

# Cooperative Learning: Making "Groupwork" Work<sup>1</sup>

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## Introduction to Cooperative Learning

When students attend a college class they typically expect to sit passively and listen to a professor "profess," they expect to be evaluated based on their individual work--exams, papers, quizzes, and they bring with them a set of norms of interaction with their classmates. Based on their past experience with school, many students perceive that they are in competition with the classmates; competition over scarce resources--grades. Even when faculty use a performance based or absolute grading system students may recognize that they're not in competition with their classmates, but only vaguely sense that their classmates grades are unrelated to theirs. Student-student competitive interaction and no student-student interaction (individualistic) are the two most common ways that students perceive one another in college classrooms. This chapter describes a third choice--student-student cooperation. Cooperative interaction is the least common, but most effective for promoting students' learning and teamwork skills.

**Cooperation** is working together to accomplish shared goals. Within cooperative activities individuals seek outcomes that are beneficial to themselves and beneficial to all other group members. **Cooperative learning** is the instructional use of small groups so that students work together to maximize their own and each others' learning (Johnson, Johnson & Smith, 1991). Carefully structured cooperative learning involves people working in teams to accomplish a common goal, under conditions that involve both *positive interdependence* (all members must cooperate to complete the task) and *individual and group accountability* (each member is accountable for the complete final outcome).

During the past 90 years, nearly 600 experimental and over 100 correlational studies have been conducted comparing the effectiveness of cooperative, competitive, and individualistic efforts. These studies have been conducted by a wide variety of researchers in different decades with different age subjects, in different subject areas, and in different settings. More is known about the efficacy of cooperative learning than about lecturing, the fifty-minute class period, the use of instructional technology, or almost any other aspect of education. From this research you would expect that the more students work in cooperative learning groups the more they will learn, the better they will understand what they are learning, the easier it will be to remember what they learn, and the better they will feel about themselves, the class, and their classmates. The multiple outcomes studied can be classified into three major categories: achievement/productivity, positive relationships, and psychological health. Cooperation among students typically results in (a) higher achievement and greater productivity, (b) more caring, supportive, and committed relationships, and (c) greater psychological health, social competence, and self-esteem. A summary of the studies conducted at the higher education level may be found in Johnson,

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Johnson, & Smith (1991a, 1991b). A comprehensive review of all studies and meta-analyses of their results is available in Johnson & Johnson (1989).

Cooperative learning researchers and practitioners have shown that positive peer relationships are essential to success in college. Isolation and alienation are the best predictors of failure. Two major reasons for dropping out of college are failure to establish a social network of friends and classmates, and failure to become academically involved in classes (Tinto, 1994). Working together with fellow students, solving problems together, and talking through material together has other benefits as well (McKeachie, et al., 1986):

Student participation, teacher encouragement, and student-student interaction positively relate to improved critical thinking. These three activities confirm other research and theory stressing the importance of active practice, motivation, and feedback in thinking skills as well as other skills. This confirms that discussions. . .are superior to lectures in improving thinking and problem solving.

Astin (1993) found that two environmental factors were, by far, most predictive of positive change in college students' academic development, personal development, and satisfaction. These two factors--**interaction among students** and **interaction between faculty and students**--carried by far the largest weights and affected more general education outcomes than any other environmental variables studied, including the curriculum content factors.

In short, Astin says it appears that how students *approach* their general education and how the faculty actually *deliver* the curriculum is far more important than the formal curricular structure. More specifically, the findings strongly support a growing body of research suggesting that one of the crucial factors in the educational development of the undergraduate is the degree to which the student is actively engaged or *involved* in the undergraduate experience (e.g., Light, 1991). His research findings suggest that curricular planning efforts will reap much greater payoffs in terms of students' outcomes if we focus less on formal structure and content and put much more emphasis on pedagogy and other features of the *delivery system*, as well as on the broader interpersonal and institutional context in which learning takes place.

### **Types of Cooperative Learning Groups**

There are many ways to implement cooperative learning in college classrooms. In terms of the structure continuum, there are informal cooperative learning groups that involve very little structure (typically small, short term, ad hoc groups), informal cooperative learning groups that contain more structure (such as the bookends on a lecture format), formal cooperative learning groups that are highly structured and typically task oriented, and cooperative base groups that are long term formal groups that are created for student support and encouragement. Each has a place in providing opportunities for students to be intellectually active and personally interactive both in and outside the classroom. Informal cooperative learning is commonly used in predominately lecture classes and are described in other chapters. Formal cooperative learning

can be used in content intensive classes where the mastery of conceptual or procedural material is essential; however, many faculty find it easier to start in recitation or laboratory sections or design project courses. Base groups are long-term cooperative learning groups whose principal responsibility is to provide support and encouragement for all their members; that is, to ensure that each member gets the help he or she needs to be successful in the course and in college.

**Informal cooperative learning groups** are temporary, ad hoc groups that last from a few minutes to one class period. They are used to focus students' attention on the material to be learned, set a mood conducive to learning, help organize in advance the material to be covered in a class session, ensure that students cognitively process the material being taught, and provide closure to a class session. They are often organized so that students engage in **focused discussions** before and after a lecture and interspersing **turn-to-your-partner** discussions throughout a lecture. Informal cooperative learning groups help counter what is proclaimed as the main problem of lectures: "The information passes from the notes of the professor to the notes of the student without passing through the mind of either one."

**Base groups** are long-term, heterogeneous cooperative learning groups with stable membership whose primary responsibility is to provide each student the support, encouragement, and assistance he or she needs to make academic progress. Base groups personalize the work required and the course learning experiences. These base groups stay the same during the entire course and longer if possible. The members of base groups should exchange phone numbers and information about schedules as they may wish to meet outside of class. When students have successes, insights, questions or concerns they wish to discuss; they can contact other members of their base group. Base groups typically manage the daily paperwork of the course through the use of group folders.

The focus of this short chapter is formal cooperative learning groups, since they are probably the most difficult to implement and they have the greatest potential for affecting positive change.

### **Essential Elements: What Makes Cooperative Learning Work**

Problems that commonly occur when using formal cooperative groups may be minimized by carefully structuring the basic elements. Many faculty who believe that they are using cooperative learning are, in fact, missing its essence. There is a crucial difference between simply putting students in groups to learn and in structuring cooperation among students. Cooperation is **not** having students sit side-by-side at the same table to talk with each other as they do their individual assignments. Cooperation is **not** assigning a report to a group of students where one student does all the work and the others put their names on the product as well. Cooperation is **not** having students do a task individually with instructions that the ones who finish first are to help the slower students. Cooperation is much more than being physically near other students, discussing material with other students, helping other students, or sharing material among students, although each of these is important in cooperative learning.

To be cooperative a group must have clear positive interdependence, members must promote each other's learning and success face-to-face, hold each other personally and individually accountable to do his or her fair share of the work, appropriately use the interpersonal and small group skills needed for cooperative efforts to be successful, and process as a group how effectively members are working together. These five essential components must be present for small group learning to be truly cooperative.

Well-structured formal cooperative learning groups are differentiated from poorly structured ones on the basis of five essential elements. These essential elements should be carefully structured within all levels of cooperative efforts. The five essential elements and suggestions for structuring them are as follows:

- 1. Positive Interdependence:** The heart of cooperative learning is positive interdependence. Students must believe that they are linked with others in a way that one cannot succeed unless the other members of the group succeed (and vice versa). Students are working together to get the job done. In other words, students must perceive that they "sink or swim together." In formal cooperative learning groups, positive interdependence may be structured by asking group members to (1) agree on an answer for the group (group product--goal interdependence), (2) making sure each member can explain the groups' answer (learning goal interdependence), and (3) fulfilling assigned role responsibilities (role interdependence). Other ways of structuring positive interdependence include having common rewards such as a shared grade (reward interdependence), shared resources (resource interdependence), or a division of labor (task interdependence).
- 2. Face-to-Face Promotive Interaction:** Once a professor establishes positive interdependence, he or she must ensure that students interact to help each other accomplish the task and promote each other's success. Students are expected to explain orally to each other how to solve problems, discuss with each other the nature of the concepts and strategies being learned, teach their knowledge to classmates, explain to each other the connections between present and past learning, and help, encourage, and support each other's efforts to learn. Silent students are uninvolved students who are not contributing to the learning of others or themselves.
- 3. Individual Accountability/Personal Responsibility:** The purpose of cooperative learning groups is to make each member a stronger individual in his or her own right. Students learn together so that they can subsequently perform better as individuals. To ensure that each member is strengthened, students are held individually accountable to do their share of the work. The performance of each individual student is assessed and the results given back to the individual and perhaps to the group. The group needs to know who needs more assistance in completing the assignment, and group members need to know they cannot "hitch-hike" on the work of others. Common ways to structure individual accountability include giving an individual exam to each student, randomly calling on individual students to present their group's answer, and giving an individual oral exam while monitoring group work. In the example of a formal cooperative learning lesson that follows, individual accountability is structured by

requiring each person to learn and teach a small portion of conceptual material to two or three classmates.

4. **Teamwork Skills:** Contributing to the success of a cooperative effort requires teamwork skills. Students must have and use the needed leadership, decision-making, trust-building, communication, and conflict-management skills. These skills have to be taught just as purposefully and precisely as academic skills. Many students have never worked cooperatively in learning situations and, therefore, lack the needed teamwork skills for doing so effectively. Faculty often introduce and emphasize teamwork skills through assigning differentiated roles to each group member. For example, students learn about the challenge of documenting group work by serving as the task recorder, the importance of developing strategy and talking about how the group is working by serving as process recorder, providing direction to the group by serving as coordinator, and the difficulty of ensuring that everyone in the group understands and can explain by serving as the checker.

5. **Group Processing:** Professors need to ensure that members of each cooperative learning group discuss how well they are achieving their goals and maintaining effective working relationships. Groups need to describe what member actions are helpful and unhelpful and make decisions about what to continue or change. Such processing enables learning groups to focus on group maintenance, facilitates the learning of collaborative skills, ensures that members receive feedback on their participation, and reminds students to practice collaborative skills consistently. Some of the keys to successful processing are allowing sufficient time for it to take place, making it specific rather than vague, maintaining student involvement in processing, reminding students to use their teamwork skills during processing, and ensuring that clear expectations as to the purpose of processing have been communicated. A common procedure for group processing is to ask each group to list at least three things the group did well and at least one thing that could be improved.

The basic elements of a well-structured formal cooperative learning group are nearly identical to those of high-performance teams in business and industry as identified by Katzenbach and Smith (1993):

*A team is a **small number** of people with **complementary skills** who are committed to a **common purpose, performance goals, and approach** for which they hold themselves **mutually accountable**.*

Structuring these five essential elements is critical to the success of formal cooperative learning groups. The next section describes in detail how these elements can be structured into formal cooperative learning groups.

### **Professor's Role in Structuring Formal Cooperative Learning Groups**

Before choosing and implementing a formal cooperative learning strategy, there are several

conditions that should be evaluated to determine whether or not it is the best approach for the situation. First, is there sufficient time available for students to work in groups both inside and outside the classroom? Second, are the students experienced and skillful enough to manage their work in formal cooperative learning groups? Third, is the task complex enough to warrant a formal group? Fourth, do other instructional goals (such as the development of students' critical thinking skills, higher level reasoning skills, or teamwork skills) warrant the use of formal cooperative learning groups. If several of these necessary conditions are met, then there is probably sufficient reason to proceed to planning a formal cooperative learning lesson.

Formal cooperative learning groups may last from one class period to several weeks to complete specific tasks and assignments--such as learning new conceptual material, decision making or problem solving, writing a report, conducting a survey or experiment, preparing for an exam, or answering questions or homework problems. Any course requirement may be reformulated to be cooperative. In formal cooperative groups the professor should:

1. **Specify the objectives for the lesson.** In every lesson there should be an academic objective specifying the concepts, strategies, procedures, etc. to be learned and a teamwork objective specifying the interpersonal or small group skill to be used and mastered during the lesson.
2. **Make a number of instructional decisions.** The professor has to decide on the size of groups, the method of assigning students to groups, how long the groups stay together, the roles the students will be assigned, the materials needed to conduct the lesson, and the way the room will be arranged. Although each of these decisions is complex, some general guidelines may be useful. Further elaboration is available in Johnson, Johnson & Smith (1991). First, keep groups small, especially at the beginning. Groups of 2 or 3 maximize the involvement and help create a sense of interdependence and accountability. Second, you choose the groups. Random assignment works very well for many faculty. Stratified random (stratify students along some relevant criterion, such as computing skills or experience) and then randomly assign student from each category to all the groups. Permitting students to choose their own groups often leads to students working with friends who have a lot of other things to talk about beside the work and to some students being left out. Third, keep the groups together until the task is completed and perhaps longer. Changing groups periodically gives students a chance to meet more of their peers and helps them gain skills for quickly getting a group up and running. Fourth, choose roles that are consistent with the requirements of the task and are important for the smooth functioning of the group. Many faculty only assign a recorder for the first group assignment.
3. **Explain the task and the positive interdependence.** The professor needs to clearly define the assignment, teach the required concepts and strategies, specify the positive interdependence and individual accountability, give the criteria for success, and explain the expected teamwork skill to be engaged in. To make a group project truly cooperative, positive interdependence and individual accountability must be structured in a variety of congruent ways. Positive interdependence is typically structured by asking the group to prepare a single product (goal interdependence), asking the students to make sure each person in the group can explain the

groups' answer (learning goal interdependence), giving the group one copy of the assignment (resource interdependence), and assigning a special role to each member (role interdependence). Individual and group accountability is typically structured by assigning specific functions to each role, randomly calling on individuals to explain their group's answer, monitoring the groups and occasionally asking a student to explain his or her group's answer or method (individual oral exam), asking each member to sign the group's report, and of course, by giving individual quizzes, exams and writing assignments. Course with extensive formal cooperative learning usually use a combination of group assignments and individual assignments to determine each student's final grade. Typical distributions between individual and group are 95-5 to 70-30, that is, between 5 and 30 percent of an individual students grade is based on group work. Some faculty use the groupwork as a base line or threshold that students must complete satisfactorily, but base grades on individual work only. A few faculty in project based courses base 100 percent of each students grade on group work.

**4. Monitor students' learning and intervene within the groups to provide task assistance or to increase students' teamwork skills.** The professor systemically observes and collects data on each group as it works. When it is needed, the professor intervenes to assist students in completing the task accurately and in working together effectively. While students are working faculty can learn a great deal about what the students know about the material and can often identify problems students are having either with the academic material or working in the group. Typical things to look for are on-task, interactions (what happens when someone says something?), involvement, strategy the group is using, how the groups deal with task or group functioning difficulties, etc.

**5. Evaluate students' learning and help students process how well their group functioned.** Students' learning is carefully assessed and their performances are evaluated. A criteria-referenced evaluation procedure must be used, that is, grading must NOT be curved. Individual student's learning is typically evaluated by written exams, quizzes, and papers. The professor provides time and a structure for members of each learning group to process how effectively they have been working together. A common method for processing is to ask the students to list things they did well while working in the group and things that they could improve. A quick process strategy is to ask each individual to list something they did to help the group accomplish its task and one that they could do even better next time.

### **Detailed Example of Formal Cooperative Learning**

In order for professors to use cooperative learning routinely, they must identify course routines and generic lessons that repeat over and over again and structure them cooperatively. Problem-solving, comprehension (read the chapter and answer the questions), jigsaw, structured controversy, and cooperative exams are common examples of repeated practice procedures. Although they are each appropriate in specific contexts, jigsaw is a strategy that permit faculty to help students learn new conceptual material in a format other than lecture or individual reading. Problem-based cooperative learning, used extensively by the author, has been described in

numerous references (Smith & Starfield, 1993; Starfield, Smith, & Bleloch, 1994; Woods, 1994; Smith, 1995).

The cooperative jigsaw strategy was described by Elliot Aronson in 1978. It is a strategy that highly effective student study groups in content dense disciplines such as medicine and law have used on an ad hoc basis for many years. The professor's role in a jigsaw involves carefully choosing the material to be jigsawed, structuring the groups and providing a clear cooperative context for the groups, monitoring to ensure high quality learning and group functioning, and helping students summarize, synthesize, and integrate the conceptual material. A typical template for a cooperative jigsaw is shown in Figure 1. The conceptual material you choose for the students to learn via a jigsaw strategy should be at a difficultly level that makes the materials accessible to the students, it should be easily divisible into sub parts, and is should have some common overriding theme that can be used to integrate the sub parts. Students need substantial guidance in working in a jigsaw format. Figure 2 provides typical guidance given to students to prepare them for working and learning in a jigsaw format.

Many faculty report that the jigsaw approach provides a pleasant alternative to lecture for helping students learn conceptual material, helps them "cover" the syllabus, helps students learn how to learn and present material, and is generally an intense learning experience for the students. Although there is an initial cost to set up the jigsaw, the benefits include students learning more material and remembering it longer, and students learn a procedure that they often start using on their own.

### **Barriers to Using Cooperative Learning**

When faculty have problems (the student who dominates, doesn't participate, etc;) I typically inquire about and look at the following:

1. Are the groups small (2-3) and are the members sitting close together?
2. Are positive interdependence and individual accountability structured in multiple ways?
3. Is a criteria-referenced grading procedure being used? Asking students to cooperate in an environment where they are being graded "on the curve" is one of the surest ways to destroy cooperation.
4. Is the professor monitoring the groups, checking on students' understanding of the material and how well the groups are working.
5. Is there a time and structure for students to process their work in the group?

Barriers to using cooperative learning can be minimized by starting small and early and then building. Giving students some rationale as to why you're using cooperative learning help reduce barriers. Providing a variety of forms of cooperative learning and doing something cooperative regularly helps build a habit of cooperation. Carefully monitoring the groups and helping with the problem they're having speeds the progress of cooperative learning. Being patient and

positive, and especially having a problem-solving approach eases the transition to more cooperative learning. Finally, working with a colleague to co-plan, discuss new ideas, and to problem-solve makes the transition to cooperative much more enjoyable. An extensive discussion of troubleshooting small groups is available in Tiberius (1990).

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Figure 1. Jigsaw Procedure  
(Adapted from Johnson, Johnson & Smith, 1991)

When you have information you need to communicate to students, an alternative to lecturing is a procedure for structuring cooperative learning groups call **jigsaw** (Aronson, 1978).

**Task:** Think of a reading assignment you will give in the near future. Divide the assignment into multiple (2-4) parts. Plan how you will use the jigsaw procedure. Script out exactly what you will say to the class using each part of the jigsaw procedure. Practice talking students through their role.

**Procedure:** One way to structure positive interdependence among group members is to use the jigsaw method of creating resource interdependence. The steps for structuring a "jigsaw" lesson are:

1. **Cooperative Groups:** Distribute a set of instructions (See Figure 2) and materials to each group. The set needs to be divisible into the number of members of the group (2, 3, or 4 parts). Give each member on part of the set of materials.
2. **Preparation Pairs:** Assign students the cooperative task of meeting with someone else in the class who is a member of another learning group and who has the same section of the material to complete two tasks:
  - a. Learning and becoming an expert on their material.
  - b. Planning how to teach the material to the other members of their group.
3. **Practice Pairs:** Assign students the cooperative task of meeting with someone else in the class who is a member of another learning group and who has learned the same material and share ideas as to how the material may best be taught. These "practice pairs" review what each plans to teach their group and how. The best ideas of both are incorporated into each presentation.
4. **Cooperative Group:** Assign students the cooperative tasks of:
  - a. Teaching their area of expertise to the other group members.
  - b. Learning the material being taught by the other members.
5. **Evaluation:** Assess students' degree of mastery of all the material. Recognize those groups where all members reach the preset criterion of excellence.

## Figure 2. The Jigsaw Strategy<sup>2</sup> (Notes to Students)

For this session we are using a procedure for structuring learning groups called **jigsaw**. Each member will be given a different section of the material to be learned. Each member is dependent on the others for success in learning all the material. Each member is accountable for teaching his or her material to the other group members and learning the material they are teaching. The **purposes** of the jigsaw strategy are:

1. Provide an alternative method of introducing new material besides reading and lecture.
2. Create information interdependence among members to increase their sense of mutuality.
3. Ensure that participants orally rehearse and cognitively process the information being learned.
4. Provide an example of high performance teamwork.

### Teaching and Learning Group

Your **task** in this group is to learn all the assigned material. Make sure each member has a different section and that all sections are covered. Work **cooperatively** to ensure that all group members master all the assigned material.

### Preparation to Teach by Pairs

Take one section of the material and find a member of another group who has the same section of the material as you do. Work cooperatively to complete these tasks:

1. **Learn and become an expert on your material.** Read the material together, discuss it, and master it. Use an active reading strategy (such as **Pair Reading**):
  - a. Scan section headings to get an overview of the material.
  - b. Both persons silently read a paragraph (or short section). Person A summarizes the content to Person B.
  - c. Person B listens, checks for accuracy, and states how it relates to material previously learned.
  - d. The two reverse roles and repeat the procedure.
2. **Plan how to teach your material to the other group members.** Share your ideas as to how best to teach the material. Make sure your partner is ready.
  - a. As you read through the material, underline the important points, write questions or ideas in the margins, and add our own thoughts and suggestions.
  - b. When finished, write down the major ideas and supporting details or examples.
  - c. Prepare one or more visual aids to help you explain the material.
  - d. Plan how to make the other members of your group intellectually active rather than passive while they listen to your presentation.

### Practice/Consulting Pairs

If you finish the preparation and have time, meet with another person from a different group who is ready and who prepared the same section of the material you did. Work cooperatively to complete these tasks:

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<sup>2</sup>Adapted from Elliot Aronson. 1987. **The jigsaw classroom**. Berkeley, CA: Sage.

1. Review what each person plans to teach his/her group and share ideas on how to teach the material. Incorporate the best ideas from both plans into each person's presentation.
2. Make sure the other person is ready to teach the material.

### **Teaching and Learning Group**

Meet with your original group and complete the cooperative task of ensuring that all members have mastered all the assigned material by:

1. Teaching your area of expertise to the other group members.
2. Learning the material being taught by the other group members.

The **presenter** should encourage:

1. Oral rehearsal.
2. Elaboration and integration.
3. Implementation ideas.

The role of the **listening members** is:

1. Clarify the material by asking appropriate questions.
2. Help the presenter by coming up with novel ways of remembering the important ideas or facts. Think creatively about the material being presented.
3. Relate (out loud) the information to previous learned knowledge. Elaborate on the information being presented.
4. Plan (out loud) how the information can be applied in the immediate future.

### **Monitoring of the Group Work**

Collect some data about the functioning of the group to aid in later group processing. The instructor will also monitor and collect data about the material being learned and the functioning of the groups.

### **Evaluation and Processing**

The instructor may assess participants' mastery of all the material by giving every participant an exam or randomly calling on individuals to explain the material they learned.

The instructor will ask each group to process briefly, for example, by asking the group to identify at least one thing that each member did to help other members learn and at least three actions that could be added to improve members learning next time.

### **Reminder**

Remember that learning material in a jigsaw is not a substitute for reading the material on your own later, just as listening to a lecture is not a substitute for individual work. The purpose of the jigsaw is to get you involved in the material, to give you an overview, and to try to motivate you to learn more on your own.