create interdependence among group members. In the Johnsons' methods a somewhat similar form of interdependence is created by having students take on roles as "checker," "recorder," "observer," and so on. The idea is that if students value their group mates (as a result of team building and other cohesiveness-building activities) and are dependent on one another, they are likely to encourage and help one another succeed. Johnson and Johnson's (1989, 1994, 1999) work straddles the social cohesion and motivationalist perspectives described in this paper; while their models do use group goals and individual accountability, their theoretical writings emphasize these as means to the development of social interdependence (group cohesion). Their prescriptive writings also emphasize team building, group self-evaluation, and other means more characteristic of social cohesion theorists. In addition, although in most cooperative learning theory and scholarship individual accountability is typically conceived as accountability to the teacher, social cohesion, it seems, would make individual accountability to the group highly salient because group members would have the best information about member efforts, even in the absence of explicit task accountability.

### *Empirical Support for the Social Cohesion Perspective*

There is some evidence that the achievement effects of cooperative learning depend on social cohesion and the quality of group interactions (Ashman & Gillies, 1997; Battisch et al., 1993). The achievement outcomes of cooperative learning methods that emphasize task specialization are less clear. Research on the original form of Jigsaw has not generally found positive effects of this method on student achievement (Slavin, 1995). One problem with this method is that students have limited exposure to material other than that which they studied themselves, so learning gains on their own topics may be offset by losses on their group mates' topics. In contrast, there is evidence that when it is well implemented, GI can significantly increase student achievement (Sharan & Shachar, 1988). In studies of at least 4 weeks' duration, the Johnsons' (1994) methods have not been found to increase achievement more than individualistic methods unless they incorporate group rewards (in this case, group grades) based on the average of group members' individual quiz scores (see Slavin, 1995). Studies of forms of Jigsaw that have added group rewards to the original model have found positive achievement outcomes (Mattingly & Van Sickle, 1991).

Research on practical classroom applications of methods based on social cohesion theories provides inconsistent support for the proposition that building cohesiveness among students through team building alone (i.e., without group incentives) will enhance student achievement. There is some evidence that group processing activities, such as reflection at the end of each class period on the group's activities, can enhance the achievement effects of cooperative learning (Yager, Johnson, Johnson, & Snider, 1986). On the other hand, an Israeli study found that team-building activities had no effect on the achievement outcomes of Jigsaw (Rich, Amir, & Slavin, 1986).

In general, methods that emphasize team building and group process but do not provide specific group rewards

based on the learning of all group members are no more effective than traditional instruction in increasing achievement (Slavin, 1995), although there is evidence that these methods can be effective if group rewards are added to them.

Chapman (2001) reported on three studies that assessed the impact of social cohesion in cooperative learning under three different incentive structures. In two of these studies students selected from their classmates those with whom they would and would not like to work. Students were then assigned to one of two types of groups. Low-cohesion groups were composed of no preferred students and some rejected students. High-cohesion groups were composed of no rejected students and some selected students. Students then studied in groups that included group goals and individual accountability, group incentives only, or no incentives. The researcher's hypothesis that results would vary according to group cohesion was not supported. The third of these studies is clearer. It examined high and low group cohesion based on task-related cohesiveness (via group processing) as opposed to social cohesiveness as in the first two studies reported. This study found a marginal advantage of high task cohesion and group goals with individual accountability combined over all of the other conditions. This finding is congruent with the body of evidence concerning group cohesion and group goals and individual accountability. One major exception is GI (Sharan & Hertz-Lazarowitz, 1980; Sharan & Shachar, 1988; Sharan & Sharan, 1992). However, in this method groups are evaluated based on their group products, which are composed of unique contributions made by each group member. Thus, this method may be using a form of the group goals and individual accountability held by motivationalist theories to be essential to the instructional effectiveness of cooperative learning.

## Cognitive Perspectives

The major alternative to the motivationalist and social cohesiveness perspectives on cooperative learning, both of which focus primarily on group norms and interpersonal influence, is the cognitive perspective. The cognitive perspective holds that interactions among students will in themselves increase student achievement for reasons that have to do with mental processing of information rather than with motivations. Cooperative methods developed by cognitive theorists involve neither the group goals that are the cornerstone of the motivationalist methods nor the emphasis on building group cohesiveness characteristic of the social cohesion methods. However, there are several quite different cognitive perspectives, as well as some that are similar in theoretical perspective but have developed on largely parallel tracks. The two most notable of these are described in the following sections.

### *Developmental Perspective*

One widely researched set of cognitive theories is the developmental perspective (e.g., Damon, 1984; Murray, 1982). The fundamental assumption of the developmental perspective on cooperative learning is that interaction among children around appropriate tasks increases their mastery of critical concepts. Vygotsky (1978, p. 86) defined the zone of proximal development as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in *collaboration with more capable peers* [italics added]." In his view, collaborative activity among children promotes growth because children of similar ages are likely to be operating within one another's proximal zones of development, modeling in the collaborative group behaviors that are more advanced than those that they could perform as individuals. Vygotsky (1978, p. 17) described the influence of collaborative activity on learning as follows: "Functions are first formed in the collective in the form of relations among children and then become mental functions for the individual. . . . Research shows that reflection is spawned from argument."

Similarly, Piaget (1926) held that social-arbitrary knowledge—language, values, rules, morality, and symbol systems—can be learned only in interactions with others. Peer interaction is also important in logical-mathematical thought in disequilibrating the child's egocentric conceptualizations and in providing feedback to the child about the validity of logical constructions.

There is a great deal of empirical support for the idea that peer interaction can help nonconservers become conservers. Many studies have shown that when conservers and nonconservers of about the same age work collaboratively on tasks requiring conservation, the nonconservers generally develop and maintain conservation concepts (see Bell, Grossen, & Perret-Clermont, 1985; Murray, 1982; Perret-Clermont, 1980). In fact, a few studies (e.g., Ames & Murray, 1982; Mugny & Doise, 1978) have found that both individuals in pairs of disagreeing nonconservers who had to come to consensus on conservation problems gained in conservation. The importance of peers' operating in one another's proximal zones of development was demonstrated by Kuhn (1972), who found that a small difference in cognitive level between a child and a social model was more conducive to cognitive growth than was a larger difference.

On the basis of these and other findings, many Piagetians (e.g., Damon, 1984; Murray, 1982; Wadsworth, 1984) have called for an increased use of cooperative activities in schools. They argue that interaction among students on learning tasks will lead in itself to improved student achievement. Students will learn from one another because in their discussions of the content, cognitive conflicts will arise, inadequate reasoning will be exposed, disequilibration will occur, and higher quality understandings will emerge.

From the developmental perspective, the effects of cooperative learning on student achievement would be largely or entirely due to the use of cooperative tasks. Damon (1984, p. 337) explicitly rejected the use of "extrinsic incentives as part of the group learning situation," arguing that "there is no compelling reason to believe that such inducements are an important ingredient in peer learning." In this view, opportunities for students to discuss, to argue, and to present and hear one another's viewpoints are the critical element of cooperative learning with respect to student achievement.

For example, Damon (1984, p. 335) integrated Piagetian, Vygotskian, and Sullivanian perspectives on peer collaboration to propose a "conceptual foundation for a peer-based plan of education":

1. Through mutual feedback and debate, peers motivate one another to abandon misconceptions and search for better solutions.
2. The experience of peer communication can help a child master social processes, such as participation and argumentation, and cognitive processes, such as verification and criticism.
3. Collaboration between peers can provide a forum for discovery learning and can encourage creative thinking.
4. Peer interaction can introduce children to the process of generating ideas.

One category of practical cooperative methods closely related to the developmental perspective is group discovery methods in mathematics, such as Marilyn Burns's (1981) Groups of Four method. In these techniques students work in small groups to solve complex problems with relatively little teacher guidance. They are expected to discover mathematical principles by working with unit blocks, manipulatives, diagrams, and other concrete aids. The theory underlying the presumed contribution of the group format is that in the exploration of opposing perceptions and ideas, higher order understandings will emerge; also, students operating within one another's proximal zones of development will model higher quality solutions for one another.

**Empirical Evidence for the Developmental Perspective.** Although considerable theoretical work and laboratory research points to the potential utility of developmentally based methods to cooperative learning, there is almost no research explicitly linking this conceptual work to classroom practice. It seems likely, however, that the cognitive processes described by developmental theorists are important mediating variables that can help explain the positive outcomes of effective cooperative learning methods (Slavin, 1987, 1995).

### *Cognitive Elaboration Perspective*

A cognitive perspective on cooperative learning quite different from the developmental viewpoint is one that might be called the cognitive elaboration perspective. Research in cognitive psychology has long held that if information is to be retained in memory and related to information already in memory, the learner must engage in some sort of cognitive restructuring, or elaboration, of the material (Wittrock, 1986). One of the most effective means of elaboration is explaining the material to someone else. Research on peer tutoring has long found achievement benefits for the tutor as well as the tutee (Devin-Sheehan, Feldman, & Allen, 1976). In this method students take roles as recaller and listener. They read a section of text, and then the recaller summarizes the information while the listener corrects any errors, fills in any omitted material, and helps think of ways that both students can remember the main ideas. The students switch roles on the next section.

One practical use of the cognitive elaboration potential of cooperative learning is in writing process models (Graves, 1983), in which students work in peer response groups or form partnerships to help one another draft, revise, and edit compositions. Such models have been found to be effective in improving creative writing (Hillocks, 1984), and a writing process model emphasizing use of peer response groups is part of the Cooperative Integrated Reading and Composition Writing/Language Arts program (Stevens, Madden, Slavin, & Farnish, 1987), a program that has also been used to increase student writing achievement. Part of the theory behind the use of peer response groups is that if students learn to evaluate others' writing, they will become better writers themselves, a variant of the cognitive elaboration explanation. However, it is unclear at present how much of the effectiveness of writing process models can be ascribed to the use of cooperative peer response groups as opposed to other elements (such as the revision process itself).

Other teaching models based on the cognitive elaboration perspective on cooperative learning include transactional teaching and reciprocal teaching (see chapter by Pressley in

this volume for a discussion of transactional teaching). Reciprocal teaching (Palincsar & Brown, 1984) is a method for teaching reading comprehension skills. In this technique students are taught to formulate questions for one another around narrative or expository texts. In doing so, they must process the material themselves and learn how to focus in on the essential elements of the reading passages.

**Empirical Evidence for the Cognitive Elaboration Perspective.** Donald Dansereau and his colleagues at Texas Christian University have found in a series of brief studies that college students working on structured "cooperative scripts" can learn technical material or procedures far better than can students working alone (Dansereau, 1988; O'Donnell, 1996; O'Donnell & Dansereau, 1992; Newbern, Dansereau, Patterson, & Wallace, 1994). In one of those studies, Dansereau and his colleagues found that whereas both the recaller and the listener learned more than did students working alone, the recaller learned more (O'Donnell & Dansereau, 1992). This mirrors both the peer tutoring findings and the findings of Noreen Webb (1989, 1992), who discovered that the students who gained the most from cooperative activities were those who provided elaborated explanations to others. In this research as well as in Dansereau's, students who received elaborated explanations learned more than did those who worked alone, but not as much as those who served as explainers.

Studies of reciprocal teaching have generally supported its positive effects on student achievement (O'Donell, 2000; Palincsar, 1987; Rosenshine & Meister, 1994). However, studies of group discovery methods such as Groups of Four (Burns, 1981) find few achievement benefits for students in comparison to traditional expository teaching (Davidson, 1985; Johnson, 1985; Johnson & Waxman, 1985).

## WHAT FACTORS CONTRIBUTE TO THE ACHIEVEMENT EFFECTS OF COOPERATIVE LEARNING?

Although the four perspectives discussed in this chapter can rightfully be considered complementary as they relate functionally to cooperative learning, real philosophical differences underlie the differing conceptions on how best to proceed. They differ in large part in where they locate motivation for learning behaviors. There is particular disagreement between researchers who emphasize the changes in incentive structure brought about by certain forms of cooperative learning and those who hold that changes in task structure are all that is required to enhance learning. The difficulty in settling these differences lies in the fact that research in each of the four traditions tends to establish settings and conditions favorable to that perspective. For example, most research on cooperative learning models from the motivational and social cohesiveness perspectives takes place in real classrooms over extended periods, as both extrinsic motivation and social cohesion may be assumed to take time to show their effects.

In contrast, studies undertaken from the developmental and cognitive elaboration perspectives tend to be very short, making issues of motivation moot. These latter paradigms also tend to use pairs rather than groups of four. Pairs involve a much simpler social process than groups of four, whose members may need time to develop ways of working well together. Developmental research almost exclusively uses young children trying to master conservation tasks, which bear little resemblance to the social-arbitrary learning that characterizes most school subjects; most cognitive elaboration research involves college students. Disentangling the effects is further complicated by the fact that empirical investigation and classroom applications of cooperative learning typically change aspects of both incentive and task structures, making it difficult to determine which factors are responsible for which outcomes.

Nonetheless, research on cooperative learning has moved beyond the question of whether cooperative learning is effective in accelerating student achievement to focus on the conditions under which it is optimally effective. The preceding discussion described alternative overarching theories to explain cooperative learning effects, as well as an impressive set of empirical findings associated with each. It is useful to examine the empirical cooperative learning research across the boundaries of theoretical perspective in order to determine which factors consistently contribute to or detract from the effectiveness of cooperative learning.

There are two primary ways to learn about factors that contribute to the effectiveness of cooperative learning. One is to compare the outcomes of studies of alternative methods. For example, if programs that incorporated group rewards produced stronger or more consistent positive effects (in comparison to control groups) than programs that did not, this would provide one kind of evidence that group rewards enhance the outcomes of cooperative learning. The problem with such comparisons is that the studies being compared usually differ in measures, durations, subjects, and many other factors that could explain differing outcomes. Better evidence is provided by studies that compared alternative forms of cooperative learning in a single investigation or series of investigations, such as the important series of studies reported by Chapman (2001). In these 10 studies conducted in Australian schools, Chapman and her colleagues set out to examine systematically and under a common methodological framework several of the major mediating factors that have

been identified in cooperative learning research and practice. In such studies, most factors other than those being studied can be held constant. The following sections discuss both types of studies to further explore factors that contribute to the effectiveness of cooperative learning for increasing achievement.

### Structuring Group Interactions

There is some evidence that carefully structuring the interactions among students in cooperative groups can be effective even in the absence of group rewards. For example, Meloth and Deering (1992) compared students working in two cooperative conditions. In one, students were taught specific reading comprehension strategies and were given "think sheets" to remind them to use these strategies (e.g., prediction, summarization, character mapping). In the other group students earned team scores if their members improved each week on quizzes. A comparison of the two groups on a reading comprehension test found greater gains for the strategy group (also see Meloth & Deering, 1994); Berg (1993) and Newbern et al. (1994) found positive effects of scripted dyadic methods that did not use group rewards; and Van Oudenhoven, Wiersma, and Van Yperen (1987) found positive effects of structured pair learning whether feedback was given to the pairs or only to individuals. Ashman and Gillies (1997) found better performance among students trained in specific cooperative learning skills and strategies than among untrained students. They also found that children trained in cooperative learning skills were consistently more helpful and inclusive of their peers and that the differences were maintained over the 12 weeks of the study. Webb and Farvier (1994) also found better achievement and helping behaviors among Latino and African American students but not among White or Asian students who received training in academic helping skills.

Research on reciprocal teaching (Palincsar & Brown, 1984) also shows how direct strategy instruction can enhance the effects of a technique related to cooperative learning. In this method the teacher works with small groups of students and models such cognitive strategies as question generation and summarization. The teacher then gradually turns over responsibility to the students to carry on these activities with each other. Studies of reciprocal teaching have generally found positive effects of this method on reading comprehension (Palincsar & Brown, 1984; Palincsar, Brown, & Martin, 1987; Rosenshine & Meister, 1994). Chapman (2001) compared structured group interaction (resource interdependence) to individual learning and to structured group interaction with group-interdependent reward. She reported that structuring group interactions was superior to individual learning and that the addition of group goals and individual accountability did not further enhance these effects. Such findings make it clear that the effects of group rewards based on the individual efforts of all group members in cooperative learning are largely indirect. They serve to motivate students to engage in the types of behaviors, such as providing group mates with elaborated explanations, that enhance learning outcomes. The research by Meloth and Deering (1992, 1994), Berg (1993), and others suggests that students can be directly taught to engage in cognitive and interpersonal behaviors that lead to higher achievement, without the need for group rewards.

However, there is also evidence to suggest that a combination of group rewards and strategy training produces much better outcomes than does either alone. Fantuzzo, King, and Heller (1992) study, cited earlier, directly made a direct comparison between rewards alone, strategy alone, and a combination and found the combination to be by far the most effective. Further, the outcomes of dyadic learning methods, which use group rewards as well as strategy instruction, produced some of the largest positive effects of any cooperative methods, much larger than those found in the Berg (1993) study that provided groups with structure but not rewards. As noted earlier, studies of scripted dyads also find that adding incentives adds to the effects of these strategies (O'Donnell, 1996). The consistent positive findings for Cooperative Integrated Reading and Composition (CIRC; Stevens et al., 1987), which uses both group rewards and strategy instruction, also argue for this combination.

### Group Goals and Individual Accountability

As noted earlier, several reviews of the cooperative learning literature have concluded that cooperative learning is most consistently effective when groups are recognized or rewarded based on individual learning of their members (Davidson, 1985; Ellis & Fouts, 1993; Manning & Lucking, 1991; Mergendoller & Packer, 1989; Newmann & Thompson, 1987; Slavin, 1983a, 1983b, 1989, 1992, 1995). The specific form of group goals implemented ranges from simple recognition to classroom privileges to material rewards, such as certificates. Individual accountability may be achieved by averaging students' individual quiz scores to derive the group score or by using the performance of a randomly selected individual to represent the group. In contrast, methods lacking group goals give students only individual grades or other individual feedback, with no group consequence for doing well as a group. Methods lacking individual accountability might reward groups for doing well, but the basis for this reward would be a single project, worksheet, quiz, or other product that could theoretically have been done by only one group member.

If we presume that students act solely out of self-interest, the importance of group goals and individual accountability is

in providing students with an incentive to help each other and to encourage each other to put forth maximum effort (Slavin, 1995). If students can only do as well as the group and the group can succeed only by ensuring that all group members have learned the material, then group members will be motivated to teach each other. Studies of behaviors within groups that relate most to achievement gains consistently show that students who give each other explanations (and less consistently, those who receive such explanations) are the students who learn the most in cooperative learning. Giving or receiving answers without explanation has generally been found to reduce achievement (Webb, 1989, 1992). At least in theory, group goals and individual accountability should motivate students to engage in the behaviors that increase achievement and avoid those that reduce it. If a group member wants her group to be successful, she must teach her group mates (and learn the material herself). If she simply tells her group mates the answers, they will fail the quiz that they must take individually. If she ignores a group mate who does not understand the material, the group mate will fail, and the group will fail as well.

In groups lacking individual accountability, one or two students may do the group's work, while others engage in "free riding" or "social loafing" (Latane, Williams, & Harkins, 1979; Williams & Karau, 1991). For example, in a group asked to complete a single project or solve a single problem, some students may be discouraged from participating. A group trying to complete a common problem may not want to stop and explain what is going on to a group mate who does not understand or may feel that it is useless or counterproductive to try to involve certain group mates.

The importance of group goals that can be achieved only by ensuring the learning of all group members is supported by empirical evidence that emphasizes both degree and consistency. Recall that 25 studies of methods that incorporated group goals and individual accountability produced a much higher median effect size (+.32) than did studies of other methods (+.07). Recall also that 78% of studies assessing the effectiveness of methods using group goals and individual accountability found significantly positive effects and that there were no significantly negative effects. This is compared with only 37% significantly positive effects and 14% significantly negative effects in studies of methods lacking group goals and individual accountability.

A comparison among the Johnson's methods studies (Johnson & Johnson, 1989) supports the same conclusions. Across eight studies of learning together methods in which students were rewarded based on a single worksheet or product, the median effect size was near zero (+.04). However, among four studies that evaluated forms of the program in which students were graded based on the average performance of all group members on individual assessments, three found significantly positive effects.

Finally, comparisons within the same studies consistently support the importance of group goals and individual accountability. For example, Chapman (2001) reported on five studies that compared group goals and individual accountability to other incentive formats. In two of those, cooperative learning with group goals and individual accountability resulted in better performance than did individualized incentives on a math task. Two more of the studies found similar results using a reading task. In the fifth study, mentioned earlier, resource interdependence with and without group-interdependent incentives yielded similar performance. That is, students who simply shared materials performed similarly to others who shared materials and were assigned interdependent goals. It is also noteworthy that an additional study by the same researchers compared group goals and individual accountability with and without cooperative interaction and found that the combination of group goals and individual accountability and cooperative interaction was superior to incentive alone. In four of the five comparisons made by Chapman and her associates, cooperative learning with group goals and individual accountability resulted in superior student performance in comparison to cooperation without such elements.

Fantuzzo et al. (1992) conducted a component analysis of Reciprocal Peer Tutoring (RPT). They compared four conditions in which students worked in dyads to learn math. In one, students were rewarded with opportunities to engage in special activities of their choice if the sum of the dyad's scores on daily quizzes exceeded a set criterion. In another, students were taught a structured method of tutoring each other, correcting efforts, and alternating tutor-tutee roles. A third condition involved a combination of rewards and structure, and a fourth was a control condition in which students worked in pairs but were given neither rewards nor structure. The results showed that the reward + structure condition had by far the largest effects on math achievement (+1.42) and that reward alone had much larger effects than structure alone. The reward + structure condition exceeded the structure-only condition by an effect size of +1.88, and the reward-only group exceeded control by an effect size of +.21 (the structure-only group performed less well than did the control group).

Other studies also found greater achievement for cooperative methods using group goals and individual accountability than for those that did not. Huber et al. (1982) compared a form of STAD to traditional group work lacking group goals and individual accountability. The STAD group scored significantly better on a math test (+.23). In a study of Team Assisted Individualization (TAI), Cavanaugh (1984) found that students who received group recognition based on the number of units accurately completed by all group members both learned

more (+.24) and completed more units (+.25) than did students who received individual recognition only. O'Donnell (1996) compared dyads working with and without incentives. In three experimental studies students who received explicit incentives based on their learning learned significantly more than those who did not. Okebukola (1985), studying science in Nigeria, found substantially greater achievement in STAD and teams games tournaments (TGT) methods using group goals and individual accountability than in forms of Jigsaw and Johnsons' methods that did not. In another study Okebukola (1986) found much higher achievement in classes that used a method combining cooperation and group competition (one form of group reward) than in a cooperative method that did not use group rewards of any kind (+1.28).

## IS THERE ANY ALTERNATIVE TO GROUP GOALS AND INDIVIDUAL ACCOUNTABILITY?

Many educators express discomfort with using group goals and individual accountability to manipulate motivation to achieve. Teachers often complain of the record keeping involved, and some voice philosophical objections to the idea of using extrinsic rewards to motivate learning. Such concerns raise the question of whether group goals and individual accountability are always necessary and, indeed, whether such goal structures are detrimental to continued learning.

Before exploring this question, it is important to make clear the theoretical rationale for the importance of group goals and individual accountability. This combination is designed principally to motivate students not only to work together but also to be concerned about the learning of their group mates. The assumption is that although group mates may readily interact with and help each other, without appropriate structuring this interaction and help may take the form of sharing answers or doing each other's work, rather than making certain that group mates understand the material and can independently solve problems. In cooperative learning techniques in which groups are rewarded based on the individual learning of each member, the group members want to succeed. The only way that they can make this happen is to teach and assess one another and to make certain that every group member can independently show mastery of whatever the group is studying.

Those opposed to using group goals and individual accountability in cooperative learning warn of possible costs of using rewards in classrooms. A few reviewers (e.g., Damon, 1984; Kohn, 1986) have recommended against the use of group rewards, fearing that they may undermine long-term motivation. There is little empirical evidence of undermining effects resulting from the use of group goals and individual accountability. Chapman (2001), noting that it would be "difficult to justify the use of a procedure that impacted positively on student achievement but negatively on their affective response to the subject matter" (p. 3), measured students' affective reactions to the lesson content and subject matter used in 10 studies that compared group goals and individual accountability to other incentive structures and found no evidence that the use of group goals and individual accountability had negative effects on student self-reports of subject-related attitudes. In some cases, students' attitudes were significantly more positive. This goal structure certainly does not undermine long-term achievement. Among multiyear studies, methods that incorporate group rewards based on individual learning performance have consistently shown continued or enhanced achievement gains over time (Calderón, Hertz-Lazarowitz, & Slavin, 1998; Greenwood, Delquadri, & Hall, 1989; Stevens & Slavin, 1995a, 1995b). In contrast, multiyear studies of methods lacking group rewards found few achievement effects in the short or long term (Solomon, Watson, Schaps, Battistich, & Solomon, 1990; Talmage, Pascarella, & Ford, 1984).

The rationale that assumes a cost to be incurred for using group goals and individual accountability is not well articulated in the literature but seems to derive from the ongoing debate over the relationship among reinforcement, reward, and students' intrinsic motivation. A 1994 meta-analysis (Cameron & Pierce, 1994), which supported earlier assertions that, overall, reward does not decrease students' intrinsic motivation, sparked considerable debate (Cameron & Pierce, 1996; Deci, Koestner, & Ryan, 1999; Lepper, Henderlong, & Gingras, 1999; Lepper, Keavney, & Drake, 1996). However, insofar as the use of the specific goal structure that combines group goals and individual accountability is concerned, there is little empirical evidence of these undermining effects. Moreover, the pervasive use of extrinsic incentives in elementary and secondary schools with or without cooperative learning makes the question largely moot. A more pertinent question is whether extrinsic incentives should be given at the group *and* individual level or only at the individual level (as is current practice in virtually all classrooms in existence). It remains incumbent on theorists who oppose these methods to develop and demonstrate consistent, substantial, and enduring achievement benefits of cooperative learning or other learning models that do not use this goal structure. For now, the preponderance of evidence indicates that the combination of cooperative learning strategies with group goals and individual accountability is a practical, feasible, and effective method of enhancing students' academic achievement.

However, there do appear to be a few instances in which this structure of group goals and individual accountability may not be necessary. These are cases in which achievement

gains, in comparison to control groups, have been found for cooperative learning treatments that lack group goals, individual accountability, or both of these elements. Whereas theoretical and empirical support for the centrality of group goals and individual accountability is strong for a broad range of school tasks, the following paragraphs summarize the evidence that some kinds of learning may not require these elements.

### Higher Level Cognitive Tasks

Cohen (1994b) raised the possibility that whereas group rewards and individual accountability may be necessary for lower level skills, they may not be for higher level ones. As evidence of this she cited a study by Sharan et al. (1984) that compared STAD and GI. In this study STAD and GI students performed equally well (and better than controls) on a test of English as a foreign language, and STAD students did significantly better than GI on "lower level" (knowledge) items (+.38). On "higher level" items, GI students performed nonsignificantly higher than STAD students, with a difference of less than half of a point on a 15-point test. Otherwise, there is no evidence that group rewards are less important for higher order skills, although the possibility is intriguing.

### Controversial Tasks Without Single Answers

One category of tasks that may not require group goals and individual accountability consists of tasks in which it is likely that students will benefit from hearing others thinking aloud—the classic Vygotskian paradigm. Students in collaborating groups make overt their private speech, giving peers operating at a slightly lower cognitive level on a given task a stepping stone to understanding and incorporating higher quality solutions in their own private speech (see Bershon, 1992). Tasks of this kind would be at a very high level of cognitive complexity but without a well-defined path to a solution or a single correct answer, especially tasks on which there are likely to be differences of opinion. For such tasks, the process of participating in arguments or even of listening to others argue and justify their opinions or solutions may be enough to enhance learning, even without in-group teaching, explanation, or assessment. Perhaps the best classroom evidence on this type of task is from Johnson and Johnson's (1979) studies of structured controversy, in which students argue both sides of a controversial issue using a structured method of argumentation. Other examples of such tasks might include group projects without a single right answer (e.g., planning a city) and solving complex problems (e.g., nonroutine problems in mathematics) or finding the main idea of paragraphs. In each of these cases, it may be that hearing the thinking processes of others is beneficial even in the absence of coteaching.

At the same time, is still important to note that use of group goals and individual accountability is unlikely to interfere with modeling of higher level thinking but is likely to add teaching and elaborated explanation (Webb, 1992). For example, Stevens, Slavin, and Farnish (1991) evaluated a method of teaching students to find the main ideas of paragraphs in which four-member groups first came to consensus on a set of paragraphs and then worked to make certain that every group member could find the main idea. Groups received certificates based on the performance of their members on individual quizzes. The consensus procedure evokes arguments and explanations, modeling higher quality thinking, but the teaching procedure ensures that students can each apply their new understandings.

### Voluntary Study Groups

A second category of cooperative tasks that may not require group goals and individual accountability consists of situations in which students are strongly motivated to perform well on an external assessment and can clearly see the benefits of working together. The classic instance of this is voluntary study groups common in postsecondary education, especially in medical and law schools. Medical and law students must master an enormous common body of information, and it is obvious to many students that participating in a study group will be beneficial. Although there is little extrinsic reason for students to be concerned about the success of other study group members, there is typically a norm within study groups that each member must do a good job of presenting to the group. Because study group membership is typically voluntary, study group members who do not participate effectively may be concerned about being invited back the next term.

There is little research on voluntary study groups in postsecondary institutions, and it is unclear how well this idea would apply at the elementary or secondary levels. In the United States it would seem that only college-bound high school seniors are likely to care enough about their grades to participate actively in study groups like those seen at the postsecondary level, yet it may be that similar structures could be set up by teachers and that norms of reciprocal responsibility to the group could be developed. Another problem, however, is that voluntary study groups can and do reject (or fail to select) members who are felt to have little to contribute to the group. This could not be allowed to happen in study groups sponsored by the school.

### Structured Dyadic Tasks

A third category of cooperative tasks that may not require group goals and individual accountability consists of tasks

that are so structured that learning is likely to result if students engage in them, regardless of their motivation to help their partners learn. Examples of this were discussed earlier. One is the series of studies by Dansereau (1988) and his colleagues in which pairs of college students proceeded through a structured sequence of activities to help each other learn complex technical information or procedures (see O'Donnell & Dansereau, 1992). Other examples are the two Dutch studies of spelling that also involved dyads and in which the study behavior (quizzing each other in turn) was structured and obviously beneficial (Van Oudenhoven, Van Berkum, & Swen-Koopmans, 1987; Van Oudenhoven, Wiersma, et al., 1987). In contrast to cooperative methods using group goals and individual accountability indirectly to motivate students to teach each other, these methods allow the teacher directly to motivate students to engage in structured turn-taking behaviors known to increase learning. The successful use of structured dyadic tasks in elementary schools seems largely limited to lower level rote skills such as memorizing multiplication tables, spelling lists, or place names.

As in the case of controversial tasks without single correct answers, there is evidence that adding group rewards to structured dyadic tasks enhances the effects of these strategies. Fantuzzo et al. (1990) evaluated the dyadic study strategy called Reciprocal Peer Tutoring (RPT). A simple pair study format did not increase student arithmetic achievement, but when successful dyads were awarded stickers and classroom privileges, their achievement increased markedly. A similar comparison of dyadic tutoring with and without group rewards at the college level also found that group rewards greatly enhanced the achievement effects of a structured dyadic study model (Fantuzzo et al., 1989), and a series of studies showed positive effects of the RPT model in many subjects and at many grade levels (e.g., Fantuzzo et al., 1990). A similar program combining structured reciprocal tutoring with group rewards called Classwide Peer Tutoring has also been successful in increasing student achievement in a variety of subjects and grade levels (Greenwood et al., 1989; Maheady, Harper, & Mallette, 1991).

### Communal Study Groups

Building on scholarship and research that are focused on the relationship between culture and cognitive development (Boykin, 1986, 1994; Jordan, 1992; Rogoff & Chavajay, 1995; Rogoff & Wadell, 1982; Serpell, 1979, 1993; Tharp & Gallimore, 1988; Vygotsky, 1978), researchers at Howard University have conducted a series of studies of African American children's performance after studying in communal learning groups without extrinsic group goals. Boykin (1994) and others have long maintained that there is a distinct group orientation in the culture of African American communities, which he terms *communalism.* Communal learning groups are defined for the research as groups that share materials and are administered a *communal prompt* (Hurley, 1999). The communal prompt is a set of instructions designed to make salient the common bonds of school and community shared by group members and to draw out communal tendencies that may otherwise be subdued at school. These investigations have consistently found that African American students who studied in communal groups performed better on individually administered quizzes than did similar students who studied individually (Coleman, 1998, 2001; Dill & Boykin, 2000; Hurley, 1997, 1999; Lilja, 2001) and as well (Hurley, 2000) or better (Albury, 1993; Dill & Boykin, 2000) than African American students who studied in cooperative learning groups with group goals and individual accountability.

Hurley (2000) suggested that this is due to the particularly strong group orientation in African American culture, which "insulates or exempts African-American children from some of the motivation and coordination hindrances typically associated with [cooperative learning groups]" (p. 38). Stated in the terms of this discussion, this work seems to argue that group interdependence (cohesion), as described earlier, is more readily attainable and motivating for African American students. This body of research is promising as a case where group goals and individual accountability are not essential elements of cooperative learning. By the same token, these studies found no evidence that group goals and individual accountability undermine student motivation or achievement. Moreover, though two of these studies (Coleman, 2001; Lilja, 2001) demonstrated the generalizability of these findings to longer time periods (three weeks), most of these studies have been very brief. Additional research is needed to clarify the relationship of these findings to the present discussion.

## RECONCILING THE FOUR PERSPECTIVES

The process model discussed earlier describes how group goals might operate to enhance the learning outcomes of cooperative learning. Provision of group goals based on the individual learning of all group members might affect cognitive processes directly, by motivating students to engage in peer modeling, cognitive elaboration, and practice with one another. Group goals may also lead to group cohesiveness, increasing caring and concern among group members and making them feel responsible for one another's achievement, thereby motivating students to engage in cognitive processes that enhance learning. Finally, group goals may motivate

students to take responsibility for one another independently of the teacher, thereby solving important classroom organization problems and providing increased opportunities for cognitively appropriate learning activities.

Scholars whose theoretical orientations deemphasize the utility of extrinsic rewards attempt to intervene directly on mechanisms identified as mediating variables in the model offered here. For example, social cohesion theorists intervene directly on group cohesiveness by engaging in elaborate team building and group processing training. The Sharan and Shachar (1988) GI study suggests that this can be successfully done, but it takes a great deal of time and effort. In this study, teachers were trained over the course of a full year, and then teachers and students used cooperative learning for 3 months before the study began. Earlier research on GI failed to provide a comparable level of preparation of teachers and students, and the achievement results of these studies were less consistently positive (Sharan et al., 1984).

Cognitive theorists would hold that the cognitive processes that are essential to any theory relating cooperative learning to achievement can be created directly, without the motivational or affective changes discussed by the motivationalist and social cohesion theorists. This may turn out to be accurate. For example, research on reciprocal teaching in reading comprehension (Palincsar & Brown, 1984; Rosenshine & Meister, 1994) shows promise as a means of intervening directly in peer cognitive processes. Reciprocal teaching strategies can be effective in a variety of subject areas, with students of various ages and in both controlled experiments and classroom practice (Alfassi, 1998; Carter, 1997; Hart & Speese, 1998; King & Johnson-Parent, 1999; Lederer, 2000). Long-term applications of Dansereau's (1988) cooperative scripts for comprehension of technical material and procedural instructions also seem likely to be successful.

From the perspective of the model diagrammed in Figure 9.1, starting with group goals and individual accountability permits students in cooperative learning groups to benefit from the full range of factors that are known to affect cooperative learning outcomes. Although group goals and individual accountability may not always be absolutely necessary, to ignore them would be to ignore the tool with the most consistent evidence of positive effects on student achievement.

## WHICH STUDENTS GAIN MOST? (IMPORTANT SUBPOPULATIONS)

Several studies have focused on the question of which students gain the most from cooperative learning. One particularly important question relates to whether cooperative learning is beneficial to students at all levels of prior achievement. It would be possible to argue (see, e.g., Allan, 1991; Robinson, 1990) that high achievers could be held back by having to explain material to their low-achieving group mates. However, it would be equally possible to argue that because students who give elaborated explanations typically learn more than do those who receive them (Webb, 1992), high achievers should be the students who benefit most from cooperative learning because they most frequently give elaborated explanations.

Slavin (1995) concluded that the evidence from experimental studies that met the inclusion criteria for his review supported neither position. A few studies found better outcomes for high achievers than for low, and a few found that low achievers gained the most. Most, however, found equal benefits for high, average, and low achievers in comparison with their counterparts in control groups. One 2-year study of schools using cooperative learning during most of their instructional days found that high, average, and low achievers all achieved better than did controls at similar achievement levels. However, a separate analysis of the very highest achievers, those in the top 10% and top 5% of their classes at pretest, found particularly large positive effects of cooperative learning on these students (Slavin, 1991; Stevens & Slavin, 1995b).

A number of studies have looked for possible differences in the effects of cooperative learning on students of different ethnicities. As mentioned earlier, several have found different, often more pronounced effects for African American students (Albury, 1993; Boykin, 1994; Coleman, 1998; Garibaldi, 1979; Haynes & Gebreyesus, 1992; Hurley, 1999; Johnson & Johnson, 1985; Jordan, 1992; Slavin, 1983b; Slavin & Oickle, 1981; Tharp & Galimore, 1988). However, other studies have found equal effects of cooperative learning for students of different backgrounds (see Slavin, 1995). These differing findings are likely due to differences in experimental methodologies and to differences in the forms of cooperation employed in the research. The second of these distinctions may be particularly important to educational practice. Because African American and other minority students are overrepresented among underachievers (U.S. Department of Education, 2000), it will be important to understand how students' backgrounds may mediate the effects of particular cooperative learning strategies. The communalism studies mentioned earlier and a few others have begun to explore these issues, and the evidence to date is encouraging. Despite some significant variation in methodology and in empirical findings, cooperative techniques have proven to have generally positive effects for African American, European American (Hurley, 1999; Slavin, 1985), Israeli (Rich et al., 1986), Hispanic (Calderón et al., 1998), Nigerian (Okebukola, 1986), and other cultural and ethnic groups. Still, much additional information will be

needed to ensure that cooperative learning practices are implemented in ways that meet the needs of the children being served.

Other studies have examined a variety of factors that might interact with achievement gain in cooperative learning. Okebukola (1986) and Wheeler and Ryan (1973) found that students who preferred cooperative learning learned more in cooperative methods than did those who preferred competition. Chambers and Abrami (1991) found that students on successful teams learned more than did those on less successful teams.

Finally, a small number of studies have compared variations in cooperative procedures. Moody and Gifford (1990) found that although there was no difference in achievement gains, homogeneous groups performed better than did mixed groups. Foyle, Lyman, Tompkins, Perne, and Foyle (1993) found that individuals assigned daily homework in cooperative learning classes achieved more than did those not assigned homework. Kaminski (1991) and Rich et al. (1986) found that explicit teaching of collaborative skills had no effect on student achievement. Hurley (1999) found that African American students performed best in cooperative learning groups with shared goals, whereas European American students performed best in cooperative learning groups with explicit individual accountability. Jones (1990) compared cooperative learning using group competition to an otherwise identical method that compared groups to a set standard (as in STAD). There were no achievement differences, but a few attitude differences favored the group competition.

## OUTCOMES OTHER THAN ACHIEVEMENT

Another important justification for the widespread use of cooperative learning techniques in education is that they have been associated with a host of affective, nonachievement effects. These include increases in all of the following areas: willingness to take on difficult tasks, intrinsic motivation, long-term retention, higher order thinking, metacognition, creative problem solving, ability to generalize concepts across content areas, positive attitudes toward schooling and towards curriculum content, time on task, on-task verbalization, positive cross-group relations (ethnicity, ability), fewer disruptions, psychological health, self-esteem, and emotional intelligence (Albury, 1993; Ellison & Boykin, 1994; Johnson & Johnson, 1983; Leikin & Zaslavsky, 1997; Nelson, Johnson, & Marchand-Martella, 1996; Sharan, 1980; Slavin, 1995; Yost & Tucker, 2000; Zahn, Kagan & Widaman, 1986; see Johnson & Johnson, 1999, for a detailed discussion of nonachievement benefits of cooperative learning). Thus, aside from the compelling, if somewhat pragmatic, goal of enhancing simple academic achievement, cooperative learning techniques have shown enormous potential to facilitate children's psychological health and development while preparing them for the intellectual demands of an information-dependent society.

## DIRECTIONS FOR ADDITIONAL RESEARCH

The four theoretical perspectives explaining the achievement effects of cooperative learning described in this paper are all useful in expanding our understanding of the conditions under which various forms of cooperative learning may affect student achievement. Figure 9.1, which links these theoretical perspectives in a causal model, provides a framework for predicting different causal paths by which cooperative learning might affect achievement.

In particular, the model shows the importance of group goals and individual accountability but also suggests ways that achievement might be affected more directly by introducing peer activities that may not require extrinsic motivation. This paper explores three types of tasks or situations in which group goals and individual accountability may not be necessary: controversial tasks lacking single right answers, voluntary study groups, and structured dyadic tasks. There is little research on voluntary study groups (such as those in medical or law schools), but research does find instances in which certain types of cooperative tasks are effective without group goals and individual accountability. However, there is also evidence that adding group goals and individual accountability to these tasks further enhances their instructional effectiveness.

Clearly, there is a need for further research on conditions under which group goals and individual accountability may not be necessary. As a practical matter, it is probably the case that most teachers using cooperative learning do not provide group rewards based on the individual learning of all group members and that most teachers feel that it is unnecessary and cumbersome to do so. Widespread reluctance to use extrinsic incentives, based in part on a misreading of research on the "undermining" effects of rewards on long-term motivation (Cameron & Pierce, 1994), has contributed to many educators' reluctance to use group rewards. For both theoretical and practical reasons it would be important to know how to make reward-free cooperative learning methods effective.

A related need for research concerns documenting the functional mechanisms that account for cooperative learning benefits. Too often, descriptions of the processes by which any of the important components contribute to learning reside in the domain of theory. Given recent advances in video and behavior coding methodologies, it should be possible to identify the specific behavioral manifestations of things like

social cohesion and cognitive elaboration and to quantify their relationship to performance outcomes. Such work was not a focus of this review; however, by way of example, Hurley (2000) found that the reward structure of learning groups did affect the incidence of process-loss behaviors (behaviors that detract from group functioning) among fifth-grade students studying a math task. Moreover, the incidence of such behaviors during study was negatively correlated with subsequent performance on the task. More of this sort of research will go a long way toward helping scholars to understand the facilitating effects of cooperative learning while providing guidance in the development of cooperative learning methods that have a meaningful positive impact on children's learning.

There is as yet much to learn about the effective uses of project-based learning. Most research on cooperative learning has involved the use of cooperative methods to help children master fairly well-defined skills or information. The key exceptions to this are studies by the Sharans (e.g., Sharan & Sharan, 1992) and by Elizabeth Cohen (1994b). Cooperative learning practice has shifted increasingly toward project-based or active learning (Stern, 1996), in which students work together to produce reports, projects, experiments, and so on. It is possible to make inferences to optimal conditions for project-based learning from research on more cut-and-dried content (see Slavin, 1996), and the work of Cohen and the Sharans does imply that well-implemented, project-based learning can be more effective than traditional instruction (Sharan & Shachar, 1988, is by far the best evidence of this). However, there is a great deal of work yet to be done to identify effective, replicable methods, to understand the conditions necessary for success in project-based learning, and to develop a more powerful theory and rationale to support project-based learning.

There is a need for both development and research at the intersection of cooperative learning and curriculum. Work at Johns Hopkins University and at the Success for All Foundation has for many years focused on development and evaluation of cooperative learning methods that are tied to particular subjects and grade levels, such as CIRC (Stevens et al., 1987), WorldLab (social studies and science; Slavin & Madden, 2000), and MathWings (Madden, Slavin, & Simons, 2000). Elizabeth Cohen's (1994a) Complex Instruction program and Eric Schaps's (Soloman et al., 1990) Child Development Project have also developed specific, broadly applicable curriculum materials to be used in a cooperative learning format. These contrast with most cooperative learning models, which typically provide some general guidance for how to adapt cooperative learning to different subjects and grade levels but rarely provide actual student materials. How is cooperative learning affected by the existence of specific materials? Does use of these materials improve the learning outcomes of cooperative learning? Does it make cooperative learning more likely to be implemented well in the first place and maintained over time? Or does the use of prepared materials lead to less thoughtful use of cooperative learning or less ability to adapt in situations lacking materials? These questions are more important for practice than for theory, but they are very important for practice. Not incidentally, there is a need for development of high-quality, well-developed, and well-researched cooperative curricula in many subjects and grade levels, especially at the secondary level.

Related to the need for research on curriculum-based methods is the need for research on effective strategies for professional development and follow-up to support cooperative learning. Nearly all training programs for cooperative learning make extensive use of simulations. It is at least worth documenting the effectiveness of this practice. There has been some research on the effectiveness of peer coaching to support implementations of cooperative learning (e.g., Joyce, Hersh, & McKibbin, 1983). Yet there is much more work to be done to identify strategies for professional development likely to lead to high-quality, thoughtful, and sustained implementation. A few factors worth studying might include contrasts between school-wide and teacher-by-teacher implementations, expert versus peer coaches, inservice focusing on generic principles versus specific strategies, and use of teacher learning communities (Calderón, 1994), that is, groups of teachers who meet on a regular basis to support each other's innovative efforts.

Perhaps the only determined opposition to cooperative learning within the community of professional educators has come from advocates for gifted students. There is some research on the effects of cooperative learning on gifted students both within heterogeneous classes (Stevens & Slavin, 1995b) and within separate programs for the gifted (Gallagher, 1995), and so far there is little evidence to support fears that gifted students are shortchanged by cooperative learning. One study did find that while low-ability students achieved most in heterogeneous-ability groups, high-ability students achieved most in homogeneous groups (Hooper & Hannafin, 1991). However, much more research is needed in this area to expand our understanding of the effects of different cooperative methods with gifted students and of how the effects of cooperative learning might be different in homogeneous and heterogeneous settings. On this last question, there is a broader need to study cooperative learning in the context of attempts to replace homogeneous with heterogeneous grouping, especially in middle and high schools, and to use cooperative learning instead of homogeneous reading groups in elementary schools.

This chapter focused on the achievement outcomes of cooperative learning, but of course many of the other outcomes mentioned earlier are in need of further research. In particular, further research is needed on the effects of cooperative learning on intergroup relations, self-esteem, attitudes toward schooling, acceptance of mainstreamed classmates, prosocial norms, and other outcomes (see Hawley & Jackson, 1995; Slavin, 1995).

In general, there is a need for more research on all outcomes for older students (seniors in high school and students in postsecondary institutions), as well as a need for development and evaluations of cooperative methods for young children, especially those in prekindergarten, kindergarten, and first grade.

In summary, although cooperative learning has been studied in an extraordinary number of field experiments of high methodological quality, there is still much more to be done. Cooperative learning has the potential to become a primary format used by teachers to achieve both traditional and innovative goals. Research must continue to provide the practical, theoretical, and intellectual underpinnings to enable educators to achieve this potential. This chapter has advanced a cohesive model of the relationships among the important variables involved in the functioning of cooperative learning. It offered a framework for discussion and continued debate while calling for a move away from competitive attempts to explain this complex phenomenon toward a unified theoretical model that can guide future research efforts and inform education practice.

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