anales de psicología, 2014, vol. 30, nº 3 (octubre), 785-791
http://dx.doi.org/10.6018/analesps.30.3.201201

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ISSN edición impresa: 0212-9728. ISSN edición web (http://revistas.um.es/analesps): 1695-2294

Cooperative Learning and Academic Achievement: Why Does Groupwork Work?

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Título: Aprendizaje Cooperativo y rendimiento académico: ¿Por qué funciona el trabajo grupal?
Resumen: El aprendizaje cooperativo hace referencia a los métodos de enseñanza en los que los estudiantes trabajan en pequeños grupos para ayudarse a aprender. En este artículo se revisan cuatro de las principales perspectivas teóricas sobre los efectos del aprendizaje cooperativo en el rendimiento: motivacional, cohesión social, evolutiva y elaboración cognitiva. La evidencia de la investigación práctica en el aula apoya, fundamentalmente, la perspectiva motivacional, que destaca el uso de los objetivos del grupo y la responsabilidad individual para el éxito del grupo. Sin embargo, hay condiciones en las que los métodos, derivados de las cuatro perspectivas teóricas, contribuyen al aumento del rendimiento. En este artículo se reconcilian estas cuatro perspectivas en una teoría unificada de los efectos de aprendizaje cooperativo.
Palabras clave: Aprendizaje cooperativo; rendimiento; cooperación; motivación, desarrollo

Abstract: Cooperative learning refers to instructional methods in which students work in small groups to help each other learn. Four major theoretical perspectives on achievement effects of cooperative learning are reviewed: Motivational, social cohesion, developmental, and cognitive elaboration. Evidence from practical classroom research primarily supports the motivational perspective, which emphasizes the use of group goals and individual accountability for group success. However, there are conditions under which methods derived from all four theoretical perspectives contribute to achievement gain. This chapter reconciles these perspectives in a unified theory of cooperative learning effects.
Key words: Cooperative learning; achievement; cooperation; motivation; development

Introduction

Cooperative learning refers to teaching methods in which students work together in small groups to help each other learn academic content. In one form or another, cooperative learning has been used and studied in every major subject, with students from preschool to college, and in all types of schools. Cooperative learning is used at some level by hundreds of thousands of teachers.

This article focuses on research on achievement outcomes of cooperative learning in elementary and secondary schools, and on the evidence supporting various theories to account for effects of cooperative learning on achievement. It builds on previous reviews by Rohrbeck, Ginsburg-Block, Fantuzzo, & Miller, (2003), Roseth, Johnson, & Johnson (2007), Sharan (2002), Slavin (2010, 2013), and Webb (2008).

Theoretical Perspectives on Cooperative Learning

While researchers generally agree that cooperative learning can have a positive effect on student achievement, there remains a controversy about why and how various cooperative learning methods affect achievement and, most importantly, under what conditions cooperative learning has these effects (Rohrbeck et al., 2003; Roseth et al., 2007; Sharan, 2002; Slavin, 2010, 2013; Webb, 2008). 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 (1995, 2010, 2013) 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 impactful 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. 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 (Johnson & Johnson, 2008, 1999). Within this perspective there is a special case, task specialization methods, in which students take responsibility for unique portions of a team assignment (Aronson, Blaney, Stephan, Sikes, & Snapp, 1978; Sharan & Sharan, 1992). 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.

This article offers a theoretical model of cooperative learning processes which 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 each plays in cooperative learning outcomes. This work fur-

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ther 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 the lessons of thirty 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 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 (2008) 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 pro-social 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 1. It depicts the functional relationships among the major theoretical approaches to cooperative learning.

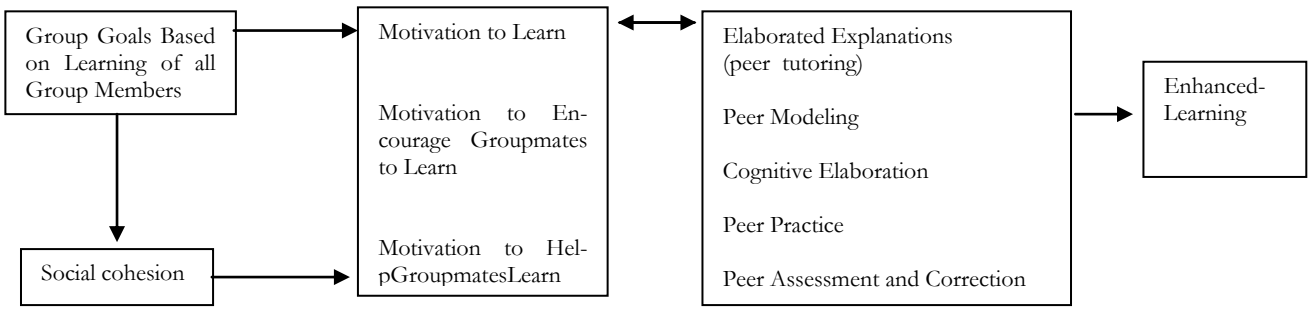

Figure 1. A Model of Cooperative Learning Effects on Learning.

The diagram of the interdependent relationships among each of the components in Figure 1 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 theoretical and empirical cooperative learning literature. 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 each prescribes, and a discussion of the empirical evidence supporting each.

Four Major Theoretical Perspectives on Cooperative Learning and Achievement

Motivational Perspectives

Motivational perspectives on cooperative learning presume that task motivation is the most important part of the process, believing that the other processes are driven by motivation. Therefore, these scholars focus primarily on the reward or goal structures under which students operate (see Slavin, 1995). From a motivationalist perspective, 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 groupmates to do whatever enables the group to succeed, and, perhaps even more importantly, to encourage their groupmates 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 groupmates' task-related efforts (see Slavin, 1983).

The motivationalist critique of traditional classroom organization holds that the competitive grading and informal reward system of the classroom creates peer norms opposing academic efforts (see Coleman, 1961). Since 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, by having 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 average team scores on quizzes or other individual assignments exceed a pre-established criterion. Methods developed by David and Roger Johnson (Johnson, Johnson, & Holubec, 2008) and their colleagues often give students grades based on group performance, which is defined in several 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 which all teammates take individually, without teammate help. For example, in Student Teams-Achievement Divisions, or 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 (for example, 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 four weeks compared achievement gains in cooperative learning and control groups. Of sixty-four studies of cooperative learning methods that provided group rewards based on the sum of group members' individual learning, fifty (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 (thirty-two percent 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., Chapman, 2001; Fantuzzo, Polite, & Grayson, 1990; Fantuzzo, Riggio, Connelly, & Dimeff, 1989).

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 groupmates learn primarily because it is in their own interests to do so. Social cohesion theorists, in contrast, emphasize the idea that students help their groupmates learn because they care about the group. A hallmark of the social cohesion perspective is an emphasis on teambuilding 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, Solomon & Delucchi, 1993). For example, Cohen (1994, pp. 82-83) stated "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...never grade or evaluate students on their individual contributions to the group product." Cohen's (1994) work, as well as that of Shlomo and Yael Sharan (1992) and Elliot Aronson and his colleagues (Aronson et. al., 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 (1983) calls "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 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 (1994) Finding Out/Descubrimiento program has students play different roles in discovery-oriented science activities.

One main purpose of the task specialization used in Jigsaw, Group Investigation, 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 groupmates (as a result of teambuilding and other cohesiveness-building activities) and are dependent on one another, they are likely to encourage and help one another to succeed.

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 (Battisch, Solomon & Delucchi, 1993; Johnson & Johnson, 2008; Webb, 2008). 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 groupmates' topics. In contrast, there is evidence that when it is well implemented, Group Investigation can significantly increase student achievement (Sharan & Shachar, 1988). In studies of at least four weeks' duration, the Johnson's (2008) methods have not generally 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 provide inconsistent support for the proposition that building cohesiveness among students through teambuilding alone (i.e., without group incentives) will enhance student achievement. In general, methods which emphasize teambuilding 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 (Johnson & Johnson, 2008.

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 which 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 which 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 Perspectives

One widely researched set of cognitive theories is the developmental perspective (e.g., Damon, 1984). 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) defines 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*" (emphasis 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 more advanced than those they could perform as individuals.

Similarly, Piaget (1926) held that social-arbitrary knowledge–language, values, rules, morality, and symbol systems– can only be learned 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 non-conservers 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). From the developmental perspective, the effects of cooperative learning on student achievement would be largely or entirely due to the use of cooperative tasks. 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.

Empirical evidence for the developmental perspective

Despite considerable support from theoretical and laboratory research, there is little evidence, from classroom experiments conducted over meaningful time periods, that "pure" cooperative methods, which depend solely on interaction, do produce higher achievement. However, it is likely that the cognitive processes described by developmental theorists are important mediating variables which can help explain the positive outcomes of effective cooperative learning methods (Slavin, 1995).

Cognitive Elaboration Perspectives

A cognitive perspective on cooperative learning quite different from the developmental viewpoint is one which 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 (Callender & McDaniel, 2009; Schunk, 2012). 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 (Calhoon, Al Otaiba, Cihak, King, & Avalos, 2007); Mathes, Torgeson, & Allor, 2001; Rohrbeck et al., 2003; Thurston, Tymms, Merrell, & Conlin, 2012; Van Keer, 2004). 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 both students can remember the main ideas. The students switch roles on the next section.

Empirical evidence for the cognitive elaboration perspective

Many brief studies have found that students working on structured "cooperative scripts" can learn technical material or procedures far better than can students working alone (O'Donnell, 2006). While both the recaller and the listener learned more than did students working alone, the recaller learned more. This mirrors both the peer tutoring findings and the findings of Noreen Webb (2008), who discovered that the students who gained the most from cooperative activities were those who provided elaborated explanations to others. Studies of Reciprocal Teaching, in which students learn to formulate questions for each other, have generally supported its positive effects on student achievement (Palincsar, Brown, & Martin, 1987; Rosenshine & Meister, 1994; O'Donnell, 2000; Sporer, Brunstein, & Kieschke, 2009).

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 & Deering (1992) compared students working in two cooperative conditions. In one, students were taught specific reading comprehension strategies and 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.

However, there is also evidence to suggest that a combination of group rewards and strategy training produces much better outcomes than either alone. The Fantuzzo et al. (1992) study, cited earlier, directly made a 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 studies 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, Madden, Slavin, & Farnish, 1987; Stevens & Slavin, 1995a, b), which uses both group rewards and strategy instruction, also argue for this combination.

Reconciling the Four Perspectives

The model shown in Figure 1 illustrates 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/or 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 which 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 de-emphasize the utility of extrinsic rewards attempt to intervene directly on mechanisms identified as mediating variables in the model described earlier. For example, social cohesion theorists intervene directly on group cohesiveness by engaging in elaborate teambuilding and group processing training. 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 chang-

es discussed by the motivationalist and social cohesion theorists.

From the perspective of the model diagrammed in Figure 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. While 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

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 article has advanced a cohesive model of the relationships among the important variables involved in the functioning of cooperative learning. It offers a framework for discussion and continued debate while calling for a move toward a unified theoretical model which can guide future research efforts and inform education practice.

Note.- This article is based on an address at a meeting of the International Association for the Study of Cooperation in Education, Scarborough, England, July 6, 2013.

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(Article received: 17-3-2014; revision received: 19-4-2014; accepted: 22-4-2014)