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THE EFFECTS OF COOPERATIVE LEARNING ON STUDENT ATTITUDE
AND ACHIEVEMENT IN A MIDDLE SCHOOL SCIENCE CLASSROOM

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in
Interdisciplinary Studies:
Integrative Studies

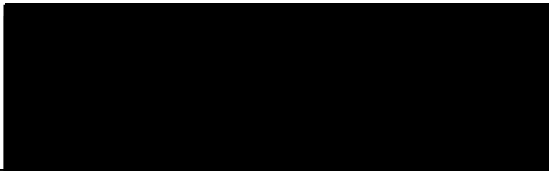
by
Elizabeth Ann Krome
September 2004

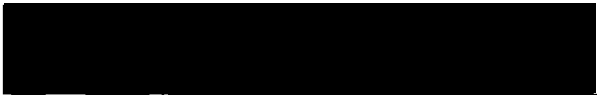
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by
Elizabeth Ann Krome
September 2004

Approved by:


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8/25/04
Date

ABSTRACT

The purpose of this project is to test the hypothesis that student enthusiasm, participation, and comprehension will increase when using cooperative learning techniques in a classroom context.

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CHAPTER ONE

INTRODUCTION

General Statement of the Problem

The teacher stands in front of the class, asks a question, and waits for the children to signal that they know the answer. Most often six to ten youngsters raise their hands, lifting themselves off their chairs and stretching their arms as high as they can in an effort to attract the teacher's attention. Several other students sit quietly with their eyes averted, hoping the teacher does not call on them.

When the teacher calls on one of the eager students, there are looks of disappointment in the faces of the other students who had tried to get the teacher's attention. If the selected student comes up with the right answer, the teacher smiles, nods approvingly, and goes on to the next question. In the meantime, the students who didn't know the answer breathe a sigh of relief. They had escaped being humiliated this time (Aronson, 2000).

As I read the above account, I was immediately taken to a daily situation encountered in my seventh grade science classroom as direct instruction took place. I

decided to take it upon myself to take a closer look at the teaching techniques that I had been practicing in my classroom. It only took a few days of observation of my own classroom and of the classrooms of my colleagues to internalize the fact that I needed to explore some new avenues to create a classroom based on success for all through cooperation rather than through competition. I felt a need to create a new atmosphere where the emphasis for success was based on not only individual success, but also success for the group as a whole.

I began my research by analyzing my population of students. I found that, as in most regular education middle school classrooms, there is a great disparity in ability levels. Some of my students were falling far below grade level, some were performing at grade level, while others were exceeding standard expectations and achieving far above grade level.

After looking at the population I was given, I began research into the various teaching modalities to create a classroom based on cooperation and success for all rather than one based on competition and success for the student as an individual entity. This research led me to the essential elements of cooperative learning as spelled out

by various researchers and authors (which will be referenced throughout this project).

Over the past decade, cooperative learning has emerged as the leading new approach to classroom instruction.

Johnson and Johnson (1987) consider the primary responsibilities of education to be learning and socialization, both which are social processes. The amount of student learning and personal development that occurs is directly proportional to the quality and quantity of student involvement in their educational program. One important reason for its advocacy is that numerous research studies in K-12 classrooms in very diverse school settings and across a wide range of content areas, have revealed that students completing cooperative learning tasks tend to have higher academic scores, higher self-esteem, greater numbers of positive social skills, fewer stereotypes of individuals of other races or ethnic groups, and greater comprehension of the content skills they are studying (Johnson, Johnson, and Holubec 1993; Slavin 1991; Stahl and VanSickle, 1992). Furthermore, the perspective of students working as "academic loners" in classrooms is very different from that of students working cooperatively in

and as "cooperative learning academic teams" (Stahl and VanSickle, 1992).

In my research I also discovered that with its increasing popularity, a large majority of group tasks that teachers use, even those teachers who claim to be using "cooperative learning", fell into the group tasks range, not those which are truly cooperative learning group tasks. Merely because students work in small groups does not mean that they are cooperating to ensure their own learning and the learning of all others in their group (Johnson, Johnson, and Holubec, 1993). This emphasis on academic learning success for each individual and all members of the group is one feature that separates cooperative learning groups from other group tasks (Slavin, 1990).

With all of these factors in mind, I set out to create a successful plan in setting up a cooperative learning framework, being sure to include the number of essential elements or requirements of true cooperative learning teaching techniques. Using this framework, I created an action-research project to test the theory that students, in my classroom context, who are taught using cooperative learning techniques will have greater overall success in the classroom.

This action-research project was created to test the theory that cooperative learning, in the science classroom, increases student enthusiasm, participation, comprehension, and ultimately student test scores. In addition, the project was also created to clearly define the components of cooperative learning, as defined by Johnson and Johnson, and to test the effectiveness of these techniques in the science classroom at the middle school level. After cooperative learning was clearly defined and teaching techniques for instruction, evaluation, and assessment were established, the components were then placed into practice.

The randomly chosen test subjects were taken from the seventh grade population at Cucamonga Middle school, in Rancho Cucamonga, California. Science Classroom A was used as the control; students were taught using traditional (direct and individualized instruction) teaching methods. Science Classroom B was used as the test subjects; students were taught using the cooperative learning teaching techniques as defined by Johnson and Johnson (1994). All students were assessed throughout the action-research project and the data was analyzed. As hypothesized, student enthusiasm, participation, comprehension, test scores, and overall cumulative semester grades increased,

proving the positive correlation between cooperative learning and student achievement.

Chapter two of this project will include a review of the literature on current cooperative learning techniques. This research will then be used as the backbone for creating all lesson plans for Science Classroom B. As noted in my research, the exact number, name, and order of cooperative learning requirements vary from one author to another. However, nearly all agree that, in one way or another, the elements that will follow in chapter two, are those that are essential to setting up, maintaining, and carrying out a successful cooperative learning lesson plan.

Chapter three will then explain how this study was designed to investigate the hypothesis that student enthusiasm, participation, comprehension, test scores, and overall cumulative semester grades will increase when using cooperative learning techniques. Included in this chapter will be a description of the test population, treatment, and data analysis procedures.

The information then presented in Chapter four will discuss the findings of this study. Included in this discussion will be any inferences, projections, and probable explanations for the results. This chapter will

be supplemented with the various tables and figures which report the data gathered while testing the hypothesis.

Finally, this project will conclude with a comprehensive summary; the conceptual framework, the design of the investigation, the methodology, and the results of the study. This chapter will also include the significance of the study and the limitations and weaknesses that were encountered before, during, and after the process.

CHAPTER TWO

REVIEW OF LITERATURE

A Review of Literature on Cooperative Learning

"United we stand, divided we fall" - Watchword of the American Revolution

Research on Cooperative Learning

Johnson and Johnson have extensively reviewed literature on cooperative learning, even identifying a study that dates back to 1897 (Brandt, 1991). They identify a variety of outcomes of cooperative learning. Achievement increases for all ability levels (high, medium, low); higher-level thinking processes can result; a deeper level of understanding is possible; critical thinking is promoted; more positive peer relationships result; students exhibit better social skills and provide more social support for their peers; and higher level of self-esteem can result (Brandt, 1991). Johnson and Johnson (1984) also report a meta-analysis of 122 studies of cooperative learning done between 1924 and 1981. The 286 findings were then analyzed using three different methods. All methods of analysis resulted in the same finding: cooperative

learning tends to promote higher achievement than does competition or individual work, with this finding holding for all age levels, all subject areas, and a variety of tasks.

Slavin (1991) identified 70 studies that evaluated various cooperative learning methods for periods of four weeks or longer; 67 involved measurement of effects on student achievement. All compared the effects of cooperative learning to traditionally taught control groups, with teachers and classes either randomly assigned to cooperative or control groups or matched on pretest achievement level and other factors. When these 67 studies were reviewed, 41 (61%) have significantly greater achievement in cooperative classes. No differences were found in 25 studies (37%). In only one study did the control outperform the cooperative group.

Slavin (1991) also maintains that if cooperative learning is to be effective, both group and individual accountability must be present. In the 44 studies in which the conditions were met, 37 studies (84%) contained reports of significant positive achievement effects. There were 23 studies in which group goals and individual accountability

were lacking. Only four of these studies (17%) reported positive effects on student achievement.

Slavin (1991), like Johnson and Johnson, also reported that, in his review, achievement efforts of cooperative learning were found to be about the same degree at all grade levels (2-12); in all major subjects; and in urban, rural, and suburban schools. Effects were equally positive for high, average, and low achievers. Positive effects were found for outcomes such as self-esteem, inter group relations, acceptance of academically handicapped students, and ability to work cooperatively.

Dr. Theodore Panitz(2004), who possesses a doctorate in education with a specialty in interactive and collaborative approaches to teaching, also sees the many benefits cooperative learning. His states that cooperative learning promotes critical thinking skills, involves students actively in the learning process, personalizes lectures, develops a social support system for students, and establishes a positive atmosphere for modeling and practicing cooperation. He also believes that cooperative learning helps students reduce their anxiety, raise their self-esteem, and helps them to develops positive attitudes towards their teachers.

Cooperative learning prepares students for today's society. It promotes active learners - students learn more when they talk and work together than when they listen passively. It motivates, leads to academic gains, fosters respect for diversity, and advances language skills (Mergendollar and Packer, 1989) It breaks down such stereotypes and leads to an increase in self-esteem (Uscher, 1986). It builds cooperative skills, such as communications, interaction, cooperative planning, sharing of ideas, decision making, listening, taking turns, and exchanging and synthesizing ideas (Sharan and Sharan, 1992). It is a method of promoting academic achievement that is not expensive or difficult to implement (Lyman and Foyle, 1988).

Why Cooperative Learning in Science?

Roger and David Johnson (1991) answer this question by pointing out that a quick look through the table of contents of scientific journals will illustrate the cooperative nature of scientific inquiry if the reader focuses on the number of authors for most of the journal articles. In addition, observation in science classes in

which hands on activities are taking place will usually reveal students working in pairs or small groups.

Writing in *Science of All Americans*, Rutherford and Ahlgren (1990) in their discussion of effective teaching and learning science, mathematics, and technology note that the collaborative nature of scientific and technical work should be strongly reinforced by frequent group activity in the classroom. Scientists and engineers work mostly in groups and less often as isolated investigators. Similarly, students should gain experience sharing responsibility for learning with each other. In the process of coming to common understandings, students in a group must frequently inform each other about procedures and meanings, argue over findings, and assess how the task is progressing. In the context of team responsibility, feedback and communication become more realistic and of a character very different from the usual individualistic textbook-homework-recitation approach.

Looking at the various studies, the components identified by Johnson, Johnson, and Holubec were consistent across the board. Therefore, I decided to implement their strategies in my classroom context. In this next section, I will summarize the major elements of their approach.

What Exactly is Cooperative Learning?

Based on my review of the literature, these are the important guidelines and practices of cooperative learning. Johnson, Johnson, and Holubec (1994) are credited with identifying the following cooperative learning components, stages, and strategies.

Cooperative learning is an instructional strategy in which small groups of students work together to maximize their own and each other's learning. Why use cooperative learning? Research has shown that cooperation, versus competitive and individualistic efforts, results in greater efforts to achieve, long-term memory retention, intrinsic motivation, higher level reasoning, and critical thinking skills. Beyond those, cooperative learning builds positive relationships among students and leads to greater psychological health, and higher self-esteem.

Advantages of using cooperative learning activities include the opportunity to instruct using various teaching techniques, the movement of students, the consideration shown among students, the involvement of students in decision making and problem solving, and the social interaction that allows students to take risks in less

threatening situations. Cooperative learning activities also allow movement from concrete to abstract thinking and for opportunities of peer acceptance. Finally, these activities help students to develop a sense of belonging to a group and foster independence from the teacher.

Cooperative learning is comprised of theory, objectives, grouping, teacher and student roles, lessons on group skills, accountability, and group process evaluation. By closely examining each component that structures cooperative learning, the benefits become evident.

Cooperative learning is made up of five basic and essential elements (see Appendix A: Figure A). Note: permission to reproduce this figure as well as Figures B - N can be found on final page of the appendix. The first and most important element is that the group activity encourage positive interdependence (see Appendix A: Figure B). Positive interdependence is a commitment to a group's success as well as one's own success. The second element is individual and group accountability. In this element each member must be held responsible for contributing to the group as well as comprehension of information as a group and individually. The third element is the promotion of face-to-face interaction. Students must provide academic as

well as social support to become personally committed to each other and to the group's mutual goals. The fourth essential element is teaching the students the required interpersonal and small group skills. Group members must know how to provide effective leadership, make decisions, build trust, communicate, and manage conflict. The fifth and final component is group processing. Students need to analyze their group's effectiveness to enhance and set goals for future cooperative learning activities.

There are four types of learning groups (see Appendix A: Figure C). The first is a pseudo-learning group. This group consists of members who have no desire to work together to help each other succeed. Members tend to communicate and coordinate poorly, leading to mass confusion, while others try to seek a free ride. The effectiveness of this type of group is less as a whole than of each individual member.

The second group is the traditional classroom learning group. In this type of group, interdependence is low. Assignments are structured around individual projects. Members take responsibility for their individual learning and do much of the work on their own. Students do not

receive training in group skills and their group process is never evaluated.

The third group is a cooperative learning group. In this type of group each member takes responsibility for the performance of himself or herself, all the teammates, and the group as a whole. The group members also hold themselves and each of the group members accountable for doing high quality work. Members in this type of group do real work together, they offer each other assistance and encouragement. Task work and teamwork skills are taught to the groups, who in turn are expected to use them to coordinate their efforts and achieve their goals. Finally, groups are required to analyze how effectively their group worked together and to determine if they achieved their goals.

The fourth and final group is a high performance cooperative learning group. This group meets all of the expectations and criteria for being a cooperative learning group and outperforms all reasonable expectations with a greater level of commitment from each of the individual group members. Members each have a mutual concern for each

other's academic and personal growth. This allows the group to be very successful and enjoyable at the same time.

There are several barriers that can hinder cooperative learning. Teachers need to be aware of these barriers so they can effectively manage them. These barriers include lack of group maturity, uncritically giving one's dominant response, social loafing, free riding, motivation loss due to perceived inequity, group think, lack of sufficient heterogeneity, lack of teamwork skills, and inappropriate group size. With teacher observation and evaluation, and with student buy-in to the cooperative learning process, these problems can be eliminated.

The first step is to determine group size. There is not a specific size for cooperative learning groups, but groups typically range from two to four members. The basic rule of thumb is "The smaller the better". There is also no perfect way to group students. Students should be grouped heterogeneously according to teamwork skills. Groups should also be composed of students with diverse abilities, backgrounds, and interests. The teacher can assign groups through random or stratified random procedures. After the groups have been selected, the length of group life must be determined. To determine this, teachers must take a look at

the type of groups that they are forming and the nature of the curriculum. Cooperative groups can range from five minute informal brainstorming sessions to year long process or project oriented groups.

After groups have been determined, the room needs to be arranged in such a way to facilitate the cooperative learning groups. There are a number of general guidelines for arranging a cooperative friendly classroom. The first is, arrange desks so that students are sitting eye to eye or knee to knee. The second is, make sure that all members are facing the front of the room or have their side to the front of the room. Groups need to be arranged far enough apart so they do not interfere with each other's learning and so that the teacher has easy access to each individual student in all of the groups. The classroom arrangement should also provide students with good spatial definition to aid students' visual and auditory focus. Finally, the room arrangement should be flexible enough for students to change from one group to another quickly and efficiently.

After groups have been formed and the room has been arranged, it is time to assign student roles. In planning a lesson, determine the type of group roles that would best match up with your expectations. Model each role with your

class before assigning them. Let the students know that they are expected to perform their individual group role to the best of their ability and, in turn, can expect each of their group members to do the same with their respective roles. Cooperative group roles are often divided into forming, functioning, formulating, and fermenting roles (see Appendix A: Figure D). After each role is determined, modeled, and assigned, constant evaluation and monitoring should be made by the teacher and by the group members. Roles should be grade level appropriate and should be reassessed and reassigned at the beginning of each new project.

The teacher role is fairly basic if followed in a clear and organized manner. Once the basic foundations have been laid and the students have a clear understanding of what is expected of them, the teacher simply needs to monitor, intervene, evaluate and process the effectiveness of the cooperative learning groups (see Appendix A: Figure E).

After groups have been formed, the room has been arranged, student roles have been assigned and modeled, group skills need to be taught. The first step is to make sure that the students see the need for the teamwork skill. Step two is to provide the students with an understanding

of what the skill is and how and when to use the skill. The third step is to model these skills through role playing. Next, the students will need to receive feedback from the teacher and fellow group members. The students will also need to evaluate how well the skill was demonstrated by their group. The fifth and final step is to monitor progress until the skill becomes natural (see Appendix A: Figure F and G).

Lesson plans are fairly simple to construct using a Cooperative Learning Planning Form (see Appendix A: Figure H and I). Always keep in mind that lessons are never set in stone. If you observe group or individual problems, use that time to reconvene as a class to brainstorm ways to correct the problems.

To monitor group accountability, teachers can use simple forms that are redesigned to touch on all group skill areas (see Appendix A: Figure J, K, and L). Teachers can also create their own forms using class input, making the students accountable for the assessment process. To monitor individual accountability, be sure to keep group sizes small, give individual tests, give random oral exams, observe individual group members, ask one student to be a "checker" of individual participation (see Appendix A:

Figure M), have individual students explain what they have learned, and check students for constant self-monitoring skills. The purpose for cooperative grouping is to make each individual member a stronger student on his/her own. Make sure that the students understand that they are responsible for themselves and for their group.

The final stage in cooperative learning is the group processing evaluation. The evaluation process includes four steps. The first step is feedback. Each student and each group is asked to give and receive feedback on the effectiveness of their task work and teamwork skills. The second step is reflection. Students are asked to analyze the feedback they received. The third step is improvement goals. Individuals and groups are asked to examine their goals to see if they were reached. The students then set new goals for themselves for improving the quality of their work. The final step is celebration. Students are encouraged to celebrate their hard work and the success of their group.

Every one of the preceding elements does not have to be used every time the teacher assigns students to work in groups. However, teachers who fail to include these requirements report far more difficulties with their

students and their group activities, and far less student academic achievement gains than do teachers who meet them. As a general rule, unless a well-researched strategy is used that allows for an alternative to one or more of these elements, teachers serious about implementing effective cooperative learning activities need to ensure that these requirements are met. More importantly, unless these elements are used frequently and correctly, teachers should not expect the many positive long-term results of cooperative learning that can be achieved (Stahl, 2000)

Cooperative learning and cooperative learning groups are means to an end rather than an end in themselves. Therefore, teachers should begin planning by describing precisely what students are expected to learn and be able to do on their own well beyond the end of the group task and curriculum unit. Regardless of whether these outcomes emphasize academic content, cognitive processing abilities, or skills, teachers should describe in very unambiguous language the specific knowledge and abilities students are to acquire and then demonstrate on their own (Stahl, 2000).

As soon as teachers begin to understand and use the basic framework of cooperative learning, they will see the many benefits and the tremendous amount of growth their

students can and will make. Just remember, cooperative learning is not a one day process. It will take a lot of time, skill, hard work, and determination on both the teachers' and students' parts. Keep your head up, and stick with it. The reward is well worth the effort!

CHAPTER THREE

METHODOLOGY

Project Creation, Procedure, and Results

Chapter three will explain how this study was designed to investigate the hypothesis that student enthusiasm, participation, comprehension, test scores, and overall cumulative semester grades will increase when using cooperative learning techniques. Included in this chapter will be a description of the test population, treatment, and data analysis procedures.

Test Location and Timeline

Cucamonga Middle School is located in Rancho Cucamonga, California. The School is comprised of grades six, seven, and eight. The total school population is approximately 897 students. Cucamonga Middle School follows the traditional school year track and students are assessed on a trimester system. This study took place over a three month period during the second trimester of the 2000-2001 school year.

Test Population Description

As a seventh grade science, Language Arts, and social studies teacher, I chose to pick my two science core classes to participate in this project. Each class consisted of a heterogeneous group of seventh grade Life Science students.

Science Classroom A was used as the control; students were taught using the teaching methods I had used in previous years, mainly direct instruction followed to individual class work. Classroom A had 33 students actively enrolled. The class consisted of fifteen girls and nineteen boys. Classroom A included students who were falling far below grade level, students performing at grade level, and students exceeding standard expectations and achieving far above grade level.

Science Classroom B was used as the test subjects; students were taught using the cooperative learning teaching techniques as defined by Johnson and Johnson. Classroom B had 32 students actively enrolled. The class consisted of fifteen girls and eighteen boys. Classroom B also was comprised of students falling far below grade level, students performing at grade level, and students

exceeding standard expectations and achieving far above grade level.

Description of Test Procedures

During the first three weeks of data collection, no treatment was given. Both classes were taught in a similar fashion; direct instruction followed by independent class work. This baseline sample was then used to assess the validity and reliability of the data collection process, showing if any great disparity between the two classes existed.

The only difference in this first three week session was the 15 minute block of time set aside for Classroom B (the test subjects) to be introduced to and become familiar with the techniques of working in a cooperative learning setting. This block of time and these first exposures to cooperative learning set the stage for and were crucial to the success of the program.

During the remaining test period, the groups were given identical activities. The only difference was that Classroom A was told to work independently, while Classroom B was instructed to work in cooperative groups. The overall outcome expected from each test group remained the

same, while the means for getting there varied in the components (cooperative group work versus independent class work).

Over the remainder of the trimester, the treatment remained the same for each group. Classroom A (control group) remained working independently on each task assigned, while Classroom B (test group) was given more and more latitude to work cooperatively on each task assigned.

Description of Data Collection

In order to determine the effects of cooperative learning in a classroom, these key areas were evaluated for both the control and experimental groups. The first area of assessment was student enthusiasm. This first element would be assessed by evaluating the oral and written communication of the students. The students would be asked to journal about their daily and weekly thoughts before, during, and after instructional periods. The students would be asked to rate their feelings on a scale of one to five (one indicating low enthusiasm and five indicating high enthusiasm). These journal entries would then be tallied to determine the overall effects of cooperative learning on

a daily and weekly basis, for students as individuals and the class as a whole.

The second area of assessment is student participation. The results of this element would be analyzed through a quantitative summary of missing and incomplete assignments. A comparison would be made between the control and experimental group for the overall number of those students who receive one or more missing assignments and the number of incomplete assignments as a class as a whole.

The third and final area to be assessed was overall comprehension of the material presented. The results of this element would also be analyzed through a quantitative summary of test scores (district assessments given to all seventh grade Life Science students) and cumulative semester grades. The students were asked to take a written district test covering the material presented to them throughout the semester. This test would then be graded on a scale of one to six (six meaning a score in the 100% - 90% range, five meaning a score in the 89%- 80% range, four meaning a score 79% - 70% range, three meaning a score in the 69%-60% range, two meaning a score in the 59% - 50% range, and one meaning a score in the 49%

- 0% range). Cumulative grades would also be compiled, which would include a summary of all assignments, projects, and chapter tests completed throughout the semester.

Once all of the data is collected from each of the three areas of assessment, the data will be compared over time to determine the overall effectiveness of cooperative learning, helping to support or refute the hypothesis that student enthusiasm, participation, comprehension, test scores, and cumulative semester grades will increase with the implementation of cooperative learning techniques.

CHAPTER FOUR

EVALUATION

Findings and Results

After the study was designed to investigate the hypothesis that student enthusiasm, participation, and comprehension would increase when using cooperative learning techniques an evaluation of the data was completed.

The information presented in this chapter will discuss the findings of the study. Upon completion of the data collection, the results for each of the three areas of assessment (student enthusiasm, participation, and comprehension) were examined. In this chapter, I will summarize and compare the results for Class A (control group) and Class B (treatment group) in regards to the aforementioned three assessment areas. Included in this discussion will be any inferences, projections, and probable explanations for the results. This chapter will be supplemented with the various tables and figures which report the data gathered while testing the hypothesis. The chapter will conclude with a summary and interpretation of the overall findings.

Student Enthusiasm

The amount of enthusiasm of Class A and Class B was monitored by the amount of student to student interaction, student to teacher interaction, and by the amount of work completed by each student. Also included in this, was the readings and tallies of student created journals, documenting thoughts and feelings throughout the study.

Overall, there was increased enthusiasm in Class B (treatment group). I observed that the students interacted more often with both fellow classmates and with me as their teacher when working in cooperative groups. Also observed, in Classroom B, was the closer bond that students developed amongst each other. This environment also created one in which the students felt more comfortable with the teacher, speaking more in depth during debates and discussions.

When student journals were read and tallied, an overwhelming amount of increased student enthusiasm was found in Class B. Using the one to five scale (one indicating low enthusiasm and five indicating high enthusiasm) journal tallies showed that student enthusiasm in Class B steadily increased throughout the semester. In the first half of the semester the student tallies averaged 2.5, where as the second half of the semester the student

tallies averaged 4.5. In Class A, the tallies remained the same throughout the semester at a score of 3. As these quantitative results indicate, the students from Class B showed greater enthusiasm than Class A.

Student Participation

The amount of participation of Class A and Class B was monitored and evaluated by the number of class projects and homework assignments that were completed and turned in. The students in Classroom B had a greater number of assignments that were complete and turned in, showing greater participation (see Appendix B: Tables One, Two, and Three). Out of the 33 students actively enrolled in Class A (control group), 23 students failed to complete one or more assignments (70%). Out of the 32 students actively enrolled in Class B (treatment group), only 13 students failed to complete one or more assignments (40%). When the classes were evaluated as a whole, Class A (control group) failed to complete a total of 82 assignments, whereas Class B (treatment group) only failed to complete 41 assignments. As these quantitative results indicate, the students from Class B showed greater participation than students from Class A.

Student Comprehension

As shown, through student achievement (grades), the students in Class B (as a whole) earned superior grades to those in Class A (see Appendix B: Tables, One, Two, and Three). The class average for Class A (control group) was 76.97%, where as the class average for Class B (treatment group) was 87.30%. The class mean for Class A (control group) was 77.87%, where as the class mean for Class B (treatment group) was 90.61%. This almost ten point discrepancy, for both class average and mean, indicates greater comprehension in Class B who worked in cooperative groups.

The data also reveals that the students who worked in cooperative groups (Class B) received higher district test scores than those who worked independently (Class A) (see Appendix B: Tables, Four, Five, and Six). Using the grading scale mentioned in Chapter three, of the 31 students who were tested in Class A (control group), fourteen students received a six, four students received a five, one student received a four, three students received a three, six students received a two, and three students received a one. Of the 32 students who were tested in Class B (treatment group), twelve students received a six, six students

received a five, six students received a four, five students received a three, two students received a two, and one student received a one. The average for the district test for Class A (control group) was 4.2, where as the average for the district test for Class B (treatment group) was 5.3. As these quantitative results indicate, Class B achieved higher test scores showing their greater amount of comprehension.

Evaluation Conclusions

As the data reveals, the students who worked in cooperative groups (Class B) showed greater enthusiasm, participation, and comprehension. This can be contributed to the greater level of understanding that students needed to be responsible for, not only for themselves, but for their groups as well. When students (Group B) were told they would receive group grades, the drive (pressure) to succeed increased, pushing the student to put forth their best effort. Students were also encouraged by their classmates, increasing the amount of confidence in each individual student (having three people cheer you on is better than having only yourself to cheer you on). The amount of support, from the students, to the students was

incredible (Class B), and truly motivated the students to succeed!

The students in Class B were given more opportunities, by various group members, to be taught the information. Not only were the concepts taught or explained to the students by the teacher, but also by the each of the students in the cooperative groups. My research, as well as others, has shown that students comprehend more when they are asked to explain or teach the concepts to others. A greater level of understanding is needed to perform this higher level of thinking. To have to explain information (Class B) is a greater learning process than it is to regurgitate information (Class A). When the teacher does all of the explaining, for the students (Class A), students are acting as passive learners rather than active ones.

Another factor, that was not part of the original methodology, was the measurement of Time-on-task. Time-on-task also increased in Classroom B. I observed that students spent more time on the actual projects than on the discernment of the instructions. Students were able to have questions answered more quickly by asking their peers, than by waiting for the teacher to get to them (four brains are quicker than one).

My research supports the hypothesis that student enthusiasm, participation, comprehension, test scores, and cumulative semester grades will increase for those students taught using cooperative learning techniques, proving the positive correlation between cooperative learning and student achievement.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

As I observed the low enthusiasm and success rate in my classroom, I knew I needed to explore some new avenues to create an enthusiastic classroom based on success for all. I felt a need to create a new atmosphere where the emphasis for success was based on not only individual success, but also success for the group as a whole.

I began this process by analyzing my population of students. After looking at the population I was given, I began research into the various teaching modalities to create a classroom based on cooperation and success for all rather than one based on competition and success for the student as an individual entity. This research lead me to the essential elements of cooperative learning as spelled out by various researchers and authors.

The review of this literature, on current cooperative learning techniques, then helped me to create a backbone for new lesson plans. I then created a set of new lesson plans using the cooperative learning framework, being sure

to include the number of essential elements or requirements of true cooperative learning teaching techniques.

Using this framework, I created an action-research project to test the theory that students who are taught using cooperative learning techniques will have greater overall success in the classroom. This project was created to test whether student enthusiasm, participation, and comprehension would increase when implementing a cooperative learning environment in my classroom. After the test population was analyzed, treatment procedures were determined, and data analysis specifics were drawn, the project was put into motion.

Next, I analyzed the data that was collected. The analysis included any inferences, projections, and probable explanations for the results. A summary was then formalized leading to a conclusion determining the effectiveness of cooperative learning techniques in the classroom.

The project was then concluded with a comprehensive summary of the conceptual framework, the design of the investigation, the methodology, and the results of the study. Also included was the significance of the study and

the limitations and weaknesses encountered before, during, and after the process.

Conclusions and Recommendations

The results of the study supported the hypothesis that the group who exercised cooperative learning techniques had an overall greater rate of success when asked to perform on a variety of instructional tasks. The data clearly supported the hypothesis in all areas assessed.

One limitation of this study is the time frame in which it took place. It would have been interesting to see if the results would have been different if the two teaching techniques were applied from the first day of the school year, before the students were able to form bonds and make assumptions about their classmates. For example, students placed in these cooperative learning groups had already made assumptions about their classmates during first semester (who was the most intelligent, the most responsible, and so on). These assumptions may have then lead to undesirable behavior in the cooperative groups.

Another limitation of a project of this nature is the teacher's ability to properly apply each of the teaching techniques. If the teacher fails to fully comprehend the

steps for creating successful cooperative learning activities, the results may not show such a great disparity between the two techniques.

An interesting next step would be to reverse the roles for trimester three. Classroom A would become the test subjects, using cooperative learning techniques; while Classroom B would be become the control group, using direct instruction followed independent class work. This twist would once again help to either cement or even possibly disprove my hypothesis. It may also show flaws in which the study was conducted.

Other recommendations, to retest the hypothesis, would be to restructure the study by using students who have been exposed to cooperative learning starting in their elementary years or schooling. Also, it would be interesting to see if cooperative learning has a positive effect in those subjects (besides science) that may not lend themselves as well to the cooperative learning structure.

It is the opinion of this researcher that cooperative learning in the classroom can lead to greater student success. That is not saying that there is not a time and a

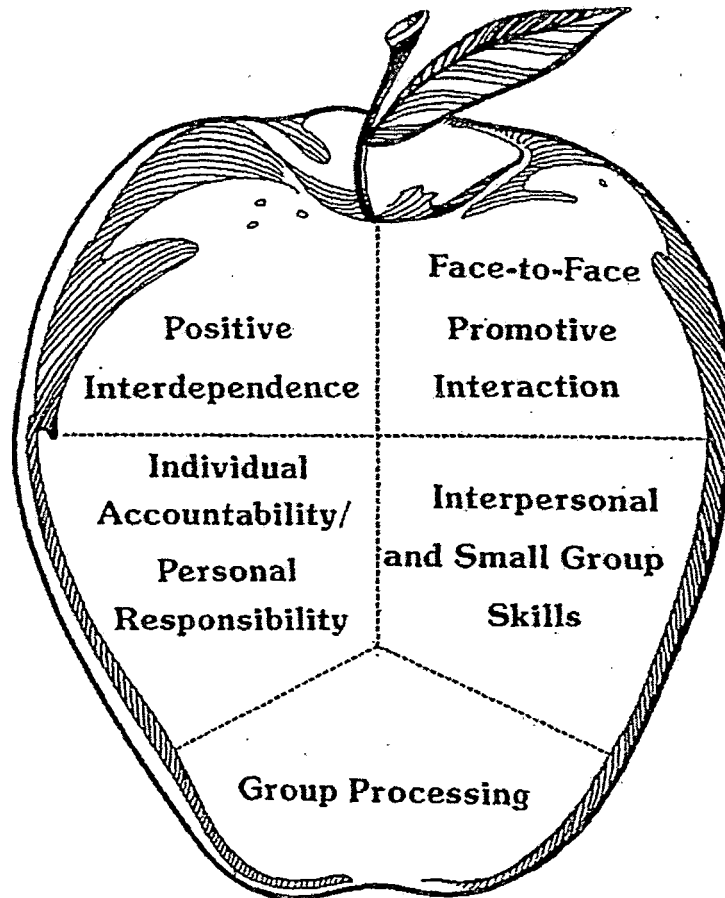
place of independent class work, just that it is not necessarily the best means to the end.

I have also learned that using cooperative learning techniques in the classroom is not a quick and easy method of instruction. It takes a lot of time and effort to follow through with the basic elements that must be incorporated into successful cooperative learning activities. If even one element is not in place, and students are not prepped for and taught the correct techniques, the activity may end in failure.

The results of this study provide some encouraging findings for those of us in the education field dealing with apathy among our students who are not using their full potential to become successful students. Hopefully future research in this area will continue to help teachers create lessons plans and classrooms that set students up for success in all aspects of their education.

APPENDIX A
ELEMENTS OF COOPERATIVE LEARNING GROUPS
FIGURES A THROUGH N

Figure A



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Figure B

Types of Positive Interdependence

Positive Goal Interdependence: Students perceive that they can achieve their learning goals if and only if all the members of their group also attain their goals. Members of a learning group have a mutual set of goals that they are all striving to accomplish.

Positive Celebration/Reward Interdependence: Group celebrates success. A joint reward is given for successful group work and members' efforts to achieve.

Positive Resource Interdependence: Each member has only a portion of the information, resources, or materials necessary for the task to be completed and the member's resources have to be combined in order for the group to achieve its goal.

Positive Role Interdependence: Each member is assigned complementary and interconnected roles that specify responsibilities that the group needs in order to complete a joint task.

Positive Identity Interdependence: The group establishes a mutual identity through a name, flag, motto, or song.

Environmental Interdependence: Groups members are bound together by the physical environment in some way. An example is putting people in a specific area in which to work.

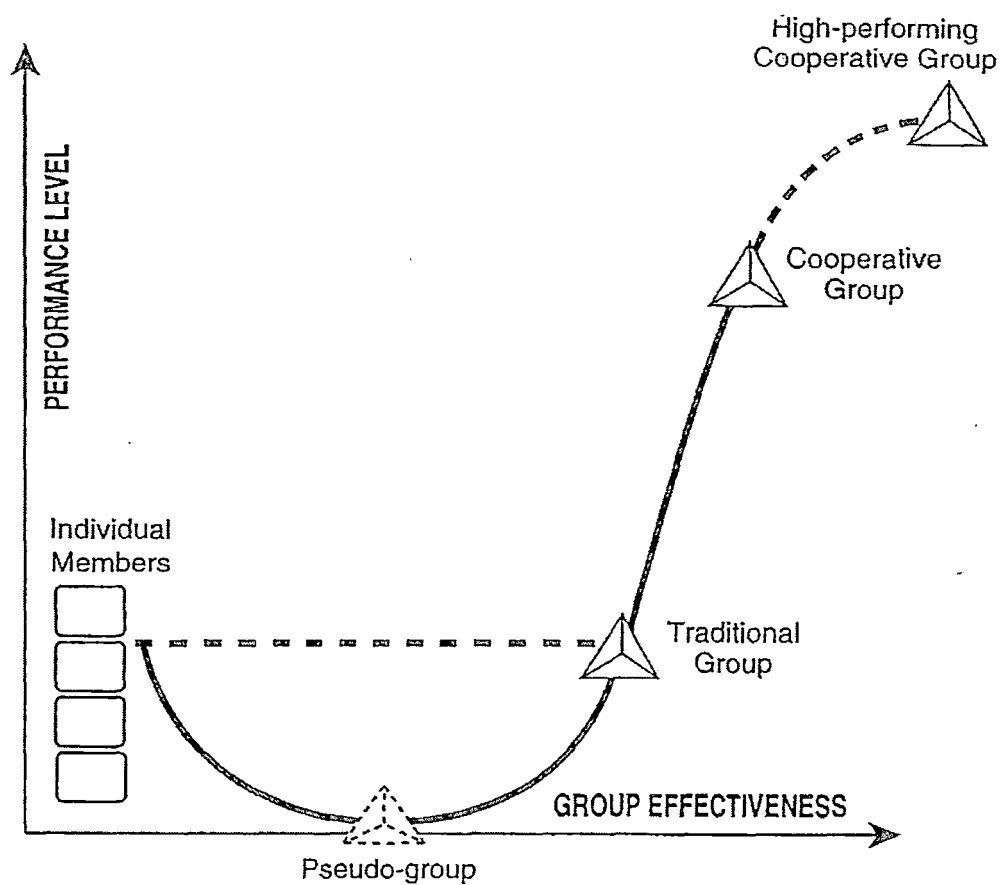
Positive Fantasy Interdependence: A task is given that requires members to imagine that they are in a life or death situation and must collaborate in order to survive.

Positive Task Interdependence: A division of labor is created so that the actions of one group member have to be completed if the next team member is to complete his or her responsibility.

Positive Outside Enemy Interdependence: Groups are placed in competition with each other. Group members then feel interdependent as they strive to beat the other groups and win the competition.

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Figure C



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Figure D

Examples Of Roles Appropriate To Each Age Level

Category	Role	Primary	Intermediate	Secondary
Forming	<i>Turn-Taking Monitor</i>	First You, Then Me	Take Turns	Contribute In Sequence
Functioning	<i>Recorder</i>	Writer	Recorder	Scribe
	<i>Encourager of Participation</i>	Say Nice Things	Give Positive Comments	Compliment
	<i>Clarifier/ Paraphraser</i>	Now You Say It	Say It In Your Own Words	Paraphrase
	<i>Consensus Seeker</i>	Everyone Agree	Reach/ Agreement	Reach Consensus
Formulating	<i>Summarizer</i>	Put Together	Combine	Summarize
	<i>Generator</i>	Give Another Answer	Give Additional Answers	Generate Alternative Answers
Fermenting	<i>Asker For Justification</i>	Ask Why	Ask For Reasons	Ask For Justification
	<i>Rationale Giver</i>	Say Why	Give Facts And Reasons	Explain

Figure E

The Teacher's Role in Cooperation Learning

Make Pre-Instructional Decisions

Specify Academic and Social Skills Objectives. Every lesson has both (a) academic and (b) interpersonal and small group skills objectives.

Decide on Group Size. Learning groups should be small (groups of two or three students, four at the most).

Decide on Group Composition (Assign Students to Groups). Assign students to groups randomly or select groups yourself. Usually you will wish to maximize the heterogeneity in each group.

Assign Roles. Structure student-student interaction by assigning roles such as Reader, Recorder, Encourager of Participation, and Checker for Understanding.

Arrange the Room. Group members should be "knee to knee and eye to eye" but arranged so they all can see you at the front of the room.

Plan Materials. Arrange materials to give a "sink or swim together" message. Give only one paper to the group or give each member part of the material to be learned.

Explain Task And Cooperative Structure

Explain the Academic Task. Explain the task, the objectives of the lesson, the concepts and principles students need to know to complete the assignment, and the procedures they are to follow.

Explain the Criteria for Success. Student work should be evaluated on a criteria-referenced basis. Make clear your criteria for evaluating students' work.

Structure Positive Interdependence. Students must believe that they "sink or swim together." Always establish mutual goals (students are responsible for own learning and the learning of all other group members). Supplement goal interdependence with celebration/reward, resource, role, and identity interdependence.

Structure Intergroup Cooperation. Have groups check with and help other groups. Extend the benefits of cooperation to the whole class.

Structure Individual Accountability. Each student must feel responsible for doing his or her fair share of the work. Ways to ensure accountability are frequent oral quizzing of group members picked at random, individual tests, and assigning a member the role of Checker for Understanding.

Specify Expected Behaviors. The more specific you are about the behaviors you want to see in the groups, the more likely students will do them. Social skills may be classified as forming (staying with the group, using quiet voices), functioning (contributing, encouraging others to participate), formulating (summarizing, elaborating), and fermenting (criticizing ideas, asking for justification). Regularly teach the interpersonal and small group skills you wish to see used in the learning groups.

Monitor And Intervene

Arrange Face-to-Face Promotive Interaction. Conduct the lesson in ways that ensure that students promote each other's success face-to-face.

Monitor Students' Behavior. This is the fun part! While students are working, you circulate to see whether they understand the assignment and the material, give immediate feedback and reinforcement, and praise good use of group skills. Collect observation data on each group and student.

Intervene to Improve Taskwork and Teamwork. Provide task assistance (clarify, reteach) if students do not understand the assignment. Provide teamwork assistance if students are having difficulties in working together productively.

Provide Closure. To enhance student learning have students summarize the major points in the lesson or review important facts.

Evaluate And Process

Evaluate Student Learning. Assess and evaluate the quality and quantity of student learning. Involve students in the assessment process.

Process Group Functioning. Ensure each student receives feedback, analyzes the data on group functioning, sets an improvement goal, and participates in a team celebration. Have groups routinely list three things they did well in working together and one thing they will do better tomorrow. Summarize as a whole class. Have groups celebrate their success and hard work.

Figure F

Teaching Teamwork Skills

Steps In Teaching A Skill	Teacher Actions
Step 1: Establish The Need For The Skill	<ol style="list-style-type: none"> 1. Students choose needed skills. 2. You choose and explain. 3. Role play the absence of the skill.
Step 2: Define The Skill	<ol style="list-style-type: none"> 1. Define with T-chart. 2. Demonstrate, model, explain.
Step 3: Guide Practice Of The Skill	<ol style="list-style-type: none"> 1. Assign the social skill as a role. 2. Record frequency and quality of use. 3. Periodically cue the skill. 4. Intervene to clarify. 5. Coach.
Step 4: Guide Feedback And Reflection	<ol style="list-style-type: none"> 1. Report data to class, group, individuals. 2. Chart/graft the data. 3. Have students analyze/reflect on the data. 4. Ensure every student receives positive feedback. 5. Have students set improvement goals. 6. Have groups celebrate their hard work.
Step 5: Repeat Steps 3 And 4 Repeatedly	Emphasize continuous improvement while proceeding through the steps of skill development over and over again.

Figure G

Checking For Understanding

Looks Like	Sounds Like
Eye contact	Explain that to me please.
Leaning forward	Can you show me?
Interested expression	Tell us how to do it.
Open gestures and posture	How do you get that answer?
	Give me an example please.
	How would you explain it to the teacher?

Contributing Ideas

Looks Like	Sounds Like
Leaning forward	My idea is...
Open gestures and posture	I suggest...
Taking turns	We could...
One person talking with others listening	I suggest we...
	This is what I would do.
	What if we...

Summarizing

Looks Like	Sounds Like
Leaning forward	Let's review what we have said.
Pleasant expression	Our key ideas seem to be...
Open gestures and postures	At this point, we have...
	The points we have made so far are...

Figure H

Cooperative Lesson Planning Form

Grade Level: _____ Subject Area: _____ Date: _____

Lesson: _____

Objectives:

1. Academic
2. Social

Decisions:

1. Group Size: _____
2. Method Of Assigning Students: _____
3. Roles: _____

4. Room Arrangement: _____
5. Materials _____
 - ☐ a. One Copy Per Group
 - ☐ b. Jigsaw
 - ☐ c. Tournament
 - ☐ d. One Copy Per Person
 - ☐ e. Other

Explaining Task And Goal Structure

1. Task: _____

2. Criteria For Success: _____

3. Positive Interdependence: _____

4. Individual Accountability: _____

5. Intergroup Cooperation: _____

6. Expected Behaviors: _____

Monitoring And Intervening

1. Observation Procedure: _____ Formal _____ Informal
2. Observations By: _____ Teacher _____ Students _____ Visitors
3. Intervening For Task Assistance: _____

4. Intervening For Teamwork Assistance: _____

4. Other: _____

Evaluating and Processing

1. Assessment Of Members' Individual Learning: _____

2. Assessment Of Group Productivity: _____

3. Small Group Processing: _____

4. Whole Class Processing: _____

5. Charts And Graphs Used: _____

6. Positive Feedback To Each Student: _____

7. Goal Setting For Improvement: _____

8. Celebration: _____

Figure I

A. COOPERATIVE LESSON/PROJECT PLANNING FORM

Grade Level: _____

Subject Area: _____

Lesson/Project Title: _____

A. General Objectives

1. _____

2. _____

B. Making Decisions

1. Group size: _____

2. Procedure for assignment to groups: _____

3. Classroom arrangements needed: _____

4. Resources needed: _____

5. Types of group cohesion

a. _____

b. _____

c. _____

d. _____

C. Preparing the Lesson/Project

1. Academic

a. Specific objectives (will become daily objectives)

(1) _____

(2) _____

(3) _____

(4) _____

b. Prerequisite knowledge and skills (to be taught or reviewed)

(1) _____

(2) _____

(3) _____

2. Social

a. Creating group cohesion (these are the procedures for developing the items in B.5)

(1) _____

(2) _____

(3) _____

b. Role assignment and responsibilities

(1) _____

(2) _____

(3) _____

3. Procedures for creating individual accountability

a. _____

b. _____

c. _____

4. Specific social skills to be reviewed

a. _____

b. _____

c. _____

5. Social skills that need to be taught (include behaviors that demonstrate these skills)

a. _____

b. _____

c. _____

D. Monitoring Procedures and Observation Forms Needed

1. _____

2. _____

3. _____

E. Processing Procedures to be Used

1. _____

2. _____

3. _____

F. Evaluation

1. Individual performance _____

2. Group performance _____

3. Social skills performance _____

4. Procedure for determining composite grade for the lesson/
project _____

Jerry Rottier and Beverly J. Ogan

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Figure J

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Analyzing Data On Group Effectiveness

You take the second step in structuring group processing when you have students reflect on and analyze the group session they just completed to discover what helped and what hindered the quality of learning and whether specific behaviors had a positive or negative effect. Varying the procedures for analyzing and reflecting on the data collected about members interactions keeps group processing vital and interesting. Ways of doing so include having each group:

1. Plot in a chart the data on members' interaction. Two of the most helpful charting procedures are the Bar Chart and the Run Chart.
2. Do a mind-map representing the secrets of the group's success.
3. Rate themselves on a series of dimensions on a bar chart.
4. Give each member 60 seconds to identify three things other members did to help groupmates learn.
5. Discuss the effective use of teamwork skills by members ("*How did other group members encourage participation?*" "*How did other group members check for understanding?*"). Each group member gives his or her response and then consensus is achieved through discussion.

A good way for teachers to stay in touch with the functioning of each learning group is to have each group summarize its processing and place its summary in a folder with its completed academic work. The folder is handed in to the teacher each class session. Making the last question on an assignment sheet a group-processing question, furthermore, signals to students that group processing is an integral part of learning.

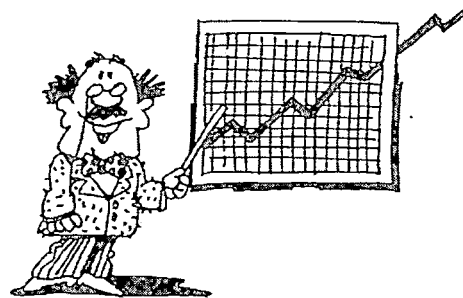


Figure K

Long-Term Group Progress: Weekly Report Form

Group Members: _____

Class: _____ Subject Area: _____

Date	On-Task Work	Contributes Ideas	Integrates Summarizes	Helps Groupmates	Completes Assignments
Totals:					

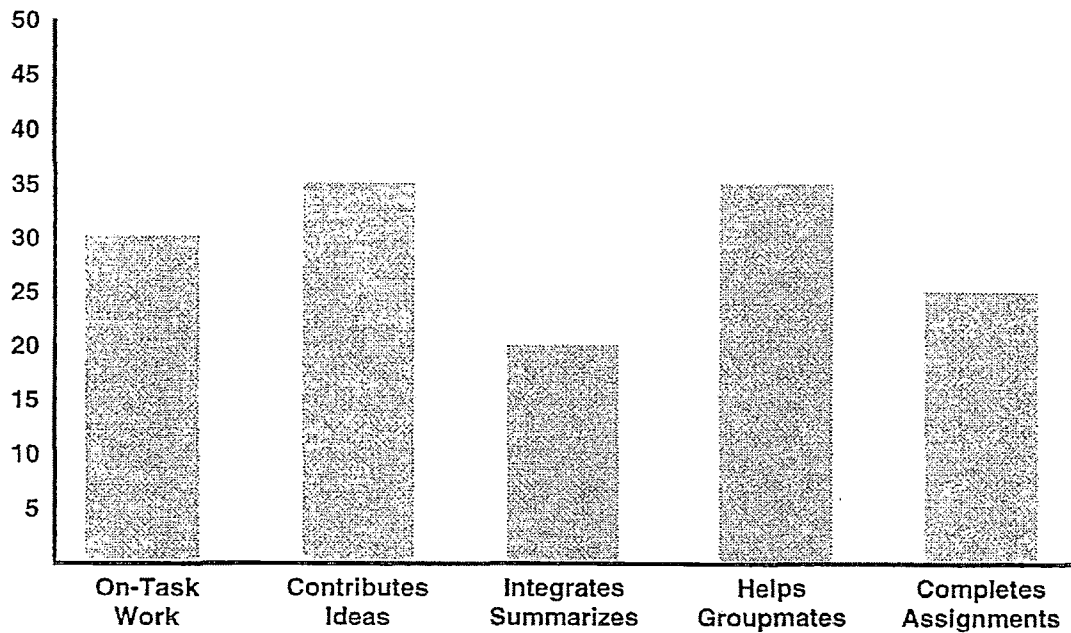
Comments: _____

Figure L

Long-Term Progress: Weekly Bar Chart

Group Members: _____

Class: _____ Subject Area: _____



Long-Term Progress: Run Chart

Group Members: _____

Class: _____ Subject Area: _____ Skill: SUMMARIZES

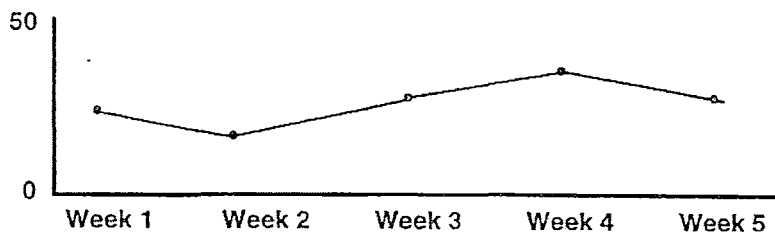


Figure M

Observation Form				
Observer: _____		Date: _____		Group: _____
Actions	Edythe	Keith	Dale	Total
Contributes Ideas				
Encourages Participation				
Checks For Understanding				
Gives Group Direction				
Other:				
Total				

Figure N

Group Processing

Write Down Two Ways Each Member Helped The Group Today!

Name	Helpful Action	Helpful Action
.	.	.
.	.	.
.	.	.

Group Processing

Agree On Your Answers And Write On Your Group Paper:

1. What are three specific actions we did that helped us do well on the assignment?
 - a.
 - b.
 - c.
2. How did each of us contribute to the group's success?
 - a.
 - b.
 - c.
3. What is an action that would help us do even better next time?
 - a.
 - b.
 - c.

APPENDIX B
DATA TABLES
TABLES ONE THROUGH SIX

Table One

Science Period #6 CLASS SUMMARY A

NUMBER OF ACTIVE STUDENTS ENROLLED: 33
NUMBER OF ASSIGNMENTS RECORDED THUS FAR: 23
CURRENT CLASS AVERAGE: 76.97%

CLASS RANK	STUDENT NAMES	POINTS EARNED	POINTS POSSIBLE	NUMBER "0" GRADES	CURRENT PERCENT	CURRENT GRADE
7		858	908	1	94.49	A
23		554	812	6	68.22	D
4		885	908	0	97.46	A
30		478	908	10	52.64	F
5		866	908	1	95.37	A
11		829	908	1	91.29	A
17		637	818	1	77.87	C
13		815	908	0	89.75	A-
31		414	908	10	45.59	F
14		802	908	2	88.32	B
18		675	908	1	74.33	C
3		892	908	0	98.23	A
27		539	882	3	61.11	D
28		549	908	4	60.46	D-
6		865	908	0	95.26	A
12		824	908	2	90.74	A
33		198	908	14	21.80	F
7		858	908	1	94.49	A
19		669	908	2	73.67	C
26		216	347	0	62.24	D
32		383	868	7	44.12	F
19		669	908	3	73.67	C
2		908	908	0	100.00	A
24		610	908	5	67.18	D
1		913	908	0	100.55	A
25		125	190	1	65.78	D
22		560	818	3	68.45	D
9		843	908	0	92.84	A
16		750	908	1	82.59	B
10		840	908	0	92.51	A
15		794	908	0	87.44	B
21		648	908	2	71.36	C
29		547	908	2	60.24	D-

CLASS SCORE ANALYSIS

(EXCLUDING: DROPPED STUDENTS AND ASSIGNMENTS, EXTRA CREDIT AND CREDIT-ONLY ASSIGNMENTS)

NUMBER of "0" = 0:	82	NUMBER of CHT = 0:	0
NUMBER of INC = 0:	1	NUMBER of EXCUSED:	39
NUMBER of TRU = 0:	0	NUMBER of DROPPED:	0

Table Two

Science Period #7 CLASS SUMMARY B

NUMBER OF ACTIVE STUDENTS ENROLLED: 32
NUMBER OF ASSIGNMENTS RECORDED THUS FAR: 24
CURRENT CLASS AVERAGE: 87.30%

CLASS RANK	STUDENT NAMES	POINTS EARNED	POINTS POSSIBLE	NUMBER "0" GRADES	CURRENT PERCENT	CURRENT GRADE
10		878	948	0	92.61	A
19		842	948	0	88.81	B+
21		798	948	0	84.17	B
3		983	948	0	103.69	A
26		756	948	4	79.74	B-
17		859	948	0	90.61	A
28		708	933	1	75.88	C
1		928	948	0	108.43	A
2		987	948	0	104.11	A
30		596	948	6	62.86	D
22		786	948	1	82.91	B
13		865	948	1	91.24	A
13		865	948	0	91.24	A
15		863	948	0	91.03	A
31		551	948	6	58.12	F
8		905	948	0	95.46	A
6		947	948	0	99.89	A
32		512	948	10	54.00	F
17		859	948	0	90.61	A
25		729	908	3	80.28	B-
7		937	948	0	98.83	A
24		766	948	1	80.80	B
5		961	948	0	101.37	A
12		866	948	0	91.35	A
9		898	948	0	94.72	A
23		750	908	0	82.59	B
16		825	908	0	90.85	A
27		712	908	2	78.41	C
4		981	948	0	103.48	A
11		855	933	2	91.63	A
20		792	906	2	87.41	B
29		570	858	2	66.43	D

CLASS SCORE ANALYSIS

(EXCLUDING: DROPPED STUDENTS AND ASSIGNMENTS, EXTRA CREDIT AND CREDIT-ONLY ASSIGNMENTS)

NUMBER of "0" = 0:	41	NUMBER of CHT = 0:	0
NUMBER of INC = 0:	0	NUMBER of EXCUSED:	10
NUMBER of TRU = 0:	0	NUMBER of DROPPED:	0

Table Three

Data Results and Analysis

Class A Quantitative Summary	

* Number of active students enrolled	33
* Number of assignments recorded	23
* Students who received one or more incomplete assignments	23
* Number of Incomplete assignments as a class	82
* Class Mean (average)	76.97%
* Class Median	77.87%

Class B Quantitative Summary	

* Number of active students enrolled	32
* Number of assignments recorded	24
* Students who received one or more incomplete assignments	13
* Number of incomplete assignments as a class	41
* Class Mean (average)	87.30%
* Class Median	90.61%

As the quantitative results indicate; the students from Class B (cooperative grouping) achieved higher scores in all areas and received less incomplete assignments.

Table Four

Science Assessment Scores

	A	B
1		6
2		3
3		6
4		6
5		6
6		6
7		na
8		5
9		2
10		6
11		5
12		6
13		1
14		5
15		4
16		6
17		1
18		6
19		6
20		2
21		2
22		3
23		6
24		2
25		6
26		na
27		1
28		6
29		2
30		5
31		6
32		2
33		3

Table Five

Science Assessment Scores

	A	B
1		4
2		3
3		6
4		6
5		6
6		6
7		6
8		6
9		5
10		2
11		5
12		3
13		6
14		5
15		4
16		6
17		6
18		5
19		2
20		3
21		6
22		4
23		6
24		5
25		5
26		3
27		4
28		3
29		6
30		4
31		4
32		1

Table Six

Data Results and Analysis

District Science Assessment

Six Point Scale

6 = 90 - 100%

5 = 80 - 89%

4 = 70 - 79%

3 = 60 - 69%

2 = 50 - 59%

1 = 0 - 49%

Class A Quantitative Results

* Number of students tested.....	31
* Students who received a score of 6.....	14
* Students who received a score of 5.....	4
* Students who received a score of 4.....	1
* Students who received a score of 3.....	3
* Students who received a score of 2.....	6
* Students who received a score of 1.....	3
* Average Score.....	4.2

Class B Quantitative Results

* Number of students tested	32
* Students who received a score of 6.....	12
* Students who received a score of 5.....	6
* Students who received a score of 4.....	6
* Students who received a score of 3.....	5
* Students who received a score of 2.....	2
* Students who received a score of 1.....	1
* Average Score.....	5.3

* As the quantitative results indicate: Class B (cooperative groups) achieved higher scores.

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