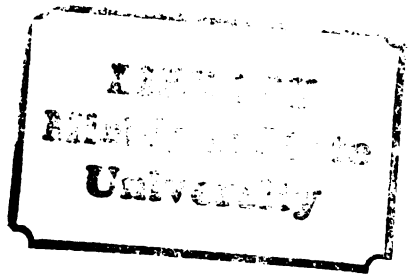

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EFFECTS OF COOPERATIVE GOAL STRUCTURING ON SIXTH GRADE SCIENCE STUDENTS' ABILITIES TO INITIATE TASK AND MAINTENANCE GROUP BEHAVIORS

presented by

Judith Ann Hay

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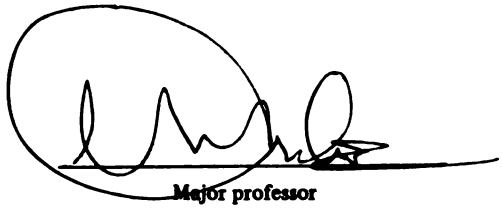

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EFFECTS OF COOPERATIVE GOAL STRUCTURING ON SIXTH GRADE SCIENCE STUDENTS' ABILITIES TO INITIATE TASK AND MAINTENANCE GROUP BEHAVIORS

By

Judith Ann Hay

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ABSTRACT

EFFECTS OF COOPERATIVE GOAL STRUCTURING ON SIXTH GRADE SCIENCE STUDENTS' ABILITIES TO INITIATE TASK AND MAINTENANCE GROUP BEHAVIORS

By

Judith Ann Hay

The study was designed to investigate the effect of Cooperative Goal Structuring on sixth grade science students' ability to initiate task and maintenance group behaviors. It was hypothesized that using Cooperative Goal Structuring would result in students' being able to increase the frequency of use of task and maintenance skills as well as increase the range or number of categories of those skills that they used. It was also felt that the students who used a cooperative method would maintain their skill levels over a three week interval in which no training was involved. Finally, cognitive performance on content-specific science materials was expected to be better for those who studied using the Cooperative Goal Structuring methods. Goal structure refers to planned interaction of students when working on a task. Three structures are: (1) working independently (no interaction), (2) working in a group that is unstructured and not monitored, and (3) working in a cooperative group with structured interaction and with observer feedback on interaction skills.

An instrument was developed for use by outside observers to monitor behaviors in ten task and ten maintenance group skill categories.

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An astronomy unit was used that could be adapted to independent structure or small group structure. A pretest and posttest on the specific content material was created.

There were three treatments: independent, unstructured groups, and structured groups. Independent variables were sociometric measures of initial popularity, influence, academic credibility and self concept, and general achievement level. Dependent variables were observations of task and maintenance skills and content-specific achievement tests.

The design was a non-equivalent control group pretest-posttest design. Three intact classrooms of sixth graders were randomly assigned treatments which structured the kind of student-student interaction they would use to study an astronomy unit. In treatment 1 (independent), students were organized to study with no interaction. Students were graded on individual work. In treatment 2, students were assigned to heterogeneous groups based on achievement scores, but the group interaction was unstructured, such that students could work alone or with others. How they worked was not prescribed. Students were graded on individual work. In treatment 3, students were assigned to heterogeneous groups based on achievement scores and taught to follow a Cooperative Goal Structuring format. They cooperated on studying material and in completing the assignments. They were graded on the product of group effort. The groups had an extra member who served as an observer of task and maintenance behaviors and gave feedback after the students had worked together.

Observations were done before the treatment, after the four-week treatment, and after a three-week interval during which no instruction in group skills was given. A content-specific pretest and posttest were given.

The data were analyzed using analysis of covariance (ANCOVA). Covariates for the posttreatment observation were the sociometric measures and the pretreatment observations. Covariates for the content-specific achievement posttest were a score on a general achievement test and the pretest score on content. Null hypotheses were tested using an alpha level of .01.

The mean differences of the Cooperative Group, when compared to the independent students' means and the unstructured group means, on task and maintenance behaviors were not significant. There was no significant difference in frequencies or in range.

When considering the content-specific achievement posttest, the cooperative group mean was significantly greater than that of the independent group. The difference in the means of the cooperative group when compared to the unstructured group was not significant.

Comparison of means on the $\text{Posttreatment}_{II}$ observation (after a three week interval without instruction) revealed no significant differences among groups.

DEDICATION

This dissertation is dedicated to

my grandfather, William E. Sims.

ACKNOWLEDGEMENTS

This dissertation represents an awesome display of organization, thought, study, and tenacity. It would have been impossible without the academic and personal support of the following people.

Dr. Sam Corl, my advisor and dissertation director, has challenged me to exchange expectations and forecasts of doom for getting in touch with what I want to do and how much I want to do it. This has enhanced my ability to set my own goals and take responsibility for what I want because of his ability to guide without pulling, pushing, or manipulating. He is truly a scholar worthy of admiration, never settling for complacency of thought. He has stretched my thinking farther than anyone else. He is also a friend.

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I publicly express my gratitude to these gentlemen, both for the excitement I feel over my academic achievement, and for the support, but not always agreement, they have given me.

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My best friend Bill Mudget has given me emotional and intellectual support and encouragement. He has helped keep me sane in the midst of insanity by keeping me in touch with sunsets and scarlet tanangers.

My mother Dorothy Gillman, my sister Joan Dardas, and my brother Tom Gillman have supplied me with unconditional love, respect, and caring. My tenacity would have never existed without being able to fall back on years of caring and support they have provided me. They were the "group" whose expectations and feedback sent me into the fray.

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Copious thanks to Necia Black and Carol Blumberg who helped me face the computer and come out unstapled and only sightly mutilated.

This dissertation would be a pile of wrinkled, discarded, typo-filled pages in a waste basket if it weren't for Barbara Reeves. She has been a friend for all the time I worked with Ed 200, and she also happens to be a premier typist. Her help and knowledge have been invaluable.

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CHAPTER ONE

THE NATURE OF THE STUDY

Educators vary in their approach to answering the question, "What are schools for?" Some of those educators who look to schools to provide more than academic competence expect school personnel to produce an environment in which students can "feel" their success and potential as well as "do" tasks before them. These educators believe school and its curriculum should be concerned with building efficiency in basic academic skills, but also equally concerned with supporting children through social and emotional learning.

Teaching socio-emotional skills helps students feel good about themselves and experience competence when working with others. This orientation is called "self actualization" curriculum by Eisner and Vallance (1974). It has also been conceptualized as "confluent education" (Brown, 1971). Confluent education refers to putting feeling and thinking together in the learning enterprise. With this type of educational experience, the encounter with curriculum is investigated as it interrelates with the students' encounters with peers and teachers.

The manner in which teachers control and direct the classroom activities of students has an effect on performance of students (Doyle, 1977). Doyle refers to studies that aim at clarifying this connection as "mediating process" research. The mediating process focuses on what students do with their time when encountering assignments.

One aspect of the mediating process is student-student interaction. Teachers may structure classroom work so that students reach goals individually, competively, or cooperatively (D. Johnson and R. Johnson, 1975). Each structure can be related most effectively to a type of classroom goal. When specific skills or knowledge acquisiton is desired and the assignment is clear and behavior specific, then individualized work may be most appropriate. When skill practice and recall or review are desired with clear assignment and rules, then competition is appropriate. When problem solving, divergent or creative tasks are the objective and the assignment is more ambiguous, then group work is effective. In the group structure, students use clarifying and inquiring skills. In individual work there need be no interpersonal interaction among students. In competitive work, students interact in an adversarial way, comparing who will win. In cooperative work, students interact to mutually reach a goal.

In more traditional settings, students remain more of an aggregate of persons without a focus on interpersonal interaction (Stanford and Roark, 1974). In building groups, skills can be taught that give students insight into possible behaviors available to them in groups that help them contribute ideas to and gain information from fellow students.

The Cooperative Goal Structuring Model

David Johnson and Roger Johnson (1975) view classroom interaction among students in terms of goal attainment structures. Teachers can organize pupil interaction cooperatively, which results in positive goal interdependence; competitively, which results in negative goal interdependence; or individually, which results in goal independence.

The steps in cooperative goal setting include:

1. Specify objectives to determine that the task is appropriate and most effectively done in a group. Most effective are problem solving and divergent thinking tasks where the assignment allows some ambiguity.

2. Select group size--not too large for the age group's skill, but large enough for variety of resources.

3. Assign students to groups for heterogeneity.

4. Arrange the classroom in clusters.

5. Provide materials.

6. Explain the task and criteria referenced evaluation, as well as the expectation of a group product.

7. Observe student-student interaction and train student observers.

8. Intervene if needed as a resource for the task or as an observer of the interaction.

9. Evaluate the product.

> The essence of cooperative learning is assigning a group goal such as producing a single product (e.g., a single set of answers to math problems or a single theme or report) or achieving as high a group average on a test as possible and rewarding the entire group on the basis of the quality or quantity of their product according to a fixed set of standards (D. Johnson and R. Johnson, 1979, p. 17).

Statement of the Problem

Cooperative groups require certain skills on the part of the group members in order to reach the goal of the group effectively. D. Johnson and R. Johnson (1975) designate communication skills, skills in building and maintaining trust, and controversy skills. These skills are similar to those referred to as functional leadership skills by Cartwright and Zander (1968). Bales, in describing these skills from yet another perspective, refers to positive and mixed reactions, attempted answers, questions, and negative and mixed actions (1970).

In this study, they were categorized as task and maintenance skills (D. Johnson and F. Johnson, 1975). A component part of working in cooperative groups is learning the skills and getting feedback on behaviors that fit those skills. Not all students exhibit the range of task and maintenance skills that is possible. Some do one type well, (for example, task skills), but seldom or never exhibit behaviors in the area of maintenance. Some students are quiet and withdrawn and exhibit none of these skills.

Research has been done that indicates some of the reasons that initiation of skills varies with different individuals and that such variance is not explainable solely on the basis of a lack of awareness of the skills. The initiation of group process skills depends on the individual's perceived power or influence, the individual's popularity and self concept, as well as his/her reason to believe that success or reward will result (Atkinson and Feather, 1966; Hemphill, 1961; Hollander, 1961; Schmuck and Schmuck, 1975).

The problem that was investigated dealt with using cooperative goal structuring--group task work plus training in task and maintenance skills--in a science class. The dependent variable was occurrence of initiation of task and maintenance behaviors before and after the cooperative goal structuring had been used. The intervening variables necessary to ascertain were each student's popularity, self concept, achievement level, and influence. An effect of cooperative goal structuring that was investigated was the possibility that more students, of varying degrees of influence, popularity, and self concept were able to initiate task and maintenance behaviors with greater frequency and in a greater variety (range).

Along with the concern for gain in group skill behaviors, the achievement of students in the content materials presented in the lessons was measured.

The Purpose of the Study

The research was designed and carried out to provide information on the effect of heterogeneous cooperative groups (D. Johnson and R. Johnson, 1975) on the ability of sixth grade students with varying degrees of popularity, influence, academic credibility, and positive self concept to initiate a pattern of selected task and maintenance behaviors in a science class in which a small group format was the pedagogical mode.

The Need for the Study

Initiation of task and maintenance behaviors has been linked to specific students' feelings of power or influence, popularity, self concept, and possible success in initiation. Cooperative goal structuring has been researched in connection with its effect on peer relationships; self concept; feelings about subject matter, teachers, and schools; and maintenance of achievement levels. Research (D. Johnson and R. Johnson, 1978) indicates a positive influence of cooperative goal structuring on those variables.

The research reported here was done to find any indication that use of a method dealing with both subject matter and group dynamics could provide practice in group skills for all students with subsequent behavioral change.

In reviewing curriculum research, Walker (1976) indicates that the most significant research may be that which deals with pupils'

pursuits (types of behaviors they spend time on in the classroom) and the resulting outcomes, rather than trying to directly relate teacher behaviors and student outcomes. The cooperative goal structuring method regulates student involvement in and practice of group task and maintenance behaviors.

Bloom (1976) states that:

> ...there is considerable evidence that differences which appear relatively early (by grade three) in school achievement tend to remain and even *increase* over the many years of school (p. 9).

He states that experiences, cognitive and affective, with early learning tasks influence behavior on later tasks. A major change effort is needed to turn the results of those experiences around. He indicates that attention should be paid to diagnosing and teaching prerequisite skills for tasks and mastery of those skills. Cooperative goal structuring may be a vehicle to teach prerequisite skills for group interaction to students. Further studies will be necessary, but this is an indicator of directions to investigate.

Overview of the Study

A sixth grade class (n=84) was chosen for research subjects. The students were from three homerooms (n=28, each) all in the same school. Each homeroom had a different teacher, but each had science with the same teacher in separate periods throughout the day.

Pre-treatment measures were taken. Each student took a pretest on the science subject matter to be studied. Each student also took several sociometric instruments to be used in determining indication of influence, popularity, academic credibility, and self concept. Outside observers tallied task and maintenance group behaviors of students

who were working on a joint task. The students were in groups of four. Using scores from a standardized achievement test taken the previous spring, the groups contained students of varying levels of achievement.

Each classroom used the same materials for the astronomy unit. The difference was in the way the students of each classroom were instructed and allowed to interact to accomplish the tasks. All three classrooms received aid and instruction from the teacher. Classroom 1 (independent) students worked on the materials independently of each other. Classroom 2 (unstructured group) students were assigned to a group, but they could choose to work with other students or independently. Classroom 3 (structured group) students were assigned to groups and followed the Johnson and Johnson Model of Cooperative Goal Structuring, including student/peer observers of task and maintenance behaviors. The material for the curriculum was written specifically for this study. It was designed with three goals in mind: (1) that it meet the school system's objectives for the astronomy unit, (2) that it be in a format that could be used either independently by students or in a jigsaw (Aronson, Blaney, Sikes, Stephan, and Snapp, 1975) format with cooperative groups, and (3) that it include up to date materials on space exploration.

A jigsaw method requires different materials for each student in a group. All materials are needed to complete the assigned task. All group members have information to share. The materials could also be used by one student in an independently structured classroom.

Following the treatment time of four weeks, students took a posttest on the science materials. The outside observers also tallied

task and maintenance behaviors of the students in all three classrooms, again in groups of four.

Three weeks later, the outside observers again tallied task and maintenance behaviors of groups of four in all three classrooms.

Hypotheses

Information collected during this study was used to investigate the effects of cooperative goal structuring on certain aspects of student behaviors in a sixth grade science class. The following broad research hypotheses gave direction to the study. The more specific research hypotheses and null hypotheses are listed in Chapter III.

1. Using the cooperative goal structuring technique increases student ability to initiate task and maintenance group behaviors and widens the range of the behaviors that are able to be initiated.

2. Variability of scores on posttreatment observations of task and maintenance group behaviors will lessen as compared with pretreatment observation when cooperative goal structuring has been practiced.

3. Using the cooperative goal structuring technique enables students to retain more information as measured by a content specific achievement test.

4. Variability of scores on a content specific achievement posttest will lessen as compared with a pretreatment test when cooperative goal structuring has been practiced.

5. A gain in ability to initiate task and maintenance behaviors will be maintained over a three-week time without formal reinforcement.

Assumptions

1. In choosing a single school, one grade level, and three separate homerooms, the assumption of independence among homeroom groups must be made.

2. The use of one teacher provides control in the sense of consistency of approach; but in interpreting data, the assumption of equivalent teacher-class rapport must be made.

3. The outside observers were trained on videotapes of the same students. It is assumed that the reliability of the videotaped observations transferred to the actual, live classroom observations.

4. The groups are equivalent at the beginning of the study.

5. Student behaviors are independent.

Limitations

A debate that has gone on in educational research is concerned with tight experimental rigor of a laboratory sort as opposed to a complex setting, full of confounding variables. Pure laboratory research does not transfer easily to the natural environment of schools. This study of a classroom process may be more valid because of the setting, but it is necessary to acknowledge limitations.

Some of the effects of using observers need to be noted. A condition of observation that can be varied by the type of behaviors investigated is called inference. The more specific and limited the behaviors that an observer is watching for, the less inference or fewer personal idiosyncrasies go into the judgments they make. The training with videotapes to establish a common frame of reference was done to limit differences due to inference.

The observers were a new element in the classroom and, therefore, changed the atmosphere of that setting, however slightly. Kerlinger (1973), while acknowledging the possible effect of observers on behaviors of the observed, makes the point that the observed cannot do what they don't know how to do. In this case, students would not initiate

task or maintenance behaviors unless they knew how and felt such behaviors were appropriate. He also states that groups seem to adapt rather quickly to being observed.

The students were from a specific community with a specific socioeconomic status, and results are only generalizable to similar students.

Their homeroom classes take science as a unit, but they interact on the playground, etc., and could have discussed classroom activities.

The specific teacher and each class have a history from the beginning of the year which may have biased interaction.

The treatment lasted four weeks.

The topic of astronomy may have been a factor in differing reaction to the treatment. Motivation to study astronomy was not measured.

The teacher has given time and effort in summer study and support of cooperative goal structuring. Although bias may be indicated by that time in study, the design and teacher role were, hopefully, controlled enough to eliminate substantial bias.

Parent reactions to certain apsects of the study may have influenced student reaction and will be discussed in Chapter Five.

The classes were held at different times of the day. Two were in the morning, and one was in the afternoon. This may have affected the outcome.

Curriculum materials were written by the researcher and the teacher to enable them to be used for both independent and group situations. The materials may have had an effect on attitude or achievement because of level of interest or level of difficulty.

Data Analysis

Analysis of covariance (ANCOVA) was used in this study for analysis of both the observation data and the content specific science data.

Observation Data Analysis

The independent variables were the treatments (independent, unstructured, structured). The covariates were sociometric scores for popularity, influence, academic credibility and self concept, and the pretreatment observation scores. The dependent variables were the posttreatment observation scores.

To analyze the observation taken after a time lag without reinforcement, the independent variables were again treatments. The covariates were the sociometric measures and the posttreatment observation scores.

Content Specific Science Data Analysis

The independent variables were treatments (independent, unstructured, structured). The covariates were achievement levels (CTBS-grade equivalents) and the pretest. Dependent variables were the posttest scores.

Definition of Terms

Task Functions in a Group

Behaviors that help accomplish the work-oriented, subject matter requirements in the classroom (Schmuck and Schmuck, 1975).

Examples of task behaviors: initiation of ideas, the seeking out and giving of information, clarifying and/or elaborating.

Maintenance Functions in a Group

Behaviors that help monitor the feelings and commitment of the group in working together (Schmuck and Schmuck, 1975).

Examples of maintenance behaviors: encouragement of others, expressing of feelings, harmonizing, helping silent people get a chance to speak.

Cooperative Goal Structuring

From D. Johnson and R. Johnson, 1975 (see pages 2 and 3 of this study).

Popularity

Popularity, in this study, refers to the assigning of liking from members of one's peer group.

An instrument (Fox, Luszki, and Schmuck, 1966) will be used to indicate who individuals would most like to be with.

Popularity or liking is a concern in this study because it ties in with referent power (French and Raven, 1959). Referent power is influence of B on A because A likes, admires, wants to be like B.

Power/Influence

French and Raven (1959) define power in terms of influence and influence in terms of change of behaviors, opinions, attitudes, needs, and goals. It is power from the perspective of those who are the recipients of influence.

They outline five types of power: coercive, reward, legitimate, expert, and referent. Referent power, which has its basis in identification and attraction of A for B, has the widest range. Their

definition of range may be exemplified by a football star in high school who has a wide range of power over admiring peers, but a narrow range of power over the school principal.

Lippitt, Polansky, Redl, and Rosen (1952) found self-perception of own power tends to be consistent with attribution of power by other members of a group.

Academic Credibility

Academic credibility refers to the opinion students/peers have of a particular student's ability to learn school work.

The assessment of students by classmates will be obtained from a sociometric tool from Diagnosing Classroom Learning Climate (Fox, Luszki, and Schmuck, 1966).

Self Concept

This is the measure of how a student describes him/herself in terms of social and academic success or failure. Atkinson and Feather (1966) believe that one of the determinants of acting in a group is expectation of success. Bloom (1976) indicates that success on a learning unit is affected by earlier success or failure on the same or a similar learning unit.

Jigsaw Technique

A way to organize the interaction of students when they are working on an assignment which was originally designed (Aronson, Blaney, Sikes, Stephan, and Snapp, 1975) to use in alleviating racial tension.

If there are four participants in a group, then each participant receives different information or is assigned a different aspect of a

study. But in order to complete a task, information from each of the four must be used. This method works well in a cooperative goal structuring group. It was appropriate for this study because it could be used in groups and also used for individuals by giving them all four parts of the information.

Overview of Succeeding Chapters

The review of literature is presented in Chapter II in the areas of group dynamics, cooperative goal structuring, pupil pursuits, observation technique, and sociometric measures. Chapter III is a description of the specific design of the study and procedures that were followed. Findings are outlined and analyzed in Chapter IV. Summarization and reflection on what was found and recommendations for implementing findings and planning further research are included in Chapter V.

CHAPTER TWO

REVIEW OF THE LITERATURE

This chapter includes the presentation of relevant theory and research in five areas. The first two areas are of primary concern for the concepts investigated in this study. They are group dynamics and cooperative goal structuring. The remaining three areas have to do with procedures used in the design and execution of the study. They include reviews of pupil pursuits as a research target, sociometric instruments to determine students' perceptions of classroom social hierarchies, and observation procedures in naturalistic settings.

Group Dynamics

The effectiveness of educational efforts as well as the support of the institution called schooling rely on the ability of educators to understand what goes on in the learning process. This understanding requires that educators take an interdisciplinary look at what happens when learners and external stimuli (i.e., natural or planned experiences) get together. One aspect of the interface of these elements has been studied specifically and consistently since the 1940s by educators, social psychologists, psychologists, and anthropologists. It is the study of group dynamics, and it is essential to the understanding of the orientation taken in this research. Studies of individual differences and learning theory, so important to the process of education, have come in only recent times to be considered in terms of the powerful

forces of those who live and work with the learner and that interaction.

The historical roots of group process study in terms of laboratory research as well as naturalistic experiential group learning is usually traced back to the work of Kurt Lewin who brought the issue to the forefront in the early 1940s. For a recent review and update on the overall history and recent research on group processes, the reader may look to an article by Zander (1979) in the Annual Review of Psychology. He includes a listing of topics and the year they have been considered by other reviewers in the same journal. These studies had an upsurge in the 1940s, 1950s, and early 1960s. Since then, the interest has lost its missionary zeal and stabilized. The research has concentrated on a particular group of topics, while ignoring other issues (Zander, 1979). Zander suggests that a topic becomes popular when a researcher realizes that an accepted theory in individual psychology is possibly relevant in group psychology. Another stimulus for study occurs when there is disagreement among researchers. He suggests topics that require more attention, two of which are the causes of productivity in a group and the effects of the social environment on a group. These topics are dealt with in the research reported here. One of the largest practical problems with studying groups is the high cost of working with groups, and another is the long time involved in the development of groups.

Researchers have found that groups, working on a task, exhibit behaviors that follow a predictable sequence of stages. Tuckman (1965) used the helpful terms form, storm, norm, and perform to indicate the stages. These stages have a predictable sequence, but not a predictable

time frame. All stages may be covered in a single session, or a group may be stuck in the storm (conflict) stage and not get to perform. Stanford (1977) modifies and readjusts the sequence for the school situation. Because a teacher intervenes with rules, Stanford believes the sequence proceeds in the following order: orientation, establishing norms, coping with conflict, productivity, and termination. Tuckman's storming and norming are reversed because Stanford notes that in Tuckman's groups there is no leader intervention.

Many studies of natural groups took place in industry, government, and the military. These studies, supplemented by laboratory studies, have supplied important information for students of group processes. Nevertheless, for the purpose of education, many more studies in classrooms need to be done than have been. In Group Processes in the Classroom, Schmuck (1979) states:

> The essential premise of this text is that "the substantial school improvement" has not occurred because the interpersonal relationships and collaborative working relationships within schools have been largely ignored by educational researchers and change agents. Even though a great deal of study has been carried out on new teaching methods, curricula, educational hardware, and architectural designs for school buildings, improvements in the quality of human interaction in our schools have largely gone unheeded (p. 5).

Added to the concerns cited by Zander about cost and time elements in group research, classroom studies would confront the researcher with ethical problems as well as practical availability problems. It is more difficult, politically, to gain access to a classroom or classrooms of students for study.

In spite of the problems involved with group research, there are relevant studies that are cited in the remainder of this review. Also,

the explanations and theory built on groups in contexts other than school lend insight into school group interaction. The topics that are discussed include: group social structure (liking, leadership and credibility, influence, self-concept), group member behavior and communication, and cognitive development in groups. The last topics discussed are group norms and goal structures. Norms and goal structures are most relevant in the second section on cooperative goal structuring and will be included in that section.

The research on classroom groups also can be looked at in terms of teacher-student relationships, student-student relationships, and student-teacher-environment relationships. All of these relationships are important in considering educational research and planning; the research reported in this dissertation was concerned with student-student interaction and relationships. Where research using teacher-student studies, or studies in industry or other removed groups, are reported, an attempt will be made to tie it into student-student interaction. Shaw (1976), in posing the question of the uniqueness of children's groups, believes that many of the general principles governing behavior in adult groups will apply to children's groups:

> The major difference between children's groups and adult groups occur as a result of developmental process. Children must learn about "appropriate" behavior in groups and, consequently, behavior of younger children in groups often varies from the adult pattern (p. 361).

Group Social Structure

The field of social psychology attributes individual personality and behavior to both internal and external feedback. We come to see

ourselves and operate in our environment to a large extent according to the messages of worth or value we received from others in response to our behaviors (Mead, 1934; Cooley, 1956; Sullivan, 1948).

Group social structure refers to the patterns that become established in a classroom concerning liking, influence, and credibility. In response to the place each individual perceives him/herself on continua of popularity, power, and competence, a self-concept or self-picture is developed for interaction in that group.

The individual comes to the group seeking inclusion, control, and affection (Schultz, 1958, 1966). Members of the group respond to the individual either openly or in covert ways to express their opinions of that person. Research shows that the bases for liking patterns are physical attractiveness, social effectiveness, intellectual competence, and mental health (Glidewell, et al., 1966). Lippitt and Gold (1959) studied the consistency of status over the year. In their studies, children stayed in much the same status position in terms of liking, influence, and expertness from the beginning through the end of the year.

French and Raven (1959) have delineated a useful categorization of interpersonal influence. They list five types of power. Power or influence is defined by Cartwright and Zander (1968) in interpersonal situations such that one person has influence over another if his/her behavior results in a change in the other person. The powerful person, according to French and Raven, can have legitimate power, coercive power, reward power, referent power, or expert power. These powers are associated with resources of the individual that are motivating to the

influenced person. The concept of power used here has the conceptual property of potentiality. It need also be noted that the power is given to the person (S) by the other (O) as O perceives that S possesses resources O needs. Legitimate power has to do with internalized, societal, or cultural norms that a "position" of power gives a person such as teacher or president. Coercive power is the power to punish, while reward power is the opposite, ability to give rewards. Referent power is a relational or closeness power. Expert power is based on the resources of knowledge and skill. One person may command attention or acquiescence because of one or a combination of the above-mentioned types of power.

Returning to the highly liked or popular student, there is a strong chance that that student will also have referent power in the classroom. Students don't often have legitimate power; that resides with the teacher. But the student with referent power may also have coercive or reward power. Sometimes the student with referent power will also have expert power, but it is not necessary.

Expert power or academic credibility of a student also can be seen as a stable attribute in a classroom. Although expert power can be derived from facility in areas other than the formal studies of the school (i.e., sports, hobbies, etc.), the academic area is important to the research reported here. As a result of interaction in previous years, students expect that certain of their peers are able to do the work quickly, easily, and well. The area of expectations is important throughout this discussion.

Finn (1972) asserts that expectations are evaluations which lead the evaluator to treat the evaluated as though the assessment were

valid. Reviewing studies done with students, Schmuck and Schmuck (1979) summarize the sources of expectations as developing through gathered information, cultural stereotypes, social situations, and taking a role.

Consider the student who has covert and/or open feedback on his/her popularity, power, and academic credibility that is generally positive. This student is more likely to form a self-concept of success and positive feelings than a student who gets negative or mixed feedback in the classroom. A student then forms self-expectations. Self-expectations and the expectations of others influence whether a student feels s/he will succeed (Sears, 1940), and low self-esteem can undermine the actual academic performance of a student (Johnson, 1970). When considering expectations and performance, the interactions which result are circular. Lippitt (1962) refers to the circular interpersonal process which is maintained when expectations and behaviors coincide. If the cycle goes as predicted and the behaviors are usually positive, the response to an "off day" behavior is perceived sympathetically. If the behaviors are in a negative cycle, an "on task day" is not perceived as hopeful. Bloom (1976) outlines the defeating cycle of failure in academic tasks which results in poor self-image which results in less confidence and poorer work in the next similar task.

Keeping a student's "self-portrait" in mind, consider the interpersonal acts termed leadership. Leadership has been thought of in the past as resulting from particular personality traits or characteristics. Stoghill (1974) summarized studies on leadership traits from 1948 to 1970 and felt that this avenue toward predicting or identifying leaders was not fruitful. Only a small number of traits, listed in various studies, overlap.

A different conception of leadership is that of functional leadership. In this model, leadership is a set of behaviors that is used to exert interpersonal influence which assists the group in reaching its goals.

> Leadership is an interpersonal influence process; it is at least dyadic rather than an attribute of a single person. It is a verb rather than a noun (Schmuck and Schmuck, 1979, p. 88).

Functional leadership frees the student of classroom group process to operationally define leader so that there is more than one leader (the teacher). Members of the group may perform leadership functions. The functions performed in a group are usually categorized as serving two main objectives: (1) the accomplishment of the task or goal, and (2) the maintenance of a good, working, group relationship in performing the task. Benne and Sheats (1948) first described the functions as task and socio-emotional. Task functions are related to the assignment, goal, or task requirements such as giving information, summarizing ideas, giving directions. Socio-emotional functions are related to cohesion of the groups, such as encouraging quiet members to speak, harmonizing, and compromising. In this study the functions will be referred to as task and maintenance group behaviors.

In Joining Together, David Johnson and Frank Johnson (1975) focus on the functional approach to leadership because it is the:

> ...most concrete and direct approach available for improving leadership skills of an individual and for improving the effectiveness of a working group (p. 23).

Basic to the idea of functional leadership is the idea that any member of the group may, at some time, perform the needed function to move the group toward accomplishing its goal. In view of this tie with

leadership and membership, they use the terms leader and member interchangeably in a dynamic sense. Every member, in actuality, does not lead; but given certain conditions, the potential for leadership in this sense is in each member.

D. Johnson and F. Johnson (1975) have developed a task-maintenance grid and description of twenty skills (ten each for task and maintenance) which can be used to develop a sense of functional leadership for those who use the instrument. These twenty task and maintenance skills were used for observation purposes in the research reported here. The terms task group behaviors and maintenance group behaviors of members are used to reflect the functional leadership concept.

There are two aspects of training for ability to initiate task and maintenance behaviors in a group. One aspect is an overt, teachable, technical set of behaviors. The second is less direct in that it has to do with classroom atmosphere and the resulting expectations and aspirations of students within that atmosphere. The teacher, therefore, can structure experiences for students to work on the first set of behaviors and also work less directly to develop the classroom atmosphere.

D. Johnson and R. Johnson (1975) support the idea that group skills can be taught. They suggest the areas are communication skills, controversy skills, and skills in building and maintaining trust. Schmuck and Schmuck (1979) outline the communication skills as paraphrasing, behavior description, feeling description, impression checking, and feedback. These correspond to the Johnsons' communication skills. D. Johnson and R. Johnson (1975) outline controversy skills as (1) defining problems to be clarified rather than win-lose; (2) being critical of ideas, not persons; (3) pacing differentiation and integration of

problem solving; and (4) taking another's perspective. Trust building falls into the area of classroom atmosphere. It includes promoting feelings of openness, sharing, acceptance, and support, as well as cooperative intentions (D. Johnson and R. Johnson, 1975).

DeCharms (1972) has referred to training students to be "origins" rather than "pawns." In his work, teacher training in "origin" behaviors and training to teach those behaviors preceded student training. An origin-like person sees what behaviors are possible and needed in interaction and recognizes his/her own potential and responsibility to initiate behaviors.

The classroom atmosphere of openness, sharing, cooperation, and safety can be promoted by teachers (Stanford and Roark, 1974; Stanford, 1977; Schmuck and Schmuck, 1979; D. Johnson and R. Johnson, 1975).

Given that there are teachable group skills, their use is related to the previous discussion on classroom status.

In order to initiate task and maintenance behaviors in groups, the individual student must be able to be aware of the possible behaviors of a flexible member, be able to diagnose what behaviors are needed at the particular time, and be able to fulfill these behaviors or get others to do them (D. Johnson and R. Johnson, 1975; Fiedler, 1967). Also involved in the tendency to act are motivation, expectation, and incentive (Atkinson and Feather, 1966). Hemphill (1961) found that expectancy of success plays a strong role in attempting leadership functions as well as the belief that one is an expert in relation to the content. He also found the reward received to be important; i.e., more pay off resulting in more leadership behaviors. His work was done in a controlled, laboratory setting with college students.

The studies on functional leadership and leadership attempts can be related to classroom group behaviors. Given a student previously mentioned with high popularity, influence, and expert credibility and a stronger probability of a good self-concept, that student would probably be more likely to attempt task and maintenance behaviors in a group. The student with low status and a lower self-concept would be less likely to initiate any behavior in a peer task group. And this range of behaviors is witnessed in many groups in and out of schools. And, as Bloom (1975) and others have shown, a student gets into a rut of self-expectation and reacts to others' expectations in a consistent manner throughout the year.

To break into the cyclic expectations and self-expectations that operate in the classroom, a teacher can take specific steps. One method, disucssed in the next section, which combines working on group skills with development of classroom climate takes place while working on the cognitive tasks of the curriculum. It is called Cooperative Goal Structuring (D. Johnson and R. Johnson, 1975).

Cooperative Goal Structuring

A consideration of Cooperative Goal Structuring (D. Johnson and R. Johnson, 1975) necessitates a brief discussion of the meanings of cooperation and competition. As part of the worry and concern about students who dislike school and/or experience little success and lots of negative affective feedback, some educators looked toward the excessive predominance of competition in the school experience. Researchers began looking at what competition and cooperation are operationally and

what student affective and cognitive states seem to accompany the cooperative and competitive processes in the classroom.

The issue is not one of proving the moral value and ultimate superiority of competition or cooperation, one over the other. Perry (1975) points out that competition and cooperation are closely related in that they are both styles of group interaction. They are not opposites. Both are normally exhibited by behaviors and result from structuring tasks differently. He suggests that people do cooperate competitively as well as compete cooperatively. Wynne (1976) teaches a method of interaction to his college students which he refers to as "cooperative-competition." The issue that does tend to pit revolutionists such as Pinar or Kozol against competition, which is set up as evil, seems to be the alleged indiscriminate, constant use and abuse of competition in schools. It may be overt and planned or it may be a hidden agenda. It results in negative classroom atmosphere when ignored and/or overused (research to be discussed in the following paragraphs).

Perry (1975) suggests that the focus be on setting up competitive and cooperative ventures in schools to study what occurs behaviorally and affectively in these frameworks and to examine what the student does to accommodate to each structure (framework). He suggests that the mission of schools in this respect is to produce students who have experience with dealing with the balance of looking out for oneself and looking out for others. There is evidence that students focus far too much on "right" answers and "pleasing the teachers" in lieu of learning for the pleasure of intrinsic success. Aronson et al. (1978) cites the example of a child who repeats an answer that was just evaluated as

incorrect because s/he did not listen to the classmate who had just uttered the erroneous response.

Rather than isolate the teacher-student interaction as the only school-supported (real or hidden curricula) classroom interaction, researchers began focusing on student-student interaction.

Attention to student-student interaction in cooperative and competitive groups was first investigated by Deutsch (1949). He referred to cooperative goals as promotively interdependent and competitive goals as contriently interdependent. He felt the studies implied that greater productivity in groups can be expected when members or subunits are cooperative rather than competitive in their relationships. There were some indications that competitiveness produced greater personal insecurity. He also urged educators to reexamine the usage of a competitive grading system.

D. Johnson and R. Johnson (1975) have concentrated on a method of structuring positive goal interdependence in student-student interaction. This type of interdependence is described as cooperative. Other classroom interactions are competitive (negative goal interdependence) and individualized (no interdependence). The model for cooperative goal structuring was outlined in Chapter I of this study.

An important element in selecting a goal structure depends on the specific type of goal or objective of the learning task. It has been found that when specific skills or knowledge acquisition is desired and the assignment is clear and behavior specific, then individualized work may be most appropriate. When skill practice and recall or review are desired with clear assignment and rules, then competition is appropriate. When problem solving, divergent or creative tasks are

the objective and the assignment is more ambiguous, group work is effective with students' using clarifying and inquiring skills. In individual work, there need be no interpersonal interaction. In competitive work, students interact in an adversarial way, comparing who will win. In cooperative work, students interact to mutually reach a goal (D. Johnson and R. Johnson, 1974).

The cooperative goal structuring model has been investigated in relation to instructional outcomes. The specific instructional outcomes that relate to the study presently being reported are cooperative goal structuring's effects on student motivation, involvement in instructional activities, attitudes toward peers, enhancement of self-esteem, and perspective-taking.

Motivation is used in the sense of the student's perception of success plus the incentive for success. Cooperative learning situations foster a greater perceived likelihood of success (D. Johnson and F. Johnson, 1975). Students who are more cooperative also see themselves as being intrinsically motivated believe that it is their own efforts that determine school success and that ideas, feelings, and learning new ideas are important (Johnson and Ahlgren, 1976; Johnson, Johnson, and Anderson, 1978).

Cooperative learning experiences, compared with competitive and individualistic ones, support greater willingness to present answers as well as a positive feeling toward the instructional experience (Garabaldi, 1976; Gunderson and Johnson, 1978).

There is evidence that cooperative learning experiences result in greater liking for peers (Garabaldi, 1976; Gunderson and Johnson, 1978; Johnson, Johnson, Johnson, and Anderson, 1976; Johnson, Johnson, and

Scott, 1978; Tjosvold, Morino, and Johnson, 1977). These same studies show that cooperative experiences also result in stronger feelings that one is liked and accepted by other students and that other students care about how much one learns and want to help.

Norem-Hebeisen and Johnson (1977) found that attitudes toward cooperation are related to basic self-acceptance and positive self-evaluation compared to peers. In correlation studies, cooperativeness is positively related to self-esteem in first through twelfth grade students in rural, urban, and suburban settings (Gunderson and Johnson, 1978; Johnson and Ahlgren, 1977; Johnson, Johnson, and Anderson, 1978; Johnson and Norem-Heibeisen, 1977; Norem-Hebeisen and Johnson, 1977).

Perspective-taking is:

> ...the ability to understand how a situation appears to another person and how that person is reacting cognitively and emotionally to the situation (D. Johnson and R. Johnson, 1978, p. 5).

Cooperative learning experiences have been found to promote greater cognitive and emotional perspective-taking ability than with competitive and individualized learning structures (Bridgeman, 1977; Johnson, Johnson, Johnson, and Anderson, 1976).

While D. Johnson and R. Johnson look at the interdependence in terms of goal structures, Slavin (Slavin, 1977; DeVries and Slavin, 1978) looks at the cooperative-competitive issues in terms of reward structures rather than goal structures. The focus is more on extrinsic motivation. They feel that the evidence for cooperative structures is positive in terms of cognitive success and productivity if the task includes opportunities to share resources and incentive to do so. If this is absent, then outcomes of cooperative groups do not exceed

competitive groups even though the affective gains are consistently supported. De Vries and Slavin (1978) have shown positive cognitive and affective gains using a cooperative-competitive method. A team works together, then competes outside the team with students from other teams and brings back points to the original cooperative team. They feel that the combination of cooperation and competition are necessary for producing cognitive and affective gains.

Aronson and colleagues (1975, 1978) were presented the task of conceiving of methods to aid in desegregation. Aronson wanted to use the beneficial aspects of small group dynamics. He and his associates devised a jigsaw method. In a jigsaw, each person in the group receives different information that is pertinent to the task assignment. Each student must communicate his/her part in order to complete the assignment. This jigsaw method was used in the present research in order that materials could be used by a group and fit into the Johnson and Johnson model at step five (provide materials) and step six (explain the task and goal), and also so that it could be used easily in the independent group (each student in that treatment got all the jigsaw pieces and worked alone).

A last note relates to the section of this chapter on group dynamics. Expectations for individuals were discussed, but not group expectations. Group expectations are shared meanings or norms. The covert or overt messages of competition become norms in a classroom. Students accept or fight, but they become knowledgable in the rules and procedures. If left on their own, in the classroom atmosphere, many of the norms guide their action. The methods mentioned in this section are taught to students as are the skills and behaviors necessary to

keep the cooperative method functioning. In this way, expectations and norms are interrupted. Competitive methods are not always appropriate and other methods are expected. In a jigsaw, the student who does not usually know an answer, or from past experience suffers defeat often, now has a piece of the jigsaw that is needed and is encouraged by peers to participate.

Cooperative Goal Structuring has used cooperation to interrupt some entrenched classroom behaviors and expectations. Research indicates that this method may create situations in which students can experiment with or change behaviors in the ways outlined in this section.

In the next section, attention is paid to curriculum research in terms of outcomes that will shed light on this conception of the teachers' structure of student-student interaction.

Pupil Pursuits

The preceeding sections outlined what happens to children when they are part of a classroom group and what cooperative educational researchers suggest to alleviate some of the negative group cognitive and affective outcomes while still maintaining a focus on the academic curriculum. Because this study necessitated the introduction of the cooperative model into a classroom, a responsible consideration of examining student outcomes in research must be a part of the literature review. The analysis of the effects of Cooperative Goal Structuring in these particular classrooms can be related to what behaviors were allowed the students in research procedures.

Relevant to this point is a review of curricular research done by Walker (1976). In a section on curriculum and academic achievement, he refers to methods of setting up research that concentrate on teacher behavior and student outcomes, or simply research that measures student outcomes after participati in a new curriculum as opposed to students who participate in the old program using the same undifferentiated test for both.

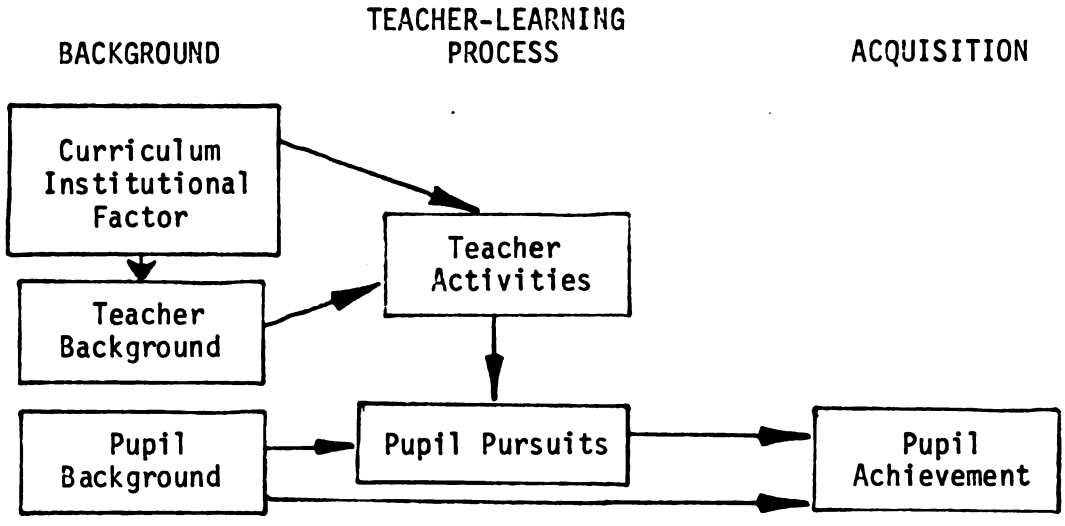
In the latter case, the concepts and processes taught in the new curriculum are shortchanged because the standardized measure is biased toward the older curriculum which it has paralleled for years. Walker suggests that research in this vein is most helpful when multiple achievement measures are designed and used so that the benefits of each curriculum may be clearly identified.

In the first instance, Walker points out the results of two lines of research that are more valuable in his opinion than comparing teacher behavior and student outcomes. The International Association for the Evaluation of Educational Achievement found a curricular variable that correlated best with achievement which they called "opportunity to learn." Opportunity to learn refers to the actual amount of exposure that teachers give students to the material that is tested by the achievement test.

Another related variable, isolated by a Swedish scholar, Dahllöf (1971), was allotment of time. It was classified under a category of variables that teachers had control of in addition to the level of attainment and complexity of objective a teacher expected. Harnischfeger and Wiley (1976) took the idea one step further and developed the idea of "pupil pursuits"; in other words, what the students <u>do</u> during their

time at school. They suggest that what teachers do or what curricular materials provide works indirectly on achievement. Some examples of pupil pursuits are listening, watching, practicing, studying, and rehearsing.

Figure 1. Harnischfeger and Wiley's Gross Determinants of Pupil Achievement



Doyle (1977), in studying models for research on teacher effectiveness, discusses three main models. They are process product, mediating process, and classroom ecology. The mediating process paradigm relates to the idea of pupil pursuits.

> According to this paradigm, variations in student learning outcomes are a function of the mediating activities employed by students during the learning process. In turn, the mediating processes that students use are influenced, in part, at least, by instructional conditions (Doyle, 1977, p. 171).

Students are not the inactive receptacles of a teacher's words; they do something to process that knowledge. Rothkopf (1976) asserts that students' attending and processing depends not on the discrete dimensions

of an instructional treatment, but on the task structure defined by that treatment.

An example of the idea expressed by pupil pursuits and mediating processes can be shown by a study reported by Mayfield (1976) in Science Education and the review of it by Martin (1976) in the same journal. Mayfield was interested in the factors operating in small groups that affect the rationality of the interaction as the group attempts to solve a particular science problem. Mayfield used a concensus task in which participants of five member groups were given a list of items and a survival situation, and they were to choose the most important items to survival. The group completed information pre- and posttests, and after each session individuals completed interpersonal rating forms on each of the other group members. Mayfield reported that the information increase was slightly significant and that the members did not seem to acquire skills in group interaction. Members who were isolates remained quiet, and leaders were reported as leaders not necessarily for proficiency reasons, but more for friendship reasons.[1]

Mayfield, himself, pointed out that merely participating in a group exercise did not produce progress in group skill development in the students. He also suggested that teachers need to direct students to examine group processes to promote interpersonal competence. He defined interpersonal competence as an awareness of what was happening in the group and the ability to do something about it. Martin (1976)

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[1]The part of Mayfield's work being discussed may not reflect the merit of the rest of his study. It is not the intention of this author to discredit what was investigated, merely to show the point of importance of design in research on outcomes.

supported Mayfield's suggestion to provide for experience and analysis of groups rather than just doing a task together. He also pointed out that groups develop over time, and this was too short a time. Mayfield also is critical of the consensus exercise in that the students knew that there was a "right" answer, and the process, therefore, was not science inquiry, but guessing the "right" answer.

This example is used to indicate that the quality of pupil pursuits was in question and interfered with the study. The study would have had more power if what the students were instructed to do and the structure they were put into were more appropriate.

To design a study in which pupils spend time learning interpersonal skills requires knowledge of what an outline of those skills are. Bloom's taxonomy of objectives for cognitive domain and Krathwohl, Bloom, and Bertram's taxonomy of objectives in the affective domain served as a model for Brandhorst (1976). He describes a taxonomy of educational objectives in the relational domain. He includes categories that are cognitive-affective-behavioral-leadership, followership, role-exchange yielding, and role-exchange asserting.

Practical guides for teaching students how to be group members are offered in Stanford (1977), Schmuck and Schmuck (1968, 1979), D. Johnson and F. Johnson (1975), and D. Johnson and R. Johnson (1975).

This section and the following two are concerned with the design of a curriculum study. In this section we looked at the importance of what students actually do in relation to the outcomes of research. In the next section we will consider observation techniques and, in the last, sociometric techniques.

Observation Techniques

The area of observation to gain knowledge and insight is as old as humanity. Scientists have been using this skill as a part of every data collection in their research. The question at the base of observation is the objectivity-subjectivity debate. In a controlled laboratory situation, observations have been regulated and quantified and objectified. Although the subjective element can never be completely controlled, it is much more able to be accounted for in a laboratory experiment.

The methodology of observation in naturalistic settings is at question here. In more recent years sociologists, psychologists, and educators have made strides in adding systematic observation to the score of respectable tools of the social sciences. This is not to say that observation that is unsystematic is not a legitimate tool in certain situations. From anthropology we get the method of ethnography or "a monograph-length written description" (Erickson, 1979). The ethnographer personally observes and produces a word-picture of the way members of a particular social culture see their situations and organize their behavior. This type of observation brings many insights and is valid in naturalistic settings such as the classroom. The ethnographer tries to be an informed camera and, later, skillfully looks for patterns when analyzing the data. For this research, though, the systematic type of observation is more appropriate and will be examined in more detail in this review.

In systematic observation, the researcher tries to limit the complexity of the natural setting. It could take a book to describe one

day in the life of a student. Systematic observation helps the observer narrow the focus.

> It is essential, therefore, that naturalistic researchers clearly determine what they are to observe out of this complexity, as well as means to record it accurately and systematically (Brandt, 1972, p. 23).

Eggleston (1975) refers to observation of what happens in classrooms, as well as who says what to whom, as interaction studies. He classifies them into five categories:

1. Inductive: observers have no prior value judgments about phenomena and no theory to determine selection of behaviors or events.

2. Prescriptive: as in supervising student teachers where the observer has a value-laden, subjective idea of "good" teaching. This is a high inference system.

3. Reflective: categories of behavior are prescribed by observers. Flander's system is an example of this. The problem is that teachers only get feedback on the researcher's categories.

4. Matching: observing for practices in the classroom that support behavioral objectives defined in school's curriculum. Again, the categories are related to the curriculum developers' theories, not teachers' or researchers.'

5. Process product: related to curriculum developments, but including measures of pupils' intellectual attainment and attitudes. The changes in student growth are measured in relation to a defined process of teacher-student behavior in classroom instruction.

Specific issues in observation studies are outlined in Foundations of Behavioral Research (Kerlinger, 1973). The observer him/herself brings behavior and construct together; therefore, his/her powers of inference are important. Training in the theory and specific behavioral indicants is important. The observer can also affect the objects of observation by being there. Alternatives are sound or videotapes

or asking the subjects what has occurred. A validity problem must be dealt with in terms of the amount of interpretation needed from the observer. Most researchers compromise between highly sophisticated systems with a large number of specifically defined categories that require less inference but are more difficult to use and systems with fewer categories that are easier to use but require more inference. Reliability of behavioral observation is usually defined as agreement among observers and needs to be worked out in training.

In determining what to consider in observation studies, two groups of researchers have surveyed research and developed anthologies of observation research. One group (Simon and Boyer, 1967, 1970, 1975) was done with primarily American studies, and the other (Galton, 1978) with British studies. Boyer, Simon, and Karafin (1973) have also done a three volume set on early childhood observation instruments. In these volumes the studies are categorized by the dimensions considered important in the research:

1. subject of observation
2. age of subjects
3. collection methods
4. collecting/coding staff needed
5. number of subjects recorded
6. setting
7. coding units
8. individual dimensions
9. social contact dimensions
10. materials and physical environment
11. developmental level rating scales

Considering the problem of observer inference (Kerlinger, 1973) and the categories listed by Simon and Boyer (1967, 1970, 1975) and Boyer, Simon, and Karafin (1973), a practical guide to designing observation instruments was developed by Boehm and Weinberg (1977). Steps were delineated so that the researcher develops instruments

that the observer can use to zero in on appropriate behaviors and lower inference problems for the observer. They suggest these steps: (1) define the problem; (2) study the physical and personnel constraints of the setting; (3) label and categorize behavior, trying to make categories mutually exclusive and/or exhaustive; (4) decide on sampling behavior and recording behavior; (5) decide on use of media or not; and (6) work on observer reliability by training.

Boehm and Weinberg (1977) make a point of the distinction between category systems and sign systems (Medley and Mitzel, 1963). In a category system, every observed behavior must be classified. It is comprised of mutually exclusive (no overlap) and exhaustive (all behaviors accounted for) categories. In a sign system, only specific predetermined behaviors are classified. It is mutually exclusive, but not exhaustive.

Group Skill Observational Instrument

Many of the studies included in the American "Mirrors" (Simon and Boyer, 1967, 1970, 1975) and British "Mirrors" (Galton, 1978) include teacher-student interaction. A large component is actually devoted to inclusion of adult-student interaction. Although this is an important part of classroom life, the focus of this study is on student-student interaction in structured group situations.

Two categorizations of group skills are particularly applicable to this study. Bales (1970) has devised of method of observing and quantifying group interaction that was originally planned to accommodate groups in naturalistic settings. It can be applied to classroom groups. The four main categories are (a) positive and mixed actions,

(b) attempted answers, (c) questions, and (d) negative and mixed actions. Examples of positive and mixed actions might be "seems friendly and agrees" while the reciprocals in negative and mixed actions would be "seems unfriendly and disagrees." He also allows for the codes to indicate who speaks to whom with numbered pairs entered in the categories rather than only tally marks.

D. Johnson and F. Johnson (1975) have developed a listing of group skills used in this study. They refer to the skills as leadership functions in terms of an influence relationship's occurring among mutually dependent group members. Any member might perform any of the skills.

They define ten task functions:

1. Information and opinion giver
2. Information and opinion seeker
3. Starter
4. Direction giver
5. Summarizer
6. Coordinator
7. Diagnoser
8. Energizer
9. Reality tester
10. Evaluator

They also define ten maintenance functions:

1. Encourager of participation
2. Harmonizer and compromiser
3. Tension reliever
4. Communication helper
5. Evaluator of emotional climate
6. Process observer
7. Standard setter
8. Active listener
9. Trust builder
10. Interpersonal problem solver

The Johnson and Johnson list concerns itself only with positive behaviors unlike Bales. In terms of Eggleston (1975) the use of it would be reflective--the researcher has set categories in mind. It would

also be a sign system (Medley and Mitzel, 1963) because it has mutually exclusive, but not exhaustive categories.

In this section, some of the issues that need to be addressed in doing an observational study have been delineated. The following section will briefly mention considerations of sociometric measures.

Sociometrics

> Sociometry is a broad term indicating a number of methods of gathering and analyzing data on the choice, communication and interaction patterns of individual in groups. One might say that sociometry is the study and measurement of social choice (Kerlinger, 1973, p. 556).

In this study there was a need to measure popularity, influence, academic credibility, and self-concept as perceived by the subjects themselves. This required the use of several tools and the analysis of the data thereafter. These aspects of classroom social structure were seen to have an effect on the behaviors of students in classrooms (see part one of this chapter).

In Diagnosing Classroom Learning Environments, Fox, Luski, and Schmuck (1966) describe twenty-three diagnostic tools used to discern relationships between the interpersonal aspects of the classroom and effective learning of subject matter. Tool five is called "How I Feel about Others in My Class." This tool can be used to indicate student popularity. It includes questions such as, "Which three persons in this class do you personally like most?" Tool six, "The People in My Class," gets at the influence in the classroom. A sample question would be, "Which three persons in this class are most often able to get other people to do things?" This instrument also asks about who a student thinks is able to learn whatever is presented and who needs

to work harder. This is an indication of who is perceived to be academically a credible source.

Tool twenty, "My Classmates," indicates an imbedded self-concept. The student is asked to rate each student in the class on nine degrees of good and bad traits, from all good characteristics through some good and some bad to all bad. They are asked to include themselves and to rate themselves.

Methods of sociometric analysis include sociometric matrices, sociograms, and sociometric indices (Kerlinger, 1973). A sociometric matrix is a rectangular array of numbers or other symbols which express, in numbers, all the choices of group members in any group. A sociogram is a diagram or chart of choices made which is used more often in practical rather than research situations. A sociometric index is a single number calculated from two or more numbers yielded by sociometric data.

The tools are used with numbers assigned to students rather than names. Often the number of responses is limited to three per question. This is an arbitrary limit often used when sociometrics are applied.

Summary

Chapter Two concerned the discussion of five topics as they applied to this research. Two important topics, Group Dynamics and Cooperative Goal Structuring, were reviewed in terms of classroom applications and the possible ramifications of the effects of being in a group as a student. Areas that link group dynamics to group behaviors and their development in a structured, cooperative group were outlined.

The last three topics were addressed in terms of the focus and design of the components of the study. The use of a structured group experiences including peer feedback on group skills fits into pupil pursuit specifications. In order to do an observational study, the setting up of observational instruments and training of observers was important. Lastly, the sources and significance of sociometric instruments in this type of study were indicated. If perceived classroom status in popularity, power, and academic credibility effect self-concept and behavior in groups, then sociometric techniques give an indication of status on those independent variables.

The following chapter, Chapter Three, deals with the design and research procedures of this study in greater detail.

CHAPTER THREE

DESIGN AND PROCEDURES

The author's purpose in this study was to investigate the ability of sixth grade students in a science class to use task and maintenance skills in a group, after working with subject matter in a structured group format. This chapter includes the description of subjects, materials, and procedures which were used in the study. The overall design in which they were used is outlined first.

Design

The design was a non-equivalent control group design using both a pretest and posttest (Campbell and Stanty, 1966). One variation must be noted when considering the term control. The treatment that was the focus of the study was cooperative goal structuring. It was one way to structure student interaction. Therefore, there were three treatments or three ways to structure interaction--independent groups, unstructured groups, and structured groups. It was not possible to randomly assign students to treatment groups. The three treatments were randomly assigned to classes. Treatments 1, 2, and 3 were designated. Then the names of the classroom homeroom teachers were drawn and assigned to 1, 2, and 3 treatments as drawn.

Because subjects were not selected randomly, an examination of pretest means and standard deviations is important. This knowledge is an indicator for the reader to get some measure of pretreatment

similarity. The more the similarity of treatment groups on relevant criterion measures is confirmed, the more effective is the use of this design (Campbell and Stanley, 1966).

Use of a control insures against mistaking effects of history, pretesting, maturation, and instrumentation for the main-effects of the treatment. Mortality of subjects needs to be explained in this design as well as interaction between selection and history.

Statistical regression is a questionable problem with a non-equivalent, control-group, pretest-posttest design. Again, a check of initial mean scores may be helpful.

The main source of concern is external validity. Although taking the classrooms as they are is a bonus compared to disrupting class composition, any obvious experimental procedures hamper generalizability. In this particular study, gaining parental permission and the use of observers were out of the ordinary conditions.

Using a pretest is a source of threat to external validity. Members of the population may not react the same to the treatment as one who participated in a research project and was pretested.

To summarize, this design is more powerful in controlling for threats to internal validity than it is in controlling for external validity. If pretesting indicates close means and standard deviations of scores, the analysis may be able to identify treatment effects. The generalizability of the study must be cautiously determined, however.

Sample

The subjects were eighty-four sixth grade students. The students were all from one elementary school which had three sixth grade homerooms. The breakdown by room and sex of students is shown in Table 3.1.

Table 3.1. Classroom Samples by Sex

	Male	Female	Total
Class 1	14	14	28
Class 2	16	12	28
Class 3	15	13	28

In Table 3.2 are listed the original number and actual numbers considering attrition. One student moved after the study began. Four students were not allowed to participate by their parents.

Table 3.2. Actual Sample N per Classroom

Classroom:	1	2	3
Entire class	28	28	28
Moved during study	0	0	1
Parents denied consent	3	1	0
Final N	25	27	27
	M = 12 F = 13	M = 15 F = 12	M = 14 F = 13

The students are members of professional and white collar families. In many cases both parents have college degrees, and the case of both parents' working is frequent. The families live in single family residences close enough for all the children to walk. The students are predominantly Caucasian with only two students in the sixth grade from minority classifications. The parents and children engage in many

leisure activities such as arts and crafts; sports; traveling; and musical productions, both vocal and instrumental.

The city has a population of approximately 36,000. It is dominated by an industry that is technically and professionally intensive in its labor force. Being more suburban than metropolitan, it is highly residential and low on shopping districts and industry. It is located in the Midwest industrial area of the country.

Consent

The proposal for the research was presented to the superintendent and assistant superintendent for approval. After their approval was obtained, the principal of the particular school was contacted and his approval received. The next step was to contact the sixth grade homeroom teachers. Only one teacher would be carrying out the study, but the cooperation and inclusion of the other two was considered important. It was mainly to reassure them that there would be minimal interference with their schedule. Secondly, they were told where to direct student or parent questions and concerns. Following all the meetings outlined above, a meeting was scheduled with parents to explain the outline of the study and obtain their consent. The consent form included provision for videotaping, test information, and confidentiality. The consent form is included in Appendix A. The parents of three students in Classroom 1 and one student in Classroom 2 preferred to have their children participate in the curriculum but not in the study.

After the students had experienced some of the components of the study, they were given their parents' consent forms and asked to sign if they thought the procedures were something they wanted to be part of for the following seven weeks.

Instrumentation/Materials

A vital part of this research was to examine the effect of using a structured group experience--Cooperative Goal Structuring--on the ability of students to exhibit a range of group task and maintenance skills. Ways to measure task and maintenance skills were needed. Measurement of cognitive gain was also determined because work on cooperative skills uses some of the time allotted for the study of curriculum.

In this section materials and tests used for both the group skills and cognitive gains are described. The measures used for covariates are also included. First, the science materials and their development are outlined.

Science Curriculum

Materials were written that could be used by students in a group or independently. It was important for the materials to be equivalent so that more of the difference would be in how students were grouped while doing the task.

Each sixth grade homeroom teacher instructed students in reading and mathematics, but only one taught science, one social studies, and one language arts to all three classes. The research was carried out only in the science class with one teacher who met with each homeroom during the day.

The materials were written on astronomy. It is an area specified by the particular school district to be covered in sixth grade.

Using the text and outside resources, ten topics were identified. Each topic was one lesson. (Topics are listed and lesson format described in Appendix C.) Each lesson was written in four parts and included a task sheet with five questions and a ten-item quiz. (Sample lesson is included in Appendix C.) The lessons were written with four pages of different information for each topic. Each page differed in difficulty. In the cooperative group, each student in a group of four received one page. The same material was able to be used in the independent treatment by giving each student all four pages and the task sheet to work alone.

The curriculum was written by the researcher and teacher. In this way it was felt that the appropriate levels of difficulty were achieved. The curriculum met the objectives of the school system, as judged by the teacher and the science curriculum coordinator. The coordinator's approval had to be obtained before the material could be used.

Each lesson had a task sheet. The task sheet included four questions to which the answers were found, one each, on the lesson pages (called resource sheets). A fifth question could be answered only by using other classroom resources or the library. The quiz was primarily objective, having true-false, matching, and multiple choice questions. The quizzes also included some short answer questions.

Science Pretest and Posttest

A standardized science pretest and posttest would not have dealt with the specific material in astronomy. Therefore, the researcher

constructed a twenty-five item multiple choice pretest and a twenty-five item multiple choice posttest. Six concepts or definitions were selected from each lesson according to what was highlighted on the task sheet for each lesson or the quiz used for each. The questions were assigned numbers one through sixty. Using a table of random numbers, the questions were alternately assigned to the pretest and the posttest. The pretest and posttest are included in Appendix B.

Student General Achievement

For each student, the grade equivalent that was determined the previous spring (April; the study took place the following February) was recorded. The test source was the Comprehensive Test of Basic Skills (CTBS) which is adjusted for aptitude, age, and actual grade level by the student's performance on the Short Form Test of Academic Aptitude (SFTAA) which accompanies CTBS. The students took Level 2 (grades 4, 5-6, 9). The test is published by McGraw-Hill.

Task and Maintenance Group Skills

An appropriate instrument to use in this research was not discovered. The list mentioned in Chapter Two (D. Johnson and F. Johnson, 1975) was chosen to be used both as a guide for the cooperative treatment skills and the observation sheet for the outside observers. In Cooperative Goal Structuring, the students, in groups of five, work on a task. Four of the students participate in the cognitive activity, and one is the observer for group task and maintenance skills. The list of skill categories is presented in Appendix B, along with behavioral descriptions of the skills.

To ascertain the use of these task and maintenance skills in the classroom before the treatment, it was decided that outside observers could do the measurement using a tally type of observation sheet with the twenty categories. A description of the observers and the training process is explained in the next section.

Outside Observers' Training

The outside observers were four undergraduate education students, two females and two males. The researcher had taught an interpersonal communication skills class in which these observers were students. They showed above average ability in using the skills and in being able to relate observation of these skills in others in the group. In addition they excelled at discriminating behavioral statements from inference-laden statements. It was felt that they would be better qualified to serve as observers because of their skills.

After they consented to work in the study, a meeting was held with the researcher. At this meeting, the twenty skills were discussed, and the observers were asked to study them. Videotapes had been made of the sixth graders in groups of four doing an unstructured task. These were used to train the observers and to try to produce a common frame of reference with the researcher of what each category meant.

The categories were meant to be mutually exclusive, but not exhaustive. Negative behaviors or non-productive behaviors were not tallied. Examples of verbalizations that were not tallied are insults or statements completely off the topic.

Nineteen categories were those which relied solely on verbalization. One category--active listening--referred to body language such

as head shaking or forward movement and one syllable verbalizations such as "yes" or "oh."

The system was one which requires inference on the part of the observer. Training with the videotapes attempted to lessen the divergent interpretations of the observers.

The average reliability between each observer and the researcher on categories per student, frequencies per student, and frequencies per category are listed in Table 3.3. The formula used came from Looking in Classrooms (Good and Brophy, 1978).

$$1 - \frac{(A-B)}{(A+B)} = \text{percent of agreement}$$

A and B represent the categories or frequencies of observed behavior of the researcher and a particular observer.

Table 3.3. Average Observer Interrater Reliability with Researcher

Observer	Average Percent Categories/Student	Average Percent Frequency/Student	Average Percent Frequency/Category
A	.98	.94	.72
B	.85	.83	.75
C	.87	.90	.66
D	.81	.90	.77

The average percentage of agreement of categories per student and frequency of behaviors per student were high. Categories per student and frequency of behavior per student were used in the analysis of data. The frequency per category agreement is lower. Before that

data would be seriously considered, use of the instrument should be made more precise.

There were three observations. One pretreatment and one post-treatment were made. After a three week interval without training or reinforcement, a third observation was made. It is referred to as post observation II. The same observation sheet was used for each observation and each outside observer monitored two groups of four students. Because it was determined that watching eight students at one time was too difficult, the observer did time sampling. The total observation time was thirty minutes. On a prearranged signal, the observer alternated focus every five minutes. A total of fifteen minutes cumulatively was spent on each group of four. Summary data for each student are included in Appendix D.

Sociometric Measures

The relationship of initiating behavior in a group to social status was discussed in Chapter Two. To help control for these differences, measures of popularity, influence, academic credibility, and self concept were obtained. Informal instruments from Diagnosing Classroom Learning Environments (Fox, Luszki, and Schmuck, 1966) were used. The three tools "How I Feel about Others in My Class" (shortened), "The People in My Class," and "My Classmates" are included in Appendix B as presented to the students. Popularity, influence, and academic credibility were assigned to students through the perception of others in their class. Self concept was assigned by the students themselves. Class lists were provided giving each student a number to be used in filling out the forms.

Popularity. The first two questions on "How I Feel about Others in My Class" were used to gather data on liking patterns.

1. What three persons in this class do you personally like the most?

2. Which three persons do you personally like the least?

The results were compiled in a matrix. Cumulative scores for students were then used to assign a category. For example, any student with more positive choices than chance and no negative choices would be assigned to category A. A listing of categories and their determinants are included in Appendix B for popularity, influence, academic credibility, and self concept.

Influence. Three questions were used from "The People in My Class" to determine influence.

1. Which three persons in this class are most often able to get other pupils to do things?

2. Which three persons in the class do the girls most often do things for?

3. Which three persons in the class do the boys most often do things for?

For categorizing, see Appendix B.

Academic credibility. Two questions from "The People in My Class" were used to determine who students believed had academic capabilities.

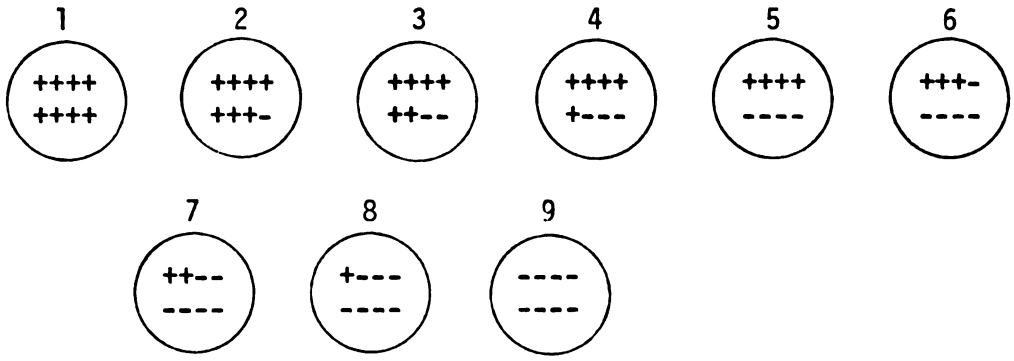
6. Which three persons in this class do you think could make the biggest improvement in their schoolwork if they wanted to?

7. Which three persons in this class do you think show the most ability to learn new things that are taught in school?

For categorizing, see Appendix B.

Self Concept. The tool to determine a ranking for students on self concept, "My Classmates," asked students to list the classmates

numbers and react to each one including themselves. They were to choose a diagram that would represent each classmate and themselves as shown below:



The pluses were described as positive characteristics, and the minuses were negative characteristics. Obtaining a self score in this imbedded way was hoped to show a reaction to self in comparison with classmates.

Summary

Using these instruments, data were collected including general academic achievement, pretest, and posttest scores on content-specific science material, sociometric measures of popularity, influence, academic credibility and self concept, and pre- and posttreatment observations of task and maintenance behaviors. The next section, Procedures, outlines how they all fit into the research and what was done with the data gathered.

Procedures

This section presents what happened chronologically in the study. Some parts of the previous sections will be referred to again for the sake of clarity. The procedures' section is in four parts: (1)

preparations, (2) pretreatment measures, (3) treatment, and (4) post-treatment measures.

Preparations

The astronomy curriculum and research proposal were sent to the school system superintendent for review. Approval was given and subsequent approval was sought and granted from the assistant superintendent, director of curriculum, science curriculum coordinator, principal and teachers at sixth grade level. All three teachers' cooperation was sought, but only one teacher worked directly with the study. This was an experienced elementary teacher. He also had the skills to teach the cooperative goal structuring method. He had worked for two years with the Johnsons at summer workshops and had worked with the method in classes last year. He had not started any cooperatively structured work this year because he knew his classes might be able to participate in the research study. The homeroom classes rotated for science, social studies, and language arts intact.

The parents were then contacted, and their approval was sought. Approval was given by all but four children's parents.

The children worked on an unstructured group task for science on one day, and those who had permission were videotaped to use for observer training. After observers were trained, the study began.

Pretreatment Measures

Students took the sociometric instruments in one class period. The idea of sociometrics and the confidentiality were discussed first.

Students' feelings about taking this type of instrument were discussed then and at a later class time.

The following class period, the pretest for science material was administered. All three classes were in an independent structure. No help or communication from classmates was involved. Only questions to the teacher were allowed.

For the preobservation, students were told that observers would be coming in and that they would be introduced. The format for observation was intended to be an activity that would blend an opening exercise for astronomy with a small group structured task. The task was structured in that several steps were to be followed. The group interaction was not structured.

On the day of the pretreatment observation, the students came to class and sat in pre-specified groups. They were introduced to the observers. The observers had not been in class before, but the researcher had been there three times. The task was outlined on the board, and the students proceeded to work on it. They were told that the observer was watching for what was happening in the group and to refrain from talking to him/her. The observers monitored two groups of four, alternating every five minutes for a total of thirty minutes. The observers milled around the halls and sometimes watched sixth grade projects while waiting to observe the next class.

These were the measures taken before the treatment. They include the pretreatment astronomy test, pretreatment observation, and the sociometric tools. The CTBS achievement scores were obtained from the student records.

Treatment

General Treatment. The curriculum was set up in ten lessons. Each lesson included four resource sheets, one task sheet and one quiz. Thirty folders were made up that could hold the lessons. The contents were changed every two days to contain the next lesson. The schedule was such that each lesson lasted two days. Day one, the students received the resource sheets and the task sheets and then worked on the task. The second day the quiz was taken. If spare time resulted from students' completing the work ahead of time, there were extra credit tasks to do related to astronomy but not the specific topics covered on the lessons.

There were three classrooms. The Cooperative Goal Structuring occurred in only one. That was called Treatment 3. Another classroom worked independently and that structure was called Treatment 1. In the last classroom students were assigned to groups but no structured group work. Students could work alone or with groups. That was referred to as Treatment 2. The term control group was avoided because of the traditional connotation of it's being a group where treatment was lacking. All three groups dealt with the curriculum, so all three had a treatment relating to goal structure. The treatment specifics are in the following section.

Specific Treatments. The classrooms were randomly assigned to a treatment. Treatment 1 was the independently structured group. On day one of the lesson, the students took one of the thirty folders which contained the resource sheets and task sheet. They worked alone in terms of student-student interaction. The teacher served as a resource and helped students individually. Reference books and the

library were available to these students. They had to do all work in school. No work was allowed to be taken home. On the second day the students completed a quiz. A grade was given to the student for each task sheet and each quiz. This process was repeated for ten lessons.

Treatment group 2 and treatment group 3 had students working in assigned groups. These groups were reassigned for each lesson. They were heterogeneous groups in respect to academic achievement. Each of the two classes was rank-ordered separately from highest to lowest achievement level according to the CTBS scores. The group was then divided into four levels: on high, two middle, and one low. Each group was comprised of a student from each of the four levels.

In Treatment 2, called unstructured groups, the students were assigned groups and could sit together but could choose to work independently or with others. The students came to class on day one and each picked up one of the folders containing the resource sheets and the task sheet. They worked alone or with others in their groups. The teacher served as a resource. On day two, each student independently took the quiz. A grade was given to the student for each task sheet and each quiz.

Treatment 3, the Cooperative Goal Structuring group, was the most structured. The students were assigned to heterogeneous groups as mentioned previously. There was a basic group of four to work on the task plus an additional member to act as observer. It was organized so that different students were observers each lesson. Each student was an observer two or three times during the ten lessons.

For each lesson on the first day, one member of the group in Treatment 3 would get one folder per group. The resource sheets were

divided among the four members of the group. The seating chart that listed the group members also designated which resource sheet went to which student. The resource sheets were in varying levels of complexity and length. Each was assigned to students according to the quarter of the class they were in as determined by the CTBS ratings.

The students worked with each other on the task sheet and each was to relate the information on his/her resource sheet to the rest of the group. They knew that the whole group was to be graded on a joint task sheet. Each person was to sign it to show agreement with the answers. They also worked on the quiz differently. Each member got a copy and did the quiz. Then they got together and did a joint one for the grade.

During day one the observer and all class members discussed group task and maintenance skills. The original plan was to teach and have the students look for four behaviors each lesson. This would introduce all twenty covered in five lessons. Then they would be reviewed, in a different order, in the next five lessons. This proved to be too complex because the students had not worked with observation and feedback on these skills. Therefore, the teacher started out more slowly and introduced less per day. Charts were made to hang in the classroom. They showed the twenty skills and gave key phrases to remember. Large red arrows pointed to the two behaviors to be observed for the day.

The observer tallied and gave feedback at the end of day one or the beginning of day two. While the group of four was taking the quiz, the observers read the resource sheets and took the quiz after that. It was felt that they might not get the content material while observing

for behaviors. The observing rotated so that the students had a chance to work cooperatively most of the time.

Posttreatment

After the last lesson, the posttreatment observation occurred. The students did a wrap up activity in groups of four. All three classrooms worked on this activity during class time and were observed by the outside observers. The same format was followed for the observation, five minute intervals for thirty minutes.

The next day the students retook the pretest on the astronomy material. The following day they took the posttest on the astronomy material. These tests were taken using an independent structure by students in all three classrooms.

During a three week interval, the three classrooms went on to another unit, one on substance use and abuse. They did not practice cooperative group skills. Following the three week interval, the observers came back and observed again. The four person groups worked on a project that had a structured outcome to it. This was done to see if any gain between pre- and posttreatment observations would be maintained over time.

Data Compiled

Consideration of a seven week span must be attended to in this section. Data for each student were compiled. The dependent variables of observation scores and science achievement scores were missing for some students. Because the science achievement test involved only the teacher, the student, and a paper and pencil test, it was easy to make up. Four students did not have all in the series of three tests; and

their data had to be eliminated. The n's for each treatment for content tests is listed below. More of a problem arose with observations because if students were absent on the day of the observation, the situations could not be duplicated and their data were removed from final analysis. Different students were absent for different observations, so the number of students with total data was reduced. Table 3.4 shows the actual n for each group.

Table 3.4. Listing of Final n per Class/Treatment for Dependent Variables

	Treatment 1	Treatment 2	Treatment 3	Total
Original n for Table 3.2	25	27	27	79
Actual n for Content	24	24	27	75
Actual n for Observation	19	22	23	64

The absences were due to illness in some cases. The final observation was one day before a vacation, and some students' families left early. The decision was made to go ahead with observations rather than wait two more weeks until after vacation.

Summary

In the preceeding section, the procedures used during the study were discussed. Preparations of materials and approvals were mentioned briefly. The context of the pretreatment measures were given. The format of each student interaction treatment was presented. Lastly, the posttreatment procedures were given. The next section will

outline the research hypotheses, null hypotheses, and method of data analysis.

Hypotheses and Data Analysis

The independent variables in this study were the three treatments of independent, unstructured groups, and structured groups; the CTBS grade equivalent achievement level; and the sociometric indicants of popularity, influence, academic credibility and self concept. The dependent variables were observations of task and maintenance behaviors and achievement on content-specific science tests.

The following research hypotheses directed the research reported here. The accompanying null hypotheses determined the statistical analysis of the data. Null hypotheses were tested using an alpha level of .01.

Hypothesis 1

Sixth grade students who perform tasks with a structured group interaction (Treatment 3), with peer observer feedback on their task and maintenance group behaviors, will exhibit those behaviors more often in a group task situation than students who perform tasks independently (Treatment 1).

Ho. There is no difference in the mean frequence of task and maintenance behaviors (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 when differences on the sociometric measures and the pretreatment observation are controlled.

Hi. There is a difference.

Hypothesis 2

Sixth grade students who perform tasks with a structured group interaction (Treatment 3), with peer-observer feedback on their task and maintenance group behaviors, will exhibit those behaviors more often in a group task situation than students who perform tasks in an unstructured group situation (Treatment 2).

Ho. There is no difference in the mean frequency of the task and maintenance behaviors (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 2 when differences in sociometric measures and pretreatment observation are controlled.

Hi. There is a difference.

Hypothesis 3

Sixth grade students who perform tasks with a structured group interaction (Treatment 3), with peer-observer feedback on their task and maintenance behaviors, will later exhibit a wider range of behaviors in a group task than students who perform tasks independently (Treatment 1).

Ho. There is no difference in the mean number of categories of task and maintenance skills used (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 when differences in sociometric measures and pretreatment observation are controlled.

Hi. There is a difference.

Hypothesis 4

Sixth grade students who perform tasks with a structured group interaction (Treatment 3), with peer-observer feedback on their task and maintenance behaviors will later exhibit a wider range of behaviors in a group task than students who perform tasks in an unstructured group situation (Treatment 2).

Ho. There is no difference in the mean number of categories of task and maintenance skills used (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 2 when differences in sociometric measures and pretreatment observation are controlled.

Hi. There is a difference.

Hypothesis 5

Sixth grade students who study science material with a structured group interaction (Treatment 3) will perform better on the content-specific achievement test (retaking pretest) than those who study science material independently (Treatment 1).

Ho. There is no difference in mean scores on the content-specific achievement posttest 1 (retaking pretest) between students who participated in Treatement 3 and those who participated in Treatment 1 when differences in CTBS scores and pretest scores are controlled.

Hi. There is a difference.

Hypothesis 6

Sixth grade students who study science materials with a structured group interaction (Treatment 3) will perform better on the content-

specific achievement posttest 1 (retaking pretest) than those who study science material in unstructured groups (Treatment 2).

Ho. There is no difference in mean scores on the content-specific achievement posttest 1 (retaking pretest) between students who participated in Treatment 3 and those who participated in Treatment 2 when differences in CTBS scores and pretest scores are controlled.

Hi. There is a difference.

Hypothesis 7

Sixth grade students who study science materials with a structured group interaction (Treatment 3) will perform better on the content-specific achievement posttest II (alternate form) than those who study science material independently (Treatment 1).

Ho. There is no difference in mean scores on the content-specific achievement posttest II (alternate form) between students who participated in Treatment 3 and those who participated in Treatment 1 when differences in CTBS scores and pretest scores are controlled.

Hi. There is a difference.

Hypothesis 8

Sixth grade students who study science materials with a structured group interaction (Treatment 3) will perform better on the content-specific achievement posttest II (alternate form) than those who study science material in unstructured groups (Treatment 2).

Ho. There is no difference in mean scores on the content-specific achievement posttest II (alternate form) between students who participated in Treatment 3 and those who participated in Treatment 2 when differences in CTBS scores and pretest scores are controlled.

Hi. There is a difference.

Hypothesis 9

Sixth grade students who perform tasks with a structured group interaction (Treatment 3), with peer observer feedback on their task and maintenance behaviors, will maintain a difference in frequency of those behaviors over those who perform tasks independently (Treatment 1) after a three week interval.

Ho. There is no difference in mean frequency in the retention of task and maintenance behaviors (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 after a three week interval when differences on sociometric measures and the post-treatment$_I$ observations are controlled.

Hi. There is a difference.

Hypothesis 10

Sixth grade students who perform tasks with a structured group interaction (Treatment 3), with peer observer feedback on task and maintenance behaviors, will maintain a difference in frequency of those behaviors over those who perform tasks in unstructured groups (Treatment 2) after a three week interval.

Ho. There is no difference in mean frequency in the retention of task and maintenance behaviors (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 2 after a three week interval when differences on sociometric measures and the post-treatment I observation are controlled.

Hi. There is a difference.

Hypothesis 11

Sixth grade students who perform tasks with a structured group interaction (Treatment 3), with peer observer feedback on task and maintenance behaviors, will maintain a difference in range of those behaviors over those who perform tasks independently (Treatment 1) after a three week interval.

Ho. There is no difference in mean number of categories of task and maintenance skills used (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 after a three week interval when differences in sociometric measures and $posttreatment_I$ observations are controlled.

Hi. There is a difference.

Hypothesis 12

Sixth grade students who perform tasks with a structured group interaction (Treatment 3), with peer observer feedback on task and maintenance behaviors, will maintain a difference in range of those behaviors over those who perform tasks in unstructured groups (Treatment 2) after a three week interval.

Ho. There is no difference in mean numbers of categories of task and maintenance skills (as measured by the observation instrument developed in this study) used between students who participated in Treatment 3 and those who participated in Treatment 2 after a three week interval when differences in sociometric measures and $posttreatment_I$ observations are controlled.

H_1. There is a difference.

Hypothesis 13

The variability of scores on the content-specific posttest in the cooperative goal structured group (Treatment 3) will be less than in the independent (Treatment 1) and unstructured group (Treatment 2).

This hypothesis cannot be tested with a hypothesis testing approach, but will be considered with descriptive data at the end of Chapter Four.

Hypothesis 14

The variability of scores on the posttreatement observation of task and maintenance skill categories will be less in the cooperative goal structured group (Treatment 3) than in the independent (Treatment 1) and unstructured group (Treatment 2).

This hypothesis cannot be tested with a hypothesis testing approach, but will be considered with descriptive data at the end of Chapter Four.

For hypotheses 1, 2, 3, and 4, the data were analyzed using the analysis of covariance (ANCOVA) procedure. Covariates used were the sociometric measures and the pretreatment observations. The contrast between Treatment 3 and Treatment 1 was run separately from the contrast of Treatment 3 and Treatment 2. This was done in order to determine between which groups significant differences existed rather than only if there were significant differences in the scores generally.

Data for hypotheses 5 and 6, 7, 8 were analyzed using analysis of covariance (ANCOVA) procedures. Covariates used were CTBS grade equivalent scores and pretest of content scores. Again the contrasts of

Treatement 3 and Treatment 1 and Treatment 3 and Treatment 2 were considered separately.

Analysis of covariance (ANCOVA) was used to analyze the data for hypotheses 9, 10, 11, and 12. The covariates were sociometric scores and posttreatment observations. The contrast of Treatment 3 and Treatment 1 was used for hypotheses 7 and 9. The contrast of Treatment 3 and Treatment 2 was used for hypotheses 8 and 10.

Hypotheses 13 and 14 will be considered with descriptive data on variances. There were not enough measures taken to do that analysis with inferential statistics.

Summary

This study utilized a non-equivalent control group pretest-posttest design. Three intact classrooms of sixth graders in the same school were randomly assigned a treatment. The treatments identified a structure for student interaction while working on cognitive tasks. The students spent four weeks working in this structure. They studied independently, in unstructured groups or in a structured cooperative group.

Independent variables measured were achievement level (CTBS) and sociometric measures of popularity, influence, academic credibility and self concept. The treatment was also an independent variable. Dependent variables were measures of frequency and range of task and maintenance behaviors obtained from in-class observations and tests of content-specific achievement.

Null hypotheses were tested at alpha level .01 for no difference in pre- and post-measures. Data were analyzed using the analysis of covariance (ANCOVA).

In Chapter Four, the findings of the data analysis will be reported.

CHAPTER FOUR

PRESENTATION OF THE FINDINGS

This chapter has as its purpose the consideration of the null hypotheses listed in Chapter Three and the analysis of data to determine the significance of the findings for each hypothesis.

The method of analysis used for hypotheses 1-12 was the analysis of covariance. An assumption made when working with analysis of covariance is that the samples were randomly assigned. Because this study used intact groups, attention should be paid to similaritity of pretest scores on both the cognitive science achievement and the pretreatment observation. Table 4.1 gives that information.

Table 4.1. Unadjusted $\overline{X}$ and SD of Pretests by Treatment Groups

	Science Material Pretest		Pretreatment Observations Category		Pretreatment Observations Frequency	
Treatment 1	$\overline{X}$	5.21	$\overline{X}$	6.74	$\overline{X}$	25.21
	SD	2.38	SD	2.75	SD	13.58
Treatment 2	$\overline{X}$	6.21	$\overline{X}$	6.73	$\overline{X}$	22.00
	SD	3.31	SD	2.76	SD	13.96
Treatment 3	$\overline{X}$	7.81	$\overline{X}$	6.61	$\overline{X}$	23.52
	SD	3.84	SD	3.10	SD	17.51

Analysis of covariance tests the significance of differences in means by taking into account the correlation of the dependent variable and one or more covariates and by adjusting initial mean differences

in the experimental groups. Covariates are chosen that are pertinent to the dependent variables.

In this study, general achievement (CTBS) was chosen to use as a covariate with the content-specific achievement. The pretest scores were also used as a covariate. The amount of variance accounted for by the CTBS scores and pretest scores are shown in Appendix D.

The behaviors showing task or maintenance skills were felt to be related to the sociometric status of students and their self concept. The scores for sociometric measures of popularity, influence, academic credibility and self concept were used as covariates on posttreatment observation scores. Pretreatment scores were also used as a covariate. The amount of variance accounted for by each covariate is listed in Appendix D. All hypotheses were tested at an alpha level of .01.

Findings

Hypothesis 1

Ho. There is no difference in the mean frequency of task and maintenance behaviors (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 when differences on the sociometric measures and the pretreatment observation are controlled.

Hi. There is a difference.

By examining Table 4.2, the main effect of treatments on mean frequency of behaviors was found to be nonsignificant ($F(1,56)=.5024$, $p < .4814$). Since .4814 was larger than .01, the null hypotheses was not rejected. That is, once differences for sociometric scores and

pretreatment observation scores were controlled, there was no significant difference.

Table 4.2. ANCOVA Summary Table for Frequency Posttreatment I, with Sociometric Scores and Pre-Treatment Scores as Covariates.

Source	Adjusted df	Adjusted ms	F	P less than
Between groups				
Structured vs. Independent	1	47.9430	.5024	.4814
Structured vs. Unstructured	1	163.7036	1.7155	.1957
Within groups	56	95.4254		
TOTAL:	58			

Correlations Between Covariates and Dependent Variable

r popularity, $Post_I$ = .0533
r influence, $Post_I$ = -.0992
r academic cred., $Post_I$ = -.1219
r self concept, $Post_I$ = -.1104
r pretest, $Post_I$ = .1122

Hypothesis 2

Ho. There is no difference in the mean frequency of the task and maintenance behaviors (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 when differences in sociometric measures and pretreatment observations are controlled.

Hi. There is a difference.

Looking at between groups differences in Table 4.2, the structured (Treatment 3) vs. unstructured (Treatment 2) differences result in

$F(1,56)=1.7155$, $p < .1957$. The differences were not significant at the .01 level. The null hypothesis was not rejected.

Combining information on Hypotheses 1 and 2 reflects the results between groups of the posttreatment observations in terms of overall frequency of behaviors. There were no statistically significant differences.

A note about the correlation coefficients between covariates and the dependent variable (see Table 4.2). The sociometrics (popularity, influence, academic credibility and self concept) were scaled so that 1 referred to high popularity or high influence, etc., while 5 referred to low popularity, low influence, etc.; hence, the negative correlations. A high score on the posttreatment observation which was negatively correlated with self concept would mean high posttreatment observation score generally related to high self concept score.

Hypothesis 3

Ho. There is no difference in the mean number of categories of task and maintenance skills used (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1, when differences on sociometric measures and pretreatment observations are controlled.

Hi. There is a difference.

The data in Table 4.3 relate information important to this hypothesis. The $F(1,56)= .0112$, $p < .9162$ indicated no significant difference at the .01 level. The null hypothesis was not rejected.

Table 4.3. ANCOVA Summary Table for Categories Posttreatment$_I$, with Sociometric Scores and Pretreatment Scores as Covariates

Source	Adjusted df	Adjusted ms	F	P less than
Between groups				
Structured vs. Independent	1	.0484	.0112	.9162
Structured vs. Unstructured	1	.4866	.1124	.7387
Within groups	56	4.3282		
TOTAL:	58			

Correlations Between Covariates and Dependent Variable

r popularity, Post$_I$ = -.1607
r influence, Post$_I$ = -.2026
r academic cred., Post$_I$ = -.2590
r self concept, Post$_I$ = -.3472
r pretreatment, Post$_I$ = .3463

Hypothesis 4

Ho. There is no difference in the mean number of categories of task and maintenance skills used (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 when differences in sociometric measures and pretreatment observations are controlled.

Hi. There is a difference.

Referring to Table 4.3, for the structured vs. unstructured group, $F(1,56)=.1124$, $p < .7387$. This was not significant at = .01. The null hypothesis was not rejected.

Summary Hypotheses 1, 2, 3, 4

Hypotheses 1, 2, 3, and 4 are concerned with the posttreatment observation. Looking at both the frequencies of task and maintenance behaviors and the range or categories of behaviors, no significant differences were found among Treatments 1, 2, and 3.

Hypothesis 5

Ho. There is no difference in mean scores on the content-specific achievement posttest I (retaking pretest) between students who participated in Treatment 3 and those who participated in Treatement 1 when differences in CTBS scores and pretest scores are controlled.

Hi. There is a difference.

Using Table 4.4, the F test between groups 1 df and within groups 70 df = .0035, p .9524. This was not significant at the alpha level of .01. The null hypothesis was not rejected.

Table 4.4. ANCOVA Summary Table for Posttest I (Repeat Pretest), with CTBS Scores and the Pretest Scores as Covariates

Source	Adjusted df	Adjusted ms	F	P less than
Between groups				
Structured vs. Independent	1	.0386	.0035	.9524
Structured vs. Unstructured	1	19.7711	1.8424	.1791
Within groups	70	10.7309		
TOTAL:	72			

Correlations Between Covariates and Dependent Variable

r CTBS, $Post_I$ = .5327
r Pretest, $Post_I$ = .6171

Hypothesis 6

Ho. There is no difference in mean scores on the content-specific achievement $posttest_I$ (retaking pretest) between students who participated in Treatment 3 and those who participated in Treatment 2 when differences in CTBS scores and pretest scores are controlled.

Hi. There is a difference.

The F test information for this hypothesis is indicated in Table 4.4. The results were $F(1,70)=1.8424$, $p < .1791$. The null hypothesis was not rejected because the difference was not significant at = .01.

Hypothesis 7

Ho. There is no difference in mean scores on the content-specific achievement posttest II (alternate form) between students who participated in Treatment 3 and those who participated in Treatment 1 when differences in CTBS scores and pretest scores are controlled.

Hi. There is a difference.

Using Table 4.5, referring to the between groups structured vs. independent treatment, $F(1, 70)=10.0130$, $p < .0024$. Using =.01, this is a significant difference. The null hypothesis was not retained. The alternative hypothesis, that there was a difference, was supported.

Hypothesis 8

Ho. There is no difference in mean scores on the content-specific achievement posttest II (alternate form) between students who participated in Treatment 3 and those who participated in Treatment 2 when differences in CTBS scores and pretest scores are controlled.

Hi. There is a difference.

Table 4.5. ANCOVA Summary Table for Posttest II (Alternative Form) with CTBS Scores and the Pretest Scores as Covariates

Source	Adjusted df	Adjusted ms	F	P less than
Between groups				
Structured vs. Independent	1	114.3459	10.0130	.0024
Structured vs. Unstructured	1	65.3303	5.7208	.0195
Within groups	70	11.4198		
TOTAL:	72	Correlations Between Covariates and Dependent Variable		
		r CTBS, $Post_{II}$ = .5630		
		r Pretest, $Post_{II}$ = .4793		

When comparing structured and unstructured treatment means, the F test results are $F(1,70)=5.7208$, $p < .0195$. This was not significant at $\alpha = .01$. The null hypothesis was not rejected.

Summary Hypotheses 5, 6, 7, 8

Hypotheses 5, 6, 7, and 8 are concerned with the cognitive achievement using the three treatment goal structures. The students took the pretest again after the treatments. It was called $posttest_I$. The differences in scores were not significant. The $posttest_{II}$ was an alternate form generated in the same way as the pretest. The differences in scores between the structured and unstructured groups were not significant at .01. The differences between the Treatment 3, structured, and Treatment 1, independent, were significant.

Hypothesis 9

Ho. There is no difference in mean frequency in the retention of tasks and maintenance behaviors (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 after a three week interval when differences on sociometric measures and $posttreatment_I$ observations are controlled.

Hi. There is a difference.

Table 4.6 summarizes the data needed to examine this hypothesis. The F test resulted in $F(1,56)=.1885$, $p < .6659$. This was not significant at .01. The null hypothesis has not been rejected.

Table 4.6. ANCOVA Summary Table for Frequency $Posttreatment_{II}$, with Sociometric Scores and $Posttreatment_I$ as Covariates

Scores	Adjusted df	Adjusted ms	F	P less than
Between Groups				
Structured vs. Independent	1	20.1414	.1885	.6659
Structured vs. Unstructured	1	659.2406	6.1688	.0161
Within groups	56	106.8674		
TOTAL:	58			

Correlations Between Covariates and Dependent Variable

r popul., $posttreatment_{II}$ = -.1053
r influ., $posttreatment_{II}$ = -.0632
r acad. cred., $posttreat._{II}$ = -.3085
r self conc., $posttreat._{II}$ = -.1701
r $posttreat._I$, $posttreat_{II}$ = .3730

Hypothesis 10

Ho. There is no difference in mean frequency in the retention of task and maintenance behaviors (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 2 after a three week interval when differences on sociometric measures and the post-treatment$_I$ observation are controlled.

Hi. There is a difference.

There was no significant difference at .01, as evidenced in Table 4.6. The F test from the analysis of covariance resulted in F(1,56)= 6.1688,p .0161. The null hypothesis was retained.

Hypothesis 11

Ho. There is no difference in mean number of categories of task and maintenance skills used (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 after a three week interval when differences in sociometric measures and posttreatment$_I$ observations are controlled.

Hi. There is a difference.

Table 4.7 contains the relevant F test. The difference was not significant, F(1,56)=.0319, p .8590. The null hypothesis was not rejected.

Hypothesis 12

Ho. There is no difference in mean number of categories of tasks and maintenance skills used (as measured by the observation instrument developed in this study) between students who participated in Treatment

Table 4.7. ANCOVA Summary Table for Categories $Posttreatment_{II}$, with Sociometric Scores and $Posttreatment_{I}$ as Covariates

Scores	Adjusted df	Adjusted ms	F	P less than
Between groups				
Structured vs. Independent	1	.2373	.0319	.8590
Structured vs. Unstructured	1	39.1709	5.2610	.0256
Within groups	56	7.4455		
TOTAL:	58			

Correlates Between Covariates and Dependent Variable

r popularity, $Posttreatment_{II}$ = -.0989
r influence, $Posttreatment_{II}$ = -.0166
r academic cred., $Posttreatment_{II}$ = -.2184
r self concept, $Posttreatment_{II}$ = -.0238
r $Posttreatment_{I}$, $Posttreatment_{II}$ = .2989

3 and those who participated in Treatment 2 after a three week interval when differences in sociometric measures and $posttreatment_{I}$ observations are controlled.

Hi. There is a difference.

Using Table 4.7, the results of the test of significance was $F(1,56)= 5.2610$, p .0256. The difference was not significant at .01. The null hypothesis was not rejected.

Summary Hypotheses 9, 10, 11, 12

Hypotheses 9, 10, 11, 12 were questioning the results of observations after a three week interval. When the sociometric measures and posttreatment observations were used as covariates, the differences in frequencies and number of categories used were not significant.

Table 4.8 reflects the information on the twelve hypotheses discussed so far.

Additional Results

This section deals with two research hypotheses and one group of information that were not analyze with tests of significance.

Hypothesis 13

The variability of scores on the content-specific posttest in the cooperative goal structured group (Treatment 3) will be less than in the independent (Treatment 1) and unstructured group (Treatment 2).

In other words, if cooperative goal structuring maintains the high achieving students' scores and at the same time helps the lower achieving pupil raise his/her score, then the variance of scores should be less.

Table 4.9 shows the unadjusted mean and variance for each treatment.

Hypothesis 14

The variability of scores on the observations of task and maintenance skill categories and frequencies will be less in the cooperative goal structured group (Treatment 3) than in the independent (Treatment 1) and unstructured group (Treatment 2).

Looking for overall gain in frequencies and categories may be supplemented by looking for increase in frequencies and categories as well as fewer differences between group measures.

Table 4.10 depicts the mean scores and variances unadjusted for covariates. Looking at categories, the cooperative group (Treatment 3) mean number increased and the variance decreased. The pattern in

Table 4.8. Summary of Findings for the Hypotheses Tested in This Study

Hypothesis	Independent Variable	Dependent Variable	Statistical Test[1]	Significance	Decision
1	Treatment 3 vs 1	Observation $Post_I$ Freq.	F-test	.4814	Not rejected
2	Treatment 3 vs 2	Observation $Post_I$ Freq.	F-test	.1957	Not rejected
3	Treatment 3 vs 1	Observation $Post_I$ Categ.	F-test	.9162	Not rejected
4	Treatment 3 vs 2	Observation $Post_I$ Categ.	F-test	.7387	Not rejected
5	Treatment 3 vs 1	Cognitive $Post_I$	F-test	.9524	Not rejected
6	Treatment 3 vs 2	Cognitive $Post_I$	F-test	.1791	Not rejected
7	Treatment 3 vs 1	Cognitive $Post_{II}$	F-test	.0024	Rejected
8	Treatment 3 vs 2	Cognitive $Post_{II}$	F-test	.0195	Not rejected
9	Treatment 3 vs 1	Observation $Post_{II}$ Freq.	F-test	.5659	Not rejected
10	Treatment 3 vs 2	Observation $Post_{II}$ Freq.	F-test	.0161	Not rejected
11	Treatment 3 vs 1	Observation $Post_{II}$ Categ.	F-test	.8590	Not rejected
12	Treatment 3 vs 2	Observation $Post_{II}$ Categ.	F-test	.0256	Not rejected

(significant at .01 level of confidence)

Table 4.9. Unadjusted Means and Variances of Content-Specific Science Tests

		Pretest	$Post_I$ (Pretest)	$Post_{II}$ (Alternate)
Treatment I	$\bar{X}$	5.21	9.53	8.08
	S^2	5.65	17.55	17.47
Treatment II	$\bar{X}$	6.21	9.92	10.29
	S^2	10.95	24.08	22.65
Treatment III	$\bar{X}$	7.81	12.26	13.26
	S^2	14.77	22.12	17.51

Table 4.10. Unadjusted Means and Variances of Observations--Category and Frequency

		CATEGORIES			FREQUENCIES		
		Pre	$Post_I$	$Post_{III}$	Pre	$Post_I$	$Post_{II}$
Treatment 1	$\bar{X}$	6.74	6.05	6.68	25.21	19.63	19.05
	S^2	7.54	5.61	10.34	184.40	74.47	133.16
Treatment 2	$\bar{X}$	6.73	5.91	5.55	20.00	22.95	16.32
	S^2	7.64	4.75	8.16	194.86	81.38	96.51
Treatment 3	$\bar{X}$	6.61	6.13	7.39	23.52	19.91	24.70
	S^2	9.61	6.12	6.07	306.62	116.54	118.68

frequencies is not clear. In Treatments 1 and 2, the variance decreased, but so did the frequency. In Treatment 3, the frequency increased, but the variance decreased.

A set of information that may be important or interesting to another researcher is the breakdown by class of the percentage of behaviors that students exhibited in each of twenty categories. This breakdown is in Appendix D. The categories included ten task and ten maintenance skills. The total mean percentage for each treatment is included in Table 4.11.

Table 4.11. Mean Percentage of Total Behaviors that Are Task and Maintenance

		Pre	$Post_I$	$Post_{II}$
Treatment 1	T	79	80	74
	M	21	20	26
Treatment 2	T	79	85	79
	M	21	15	21
Treatment 3	T	79	81	71
	M	21	19	29

Each class began with seventy-nine percent task behaviors and twenty-one percent maintenance behaviors. The $Posttreatment_I$ percentages all increased in task and decreased in maintenance. In the final observation, Treatment 2 group returned to seventy-nine and twenty-one task and maintenance, respectively. The other two treatment groups decreased in task and increased in maintenance.

Summary

Analysis of covariance was done to test significance of differences of the dependent measures, content-specific science achievement and observation of task and maintenance behaviors. Covariates used for science achievement were CTBS scores and science achievement pretest scores. Covariates for the posttreatment observation were sociometric measures of popularity, influence, academic credibility and self concept, and the pretreatment observation scores. For the observation following the three week interval, $Posttreatment_{II}$, the covariates were again the four sociometric measures and the $Posttreatment_I$ observations. For Hypotheses 1 through 12, only one null hypothesis was rejected.

When comparing science achievement of Treatment 3 to Treatment 1 students, there was a significant difference at .01.

The research hypotheses 13 and 14 were discussed. They focused on variability of scores within treatments. Lastly, the mean percentages of task and maintenance skills were outlined.

Chapter Five includes a summary of the research study. The findings from this chapter are discussed. Implications of the findings and suggestions for further research are conveyed.

CHAPTER FIVE

SUMMARY AND CONCLUSIONS

The researcher's purpose in this study was to investigate the effect of Cooperative Goal Structuring on sixth grade science students' ability to initiate task and maintenance group behaviors. It was hypothesized that using Cooperative Goal Structuring would result in students' being able to increase the frequency with which they interacted in a group as well as increase the range or number of categories of task and maintenance skills that they used. It was also felt that the students who used a cooperative method would maintain an increase in skill level of task and maintenance behaviors over a three-week interval during which no training was involved. Cognitive performance as measured by a pretest and posttest on content-specific science material was expected to be better for those who studied using Cooperative Goal Structuring methods. Goal structure refers to the planned interaction of students when working on a task.

Research on Cooperative Goal Structuring has shown a positive correlation between use of Cooperative Goal Structuring and increase in student motivation/involvement in instructional activities, positive attitudes toward peers, enhancement of self esteem, and increased perspective taking.

From investigations of group dynamics, researchers have related the ability of an individual to initiate task and maintenance behaviors in a group to his/her social status, ability to understand what

behaviors are needed, and belief in success. Social status is described in respect to student popularity, influence, and academic credibility. Self concept was also found to be related.

The design of the study was a nonequivalent control group, pretest-posttest design.

Independent variables were treatments, general achievement scores, sociometric measurements of popularity, influence, academic credibility and self concept. Dependent variables were scores on content-specific achievement tests and scores obtained on an observation measure developed for this research.

Three intact classrooms of sixth graders were randomly assigned treatments which structured the kind of student-student interaction they would use during the study of an astronomy unit. Treatment 1 (independent) organized students to study with no interaction. Students were graded on individual work. Treatment 2 assigned students to heterogeneous groups based on achievement scores (CTBS--McGraw-Hill), but the group interaction was unstructured in that students could work alone or with others in the group. How they worked was not prescribed. Students were graded on individual work. Treatment 3 assigned students to heterogeneous groups based on achievement scores (CTBS--McGraw-Hill) and taught the students to follow a Cooperative Goal Structuring Model. They cooperated on studying material and in completing the assignments. They were graded on the product of group effort. Everyone in the group got the same grade. The groups had an extra member who served as an observer of task and maintenance skills and gave them feedback after they had worked together.

Multiple choice content-specific achievement tests were given pretreatment and posttreatment. Observations were done pretreatment and posttreatment as well as after a three week interval.

The compiled data were analyzed using analysis of variance (ANCOVA). Null hypotheses were tested for significance at = .01.

The results relative to the testing of each hypothesis were as follows:

Ho_1. There is no difference in the mean frequency of task and maintenance behaviors (as measured by observation instrumentation developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 when differences on the sociometric measures and the pretreatment observation are controlled. The hypothesis was not rejected.

Ho_2. There is no difference in the mean frequency of the task and maintenance behaviors (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 2 when differences in sociometric measures and pretreatment observations are controlled. The hypothesis was not rejected.

Ho_3. There is no difference in the mean number of categories of task and maintenance skills used (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1, when differences in sociometric measures and pretreatment observations are controlled. This hypothesis was not rejected.

Ho_4. There is no difference in the mean number of categories of task and maintenance skills used (as measured by the observation

instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 when differences in sociometric measures and pretreatment observations are controlled. This hypothesis was not rejected.

Ho_5. There is no difference in mean scores on the content-specific achievement $posttest_I$ (retaking pretest) between students who participated in Treatment 3 and those who participated in Treatment 1 when differences in CTBS scores and pretest scores are controlled.

This hypothesis was not rejected.

Ho_6. There is no difference in mean scores on the content-specific achievement $posttest_I$ (retaking pretest) between students who participated in Treatment 3 and those who participated in Treatment 2 when differences in CTBS scores and pretest scores are controlled.

This hypothesis was not rejected.

Ho_7. There is no difference in mean scores on the content-specific achievement $posttest_{II}$ (alternate form) between students who participated in Treatment 3 and those who participated in Treatment 1 when differences in CTBS scores and pretest scores are controlled. This hypothesis was rejected.

Ho_8. There is no difference in mean scores on the content-specific achievement $posttest_{II}$ (alternate form) between students who participated in Treatment 3 and those who participated in Treatment 2 when differences in CTBS scores and pretest scores are controlled. The hypothesis was not rejected.

Ho_9. There is no difference in mean frequency in the retention of task and maintenance behaviors (as measured by the observation instrument developed in this study) between students who participated in

Treatment 3 and those who participated in Treatment 1 after a three week interval when differences on sociometric measures and posttreatment observations are controlled. the hypothesis was not rejected.

Ho_{10}. There is no difference in mean frequency in the retention of task and maintenance behaviors (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 2 after a three week interval when differences on sociometric measures and the posttreatment observations are controlled. This hypothesis was not rejected.

Ho_{11}. There is no difference in mean number of categories of task and maintenance skills used (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 1 after a three week interval when differences in sociometric measures and posttreatment observations are controlled. This hypothesis was not rejected.

Ho_{12}. There is no difference in mean number of categories of task and maintenance skills used (as measured by the observation instrument developed in this study) between students who participated in Treatment 3 and those who participated in Treatment 2 after a three week interval when differences in sociometric measures and posttreatment observations are controlled. This hypothesis was not rejected.

Only one null hypothesis was rejected, Ho_7. A significant difference in means on the posttest (alternate form) was found between Treatment group 3 and Treatment group 1.

In addition to the null hypotheses, two research hypotheses were considered. Hypothesis 13 suggested that scores on the content-

specific achievement posttest should have less variability in the cooperative group (Treatment 3) than the other groups. Hypothesis 14 suggested that the variability for the cooperative group on task and maintenance behaviors may be less than other groups at the end of the study. The variances were examined.

Lastly, it was suggested that the percentage of task vs. maintenance skills per class may be important to consider.

Conclusions

The study was done to investigate the effect on initiation of group skills of different structures for student-student interaction in the classroom while working on a cognitive task. Specifically, Cooperative Goal Structuring methods were the focus. Hypotheses 1, 2, 3, and 4 were concerned with the effect of the structured group (Cooperative Goal Structuring) on the posttreatment observation of task and maintenance behaviors. The differences between the structured group and the independent group and the differences between the structured group and the unstructured group did not prove to be significant. The null hypotheses were not rejected. Therefore, using the instrument developed in this study for observation and the sociometric measures of popularity, influence, academic credibility and self concept as covariates, no significant treatment effects could be found. Looking at raw scores per class mean (p. 85), Treatment 1 and 3 decreased and Treatment 2 increased slightly.

The second set of hypotheses, 5, 6, 7, and 8, set up the comparisons of the cooperative group and the independent group as well as the cooperative group and the unstructured group using scores on the

science achievement test. In this set there was one significant difference between the means of the cooperative group and the independent group. Two posttests were used. $Posttest_I$ was the pretest repeated at the end of the study. $Posttest_{II}$ was the alternate form. The significant difference was on the alternate form, $Posttest_{II}$.

In the last group of hypotheses, 9, 10, 11, and 12, the $Posttreatment_{II}$ observation after the three week interval was investigated. No significant differences could be reported at the .01 level of significance. Originally, when the study was designed, it was hypothesized that the cooperative group work would result in an increase of task and maintenance skill use. If the cooperative treatment group increased significantly in comparison to the other two treatment groups, it was felt that a test to see if students maintained those skill levels over time would be important. As the result of Hypotheses 1, 2, 3, and 4 indicate, there was no significant main treatment effect; therefore, this question of maintenance over time is not meaningful.

Hypotheses 13 and 14 were concerned with the final variance of scores in science tests and observations. It was thought that a decrease in variance might be a sign of progress in skillfulness of pupils in the group behavior. The variance for Treatment 3 students did decrease for categories of group behaviors. There was no decrease in variance on the scores on the science tests.

Discussion

The significant difference in content-specific science achievement between the Cooperative Goal Structuring group (Treatment 3) and the independent structured (Treatment 1) was educationally significant

because the students' unadjusted mean difference was 5.17. Raising the class mean nearly five points would be welcomed by any teacher.

The second posttest was taken, by all groups, under the independent structure. The students in treatment group 3 had been working jointly on tasks and getting joint grades for four weeks. The science material had been studied with input from four students. The other groups had studied alone (Treatment 1) or alone with others (Treatment 2), but they took quizzes independently. Structuring the posttests to be taken independently by all groups could have favored the Treatment 1 and Treatment 2 groups because of familiar format. Nevertheless, the cooperative group mean was significantly higher.

The chosen level of significance was .01. It should be noted that differences between the cooperative group (Treatment 3) and the unstructured (Treatment 2) were significant at the .025 level.

The results for the Posttest_I can be understood when considered in light of the fact it was a repetition of the pretest. The practice effect and awareness effect might explain why all the classes performed with less difference on means. The cooperative classroom still had the highest mean; but when controlled for pretest and general achievement (CTBS), the difference between groups was not significant.

The more central question in this study is that of determining if Cooperative Goal Structuring affects the ability to initiate task and maintenance skills. The analysis of the data resulted in no significant main treatment effect. This leaves the question unanswered. Perhaps Cooperative Goal Structuring has no effect on group skill development when compared to the other two types of treatment groups used in

this study. Or perhaps the conceptual orientation to measurement of group skillfulness taken in this study was erroneous. For this research, the hypotheses were written and the tests were analyzed to examine possible increases in behaviors and number of categories used by students in small groups. The implication is that "more" behaviors are better than "fewer." Thinking of progress in terms of "more," recall that Shaw (1976) stated children's groups and adult groups often followed the same group principles, but children needed to learn the appropriate behaviors. If sixth graders are just learning the skills, an increase model may be appropriate.

An alternative to increase showing progress was referred to in Hypothesis 14. The idea of less variability in scores suggesting progress was presented. For example, the data from this study indicate students vary widely in number of task and maintenance behaviors and range of behaviors exhibited in classroom work (see Appendix D). Student two in Treatment 3 had an initial frequency of eighty-eight behaviors, while student twenty-seven began with ten behaviors. Looking at the $\text{Posttreatment}_{II}$ observation, student two exhibited thirty-two behaviors, and student twenty-seven exhibited thirty. If student two realized, from lessons in group behaviors, that it is helpful to bring out others' ideas or to get others to discuss problems, s/he would be more skillful when not monopolizing. On the other hand, student twenty-seven may have understood more of what group sharing is and increased. The intentions of these students are just conjective because no interviews were done. The example is given to indicate that another methodology is required to obtain data to support student progress in group skill development. Perhaps variance is a key.

The cooperative group did increae in categories used and decrease in variance when unadjusted scores are considered. The other two treatment classes did not. The pattern is not as clear in the case of frequencies of task and maintenance behaviors.

Two final comments about the design of the study are necessary. There were only three days of observation. The days were planned and flexibility limited. External variables of which the researcher is unaware and could not control could have affected students' performance.

The treatment time was four weeks. Intervention and teaching of skills may make some difference; but, considering the stages of group development (Tuckman, 1965; Stanford, 1977), a longer period of time may be needed to evidence progress in group task and maintenance skills.

Theoretical Implications of Results

The results of this study can be examined in light of the conceptualization of the research concerns explored in Chapter Two.

1. The cooperative group did significantly better on the posttest on content specific science achievement. The cooperative group work requires students to spend more time on a task. They needed to reach concensus on the answers they put down. Harnischfeger and Wiley (1976) attribute student outcomes to time spent on the material or activity that is being tested. The findings of hypothesis 7, which proved significant, supports that theory. The teacher in this study recorded informal observations and reflections during the four weeks. One observation was that the cooperative groups worked longer. Often the other groups of students hurried through and then read or did another activity-social or academic.

The time spent teaching about the skills and having students give each other feedback was felt to be another example of time on task. In reality, it only took a total of ten-fifteen minutes out of one hundred minutes of class every two days.

2. The sociometric covariate plus the preobservation scores as covariates accounted for 27.73% of the variance of scores on the post-treatment$_I$ observation. This supports the research reported in Chapter Two on initiation of behaviors in a group. Self concept alone accounted for eleven percent of the variance.

3. The lack of significant difference in initiating both task and maintenance behaviors may be a result of the stage of moral development of sixth graders. Kohlberg and Turiel (1971) outline the stages as premoral, preconventional, convention, and post-conventional or principled levels. The fifth and sixth stages demonstrate less rigidity and more consideration of behavior which reflects what is needed rather than a strict code of law and order or other-influenced behavior. The use of Cooperative Goal Structuring is positively related to the ability to take another's perspective. Would maintenance skills specifically, as well as knowing when specific task skills are needed, requires a high level of moral reasoning? Would Cooperative Goal Structuring, by improving ability to take another's perspective, also affect the level of moral development? The results of the percentage of behaviors in each category was based on mean frequencies within classrooms. The classes all began with seventy-nine percent task and twenty-one percent maintenance. By the end of the study and the last posttreatment observation, the cooperative group was seventy-one percent task and twenty-nine percent maintenance. The independent group

was seventy-four percent task and twenty-six percent maintenance. The unstructured group was seventy-nine task and twenty-one maintenance. Are sixth graders too young to be able to increase much in maintenance skills? A study in Holland, Michigan, in 1962 studied leadership training in elementary school. One of its conclusions was that children's understanding of the task dimensions of leadership preceed the understanding and use of socio-emotional aspects of leadership. Early elementary students are not aware of human relations aspect of group leadership until they are middle or later elementary age. The incentive for leadership for early age elementary students was found to be telling others what to do. Later elementary and high school students were motivated by service or gaining respect.

4. The failure of the study to find significant differences between the structured group and the unstructured group suggests that simply putting students in a group is as useful as using a cooperative group technique. Group dynamics' theory suggests that the cohesion of a classroom group develops over time, as does productivity (Stanford, 1977). The groups to be observed were not the same composition each time. Students were rotated to combine a different four for each lesson. The effects of the planned skill training might then be reflected in the data. Something else may have been operating in the unstructured classroom. Data were not sufficient to determine this. These were some of the ways that the results suggested reference to theory.

Practical Implications of Results

The results indicate possible considerations for classroom teachers:

1. If the sociometric measures were responsible for twenty-seven percent of the variance in the posttreatment observation scores, the development of a supportive classroom atmosphere must be considered, one in which affective objectives are established and systematically worked towards.

2. If time on task is important to student outcomes, Cooperative Goal Structuring as a method may give more students more opportunity to spend time on the task. The balance between advantages and disadvantages of using Cooperative Goal Structuring needs to be weighed by the individual classroom teacher. A considerable body of research on the effects of Cooperative Goal Structuring has resulted in data which indicated significant affective gains when using that method. A smaller group of studies, including the research reported here, show greater cognitive gains using cooperative groups.

On the other hand, costs are involved in using Cooperative Goal Structuring. Appropriate materials may be time consuming. The jigsaw approach requires considerable organization of materials. It is important to note that there are many other strategies for Cooperative Goal Structuring that are not as time-consuming.

If a teacher is considering using a cooperative method, a tolerance for a classroom that is noisy is important. Independent work can be very quiet; cooperative work requires talking.

Most school districts have a policy of grading students individually. Begging the issue of educational worth of individual grades, students and parents expect those grading procedures. Using cooperative grades requires effort by the teacher to communicate the rationale to the parents.

3. The observation sheet developed in the study, or a variation of it, may be used by the teacher to diagnose problems in classroom group work. The teacher can outline what skills are going to be monitored and give students feedback. The next step would be teaching students to be observers. Using student observers is explained in more detail in D. Johnson and R. Johnson (1975) and Schmuck and Schmuck (1979).

Recommendations for Further Research

The need for further research, based on the results of this study, are most apparent in the following areas:

1. The observation instrument needs refinement. A research project on just the instrument would be a helpful aid to future studies of group interaction in classroom.

2. A descriptive study of individuals' working in groups in classrooms in which training is being done may uncover patterns that would suggest a better model for determining progress in group skillfulness. The study should include an ethnographic type of methodology.

3. A study that replicates this one and/or uses a longer time for treatments may result in significant differences in student initiation of behaviors.

4. The link between Cooperative Goal Structuring and moral development and ability to initiate task and maintenance behaviors would be an interesting source of information on groups' development when intervention techniques are being used.

5. The use of a tape recorded, with later analysis of student verbalization, would reduce the effects of observers in the classroom.

It would also allow the researcher easier access to more data. This would necessitate developing a system of analyzing the verbal data.

Historically, researchers have avoided naturalistic settings because "true scientific" method dictates control that is out of reach in a social context. Statisticians continue to issue warnings about the graves dug by those who do not randomize. Generalizability may be a function of true randomization, or it may be a figment of a researcher's imagination. Those who wrestle with behavioral science are allowed to choose designs that are less than the ideal.

The research reported here was conducted using intact groups in one specific school in a unique community. Not only was the sample highly individual, the focus of the research was on a method of structuring student interaction in a classroom in the process of reaching classroom goals. It is called Cooperative Goal Structuring.

Can the question be answered, "Is Cooperative Goal Structuring a successful method for classroom use?" Even more specifically, "Should teachers use Cooperative Goal Structuring?" This study was not carried out to condemn or applaud this method. A judgment cannot be made on the ultimate worth of Cooperative Goal Structuring. It is hoped that the practioner will have an awareness of issues of classroom life that are addressed using Cooperative Goal Structuring.

Teachers should use the method if it deals with facets of classroom work that are important to them. The specific data in this study showed that in this instance, cognitive gains were made by the students in the cooperative group in excess of the students in the classroom that worked independently. The importance of the social workings of the classes were reflected in the amount of variance accounted for by

the covariates of popularity, influence, academic credibility and self concept in the student behaviors in groups. The positive relationship of affective aspects of school life (such as the components of social status) to Cooperative Goal Structuring in the literature warrant further investigation of its effects in classrooms.

Finally, is it important to search for a way to facilitate the use of task and maintenance behaviors? Awareness of the aspects of task and maintenance and how they differ, as well as when they should be used, allows the practitioner to diagnose the skill level of his/her classroom. If the range of behaviors is limited, strategies will be needed to teach those skills. Perhaps Cooperative Goal Structuring is a way to do that because it integrates the cognitive goals of the classroom with the affective concerns of school life.

Reflections

The insights and "gut level" reactions of an experienced educator do not have a place in the body of a research report. Nevertheless, an observing, feeling, thinking person authored this dissertation. This section is devoted to relating some of those observations, feelings, and thoughts, as well as some speculation on what would be changed if this study were to be replicated by the author.

1. It is felt that more focus on the teacher in this study might have been advantageous. The choice of student-student interaction drew the researcher into trying to control for that to be the primary effect. The role of the teacher was to be as organizer, resource, and helper. This teacher is an experienced, respected, and active educator in the school system. Some way might have been conceptualized to include this

teacher's perceptions and insights. The restriction on that came from the researcher's decision that investigation of teacher roles would extend the scope of this study too far. It should be understood that during the conduct of this study, the classroom processes normally used by this teacher were suspended, in favor of those called for by the experimental design. Thus classroom norms, content, group interactions, and, most significantly, the normal teacher-student interaction pattern, changed considerably. With this in mind, the following are several aspects of the teacher's part in the study that may give the reader further insight:

a. The teacher expressed frustration with the rigidity of the two-day lessons. He felt that his usual style would be more flexible, especially if students were frustrated. Given an ordinary lesson of his design, he could have changed gears to keep them more interested and less frustrated.

b. On some days it was a relief to have the independent group because it was quiet and organized.

c. He was trained in cooperative goal structuring and waiting for the study to occur in February before using the technique with the class may have been difficult.

d. He felt it necessary to cover some additional work in astronomy, after the study, and give another final test. The students felt they could study more for it and study in their usual manner (the norm set up during the year).

e. The unstructured group had a history of being difficult to handle (comments from all three homeroom teachers). From the teacher's

observations, the independent and the cooperative goal structuring groups were more content (e.g., got to work more quickly, argued less with teachers and peers) throughout the study than the unstructured group students.

2. It became apparent to the researcher that this was an intervention into the lives of students and teachers that was considerable. This might not be the way a teacher would introduce the three ways of interacting to a classroom. If the researcher were to be responsible for a classroom in the future, the idea of cooperation, competition, and independent work would be interspersed throughout the year. But for research purposes, this was not possible.

3. The researcher returned after several weeks to all the rooms and discussed the study with each homeroom. The idea of social science and physical science research was discussed. The experience was a good one for the researcher in both an affective and cognitive way. It was fun, and the discussion of the students concerning experiments was interesting.

4. An unmeasured and uncontrolled change that seemed to take place in the cooperative group concerned negative behavior, specifically the "put-down." The literature on cooperative goal structuring cites correlations between cooperative experiences and students' feeling "better" about their peers. Examples of this were observed during the posttreatment_{I} and $\text{posttreatment}_{II}$ observations. For example, a student who was put-down and on the fringe of a group in the pretreatment observation was observed in the $\text{posttreatment}_{II}$ observation to say, "This is a good group. We are really working well together."

The other group members responded positively to him at that time. He may not have been able to say that without these experiences.

Considering the preceding thoughts, the complexity of an in-classroom study must certainly be evident. This researcher still supports the study of behavior in the natural setting in spite of the difficulties encountered and the disruption of "normal" classroom processes. Such research might even be further expanded on the assumption that experiences with research and experimentation of classroom processes may help teachers be more aware of their impact on children. The disruption which occurs may help provoke a more objective analysis of what comes to be "normal" through habit and through inertia. It also needs to be dealt with sensitively by cooperating teachers and researchers so that children continue to experience positive and supportive situations in their classrooms.

APPENDICES

APPENDIX A

CONSENT FORMS

MICHIGAN STATE UNIVERSITY

UNIVERSITY COMMITTEE ON RESEARCH INVOLVING
HUMAN SUBJECTS (UCRIHS)
238 ADMINISTRATION BUILDING
(517) 355-2186

EAST LANSING • MICHIGAN • 48824

March 4, 1980

Ms. Judith A. Hay
313 Brookfield Circle
East Lansing, Michigan 48823

Dear Ms. Hay:

Subject: Proposal Entitled "The Effect of Heterogeneous Cooperative Groups on 5th Grade Science Students' Initiations of Task and Maintenance Group Skills"

The above referenced project was recently submitted for review to the UCRIHS.

We are pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and the Committee, therefore, approved this project at its meeting on March 3, 1980.

Projects involving the use of human subjects must be reviewed at least annually. If you plan to continue this project beyond one year, please make provisions for obtaining appropriate UCRIHS approval prior to the anniversary date noted above.

Thank you for bringing this project to our attention. If we can be of any future help, please do not hesitate to let us know.

Sincerely,

Henry E. Bredeck
Chairman, UCRIHS

HEB/jms

cc: Dr. Samuel Corl

CONSENT FORM

Child's Name_____

As the legal parent/guardian of the above-named student, I hereby give my permission for his/her participation in the research project to be carried out at Chestnut Hill Elementary School. The research is being directed by Judith Hay as partial fulfillment of the requirements for a doctoral degree in Curriculum and Instruction. The research is guided by Samuel S. Corl, Professor of Education at Michigan State University. I understand that any reporting of data will not identify any student by name. The information gathered will be used for this research only and will not become a part of any child's permanent records.

Videotape permit: I understand that a videotape will be made of groups of students that will be used to train observers. It will be the property of Midland Public Schools and will be destroyed following the training. No student in it will be identified by name.

Observers: I realize trained observers will be utilized as part of this project for purposes of information gathering. They will be supplying information for the purposes of this research project only.

Test information: The 1979 CTBS test results will be used to statistically match the control and treatment groups. My child will also take three sociometric measures that relate to the research question. None of the tests will be reported in association with my child's name.

Curriculum: I understand that the curriculum and methodology have been approved by Midland Public Schools.

Withdrawal: I understand that my child may be withdrawn from the project and still be offered the curriculum materials according to Midland's science objectives. I can withdraw my child by sending a written notice to school.

Date:_____ Signed:_____

I will permit my child to participate in all of the above except _____ _____.

Date:_____ Signed:_____

I will not permit my child to participate in this research project.

Date:_____ Signed:_____

APPENDIX B

INSTRUMENTS USED IN DATA COLLECTION

SUMMARY OF TASK AND MAINTENANCE FUNCTIONS

Task Functions

1. Information and Opinion Giver: offers facts, opinions, ideas, suggestions, and relevant information to help group discussion.

2. Information and Opinion Seeker: asks for facts, information, opinions, ideas and feelings from other members to help group discussion.

3. Starter: proposes goals and tasks to initiate action within the group.

4. Direction Giver: develops plans on how to proceed and focuses attention on the task to be done.

5. Summarizer: pulls together related ideas or suggestions and restates and summarizes major points discussed.

6. Coordinator: shows relationships among various ideas by pulling them together and harmonizes activities of various subgroups and members.

7. Diagnoser: figures out sources of difficulties the group has in working effectively and the blocks to progress in accomplishing the group's goals.

8. Energizer: stimulates a higher quality of work from the group.

9. Reality Tester: examines the practicality and workability of ideas, evaluates alternative solutions, and applies them to real situations to see how they will work.

10. Evaluator: compares group decisions and accomplishments with group standards and goals.

Maintenance Functions

11. Encourager of Participation: warmly encourages everyone to participate, giving recognition for contributions, demonstrating acceptance and openness to ideas of others; is friendly and responsive to group members.

12. Harmonizer and Compromiser: persuades members to analyze constructively their differences in opinions, searches for common elements in conflicts, and tries to reconcile disagreements.

13. Tension Reliever: eases tensions and increases the enjoyment of group members by joking, suggesting breaks, and proposing fun approaches to group work.

14. Communication Helper: shows bood communication skills and makes sure that each group member understands what other members are saying.

15. Evaluator of Emotional Climate: asks members how they feel about the way in which the group is working and about each other, and shares own feelings about both.

16. Process Observer: watches the process by which the group is working and uses the observations to help examine group effectiveness.

17. Standard Setter: expresses group standards and goals to make members aware of the direction of the work and the progress being made toward the goal and to get open acceptance of group norms and procedures.

18. Active Listener: listens and serves as an interested audience for other members, is receptive to others' ideas, goes along with the group when not in disagreement.

19. Trust Builder: accepts and supports openness of other group members, reinforcing risk taking and encouraging individuality.

20. Interpersonal Problem Solver: promotes open discussion of conflicts among group members in order to resolve conflicts and increase group togetherness.

OBSERVATION FORM

T - Information giver				
T - Starter				
T - Direction giver				
T - Information seeker				
T - Reality tester				
T - Evaluator (tester)				
M - Standard setter				
T - Summarizer				
T - Coordinator				
T - Diagnoser (detective)				
M - Process observer (group observer)				
M - Encourager of participation				
M - Communication helper (checker)				
M - Trust Builder (encourage risk)				
T - Energizer				
M - Tension reliever				
M - Evaluator of emotional climate (emotional thermometer)				

M - Harmonizer and compromiser				
M - Interpersonal problem solver (feeling problem solver)				
M - Active listener				

Date_____
Your Number_____
Class_____

HOW I FEEL ABOUT OTHERS IN MY CLASS

Everybody has different feelings about everybody else. We like some people a lot, some a little bit, and some not at all. Sometimes we think it is not proper or polite to dislike other people, but when we are really honest about it we know that everyone has some negative feelings about some of the people he/she knows. There are some people ypu like a lot and some you don't like. There are some people who like you a lot and some don't like you at all. IF the teacher knows the way you really feel about the other members of your class, he can often plan things better. There are no right or wrong answers.

1. Which three persons in this class do you personally like the most? Using your class list with names and numbers, write the three numbers in the blanks.

	Pupil's number
The three I like most	_____
	_____
	_____

2. Which three persons do you personally like the least? Write the numbers in the blanks.

	Pupil's number
The three I like least are:	_____
	_____
	_____

3. How many people in this class would you say you know pretty well?

____ All of them
____ All but a few
____ More than half
____ About half
____ Less than half
____ Only a few

4. How many people in this class would you say you like quite a lot?

____ All but a few
____ More than half
____ About half
____ Less than half
____ Only a few
____ None

Date_____

Your Number_____

Class_____

THE PEOPLE IN MY CLASS

It is a job of teachers to find ways to make school life more interesting and worthwhile for all the students in the class. This form is your chance to give the teacher confidential information that will help him to help each pupil. There are no right or wrong answers. The way you see things is what counts.

1. Which three persons in this class are most often able to get other pupils to do things? Using your class list, write the numbers of the pupils you select.

	Pupil's number
The three who are most often able to get others to do things are:	_____
	_____
	_____

2. Which three persons in the class do the girls most often do things for?

	Pupil's number
They are:	_____
	_____
	_____

3. Which three persons in the class do the boys most often do things for?

	Pupil's number
They are:	_____
	_____
	_____

4. Which three persons in this class are most cooperative with the teacher and like to do what the teacher wants the class to do?

	Pupil's number
The three most cooperative pupils are:	_____
	_____
	_____

5. Which three persons in this class most often go against the teacher and what he would like the class to do?

	Pupil's number
The three pupils who most often go against the teacher are:	_____
	_____
	_____

6. Which three persons in this class do you think could make the biggest improvement in their schoolwork if they wanted to?

	Pupil's number
The three who could improve most are:	_____
	_____
	_____

THE PEOPLE IN MY CLASS - PAGE 2

7. Which three persons in this class do you think show the most ability to learn new things that are taught in school?

	Pupil's number
The three best learners are:	_____
	_____
	_____

8. Who would you most like to be if you couldn't be yourself but had to be somebody else in this class?

	Pupil's number
Who would you like most to be?	_____
Who else would you like to be?	_____
Who else would you like to be?	_____

Date_____

Your number_____

Class_____

MY CLASSMATES

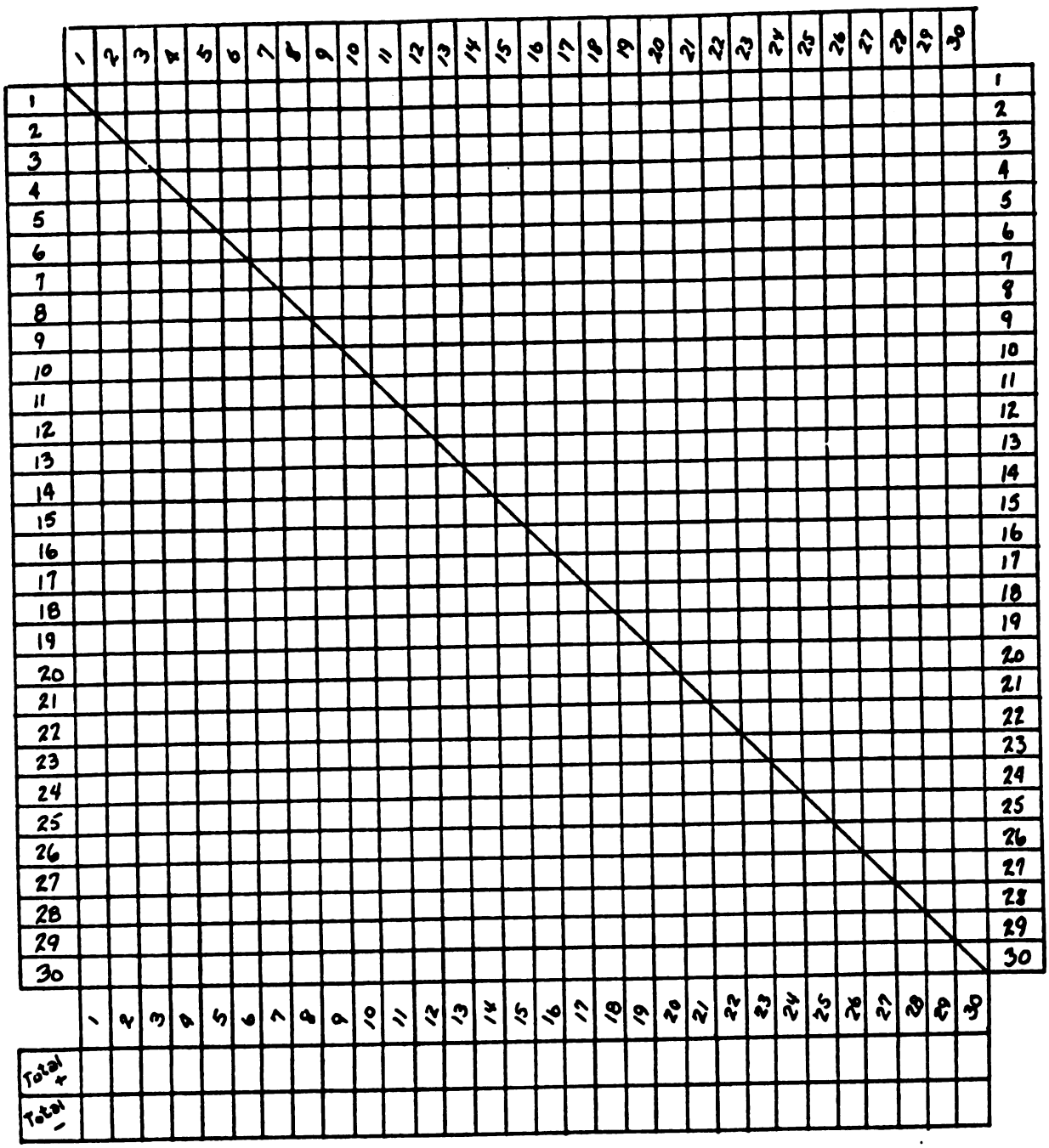
Everyone has some things about him you like and some things about him you don't like so much. Some people seem to have more things about them you like and other people have more things about them you don't like.

Look at the circles below. Suppose that each circle stands for a different kind of person. Each person has many things you like and and don't like. Cirlce 1 has all pluses (+) in it. This stands for a person who has only things about him you like. Circle 9 has all minuses (-) in it. This stands for a person who has only things about him you don't like. The other circles have different numbers of pluses and minuses. These circles stand for people who have different amounts of certain things about them that you like and that you don't like.

For each person in this class, pick the circle that shows the combination of things you like and don't like. Then put a check (✓) for each person under the circle you choose. Check just one circle for each person. Do this for yourself, too. There are no right or wrong answers.

Pupil	1 ++++ ++++	2 ++++ +++-	3 ++++ ++--	4 ++++ +---	5 ++++ ----	6 +++- ----	7 ++-- ----	8 +--- ----	9 ---- ----

Matrix for Sociometric Analysis



SOCIOMETRIC CATEGORIES FROM MATRIX DATA

Using cumulative + and - scores from each student's form based on peer or=self evaluation, the data were assigned a category number as described below. This method is described in Diagnosing Classroom Learning Environments (Fox, Luszki, & Schmuck 1966).

Popularity (How I Feel About Others In My Class, 1,2)

Category	Explanation
1	+ > chance and no -
2	+ > -
3	- > +
4	- > chance and no +
5	isolate

Influence (The People In My Class, 1,2,3)

Category	Explanation
1	More than chance in all three categories
2	More than chance in at least one category
3	Some influence, but less than chance
4	No influence or total less than three

Academic Credibility (The People In My Class, 6,7)

Category	Explanation
1	+ > chance and no -
2	+ > -
3	no score or + minus - = 0
4	- > +
5	- > chance and no +

Self-Concept

Category	Explanation
1	high positive-categories 1 or 2
2	positive-categories 3 or 4
3	neutral-category 5
4	negative-categories 6 or 7
5	low negative-categories 8 or 9

ASTRONOMY
Test I

Name _____
Date _____
Number _____

Directions: Read all of the terms on this page. Then read all of the phrases and definitions on the following page. Write the letter of the correct answer in front of each phrase or definition. There are more terms than there are phrases or definitions.

TERMS

A. Greenhouse effect
B. Meteors
C. Corona
D. Colonizing
E. Uranus
F. Mars, Phobos, Deimos
G. Solar eclipse
H. Pluto
I. Thomas Stafford
J. Michael Collins
K. Astronomer
L. Neptune
M. Mars and Earth
N. Earth and the Moon
O. Asteroid
P. Methane, ammonia, water, hydrogen, electric spark
Q. Jupiter
R. Canada and Northwest U.S.
S. Alpha Centauri
T. Apollo 11
U. Great Red Spot
V. Comets
W. Apollo 18
X. Ion
Y. Lunar eclipse
Z. 88 Earth days
AA. 248.4 Earth years
BB. Saturn, Uranus, Neptune
CC. Ranger
DD. Anorthosite
EE. Mare basalt
FF. Saturn's rings
GG. Infrared waves
HH. Skylab

Name_____
Date_____
Number_____

___ 1. Sending organisms to live in a hostile or different environment.

___ 2. Composed of many small rocks and pebbles that are frost covered.

___ 3. Intense heat on Venus because of cloud cover.

___ 4. Enter the Earth's atmosphere and are seen and called "shooting stars".

___ 5. Have a tail of gas vapor when they near the Sun in their orbit.

___ 6. Outermost covering of the Sun.

___ 7. Seasons and polar ice caps exist.

___ 8. Conditions said to be present on ancient Earth when life began.

___ 9. Orbited by one satellite,Charon.

___10. Mercury's orbit.

___11. Has five thin, non-reflecting(not bright) rings.

___12. Characteristic on one planet caused by high pressure zone and winds of hurricane force.

___13. Collected with telescopes using a bolometer.

___14. Planet with chemicals and sparks most like ancient Earth when life is thought to have begun.

___15. Sometimes called the "double planet".

___16. Most common moon rock.

___17. When the Moon comes between the Sun and the Earth.

___18. Site of the total eclipse of the Sun in Feb. 1979.

___19. Brought first men to the surface of the Moon.

___20. Space station that orbited Earth for experiments with living in space for a long time.

___21. Commander of Apollo 18 that rendezvoused in space with Russian Soyuz.

___22. Joined Soyuz for first rendezvous in space.

___23. Roman gods of war, fear, and terror

___24. An atom or a molecule having an electric charge.

___25. One who studies the heavens.

ASTRONOMY
Test II

Name_____
Date_____
Number_____

Directions: Read all of the terms on this page. Then read all of the phrases and definitions on the following page. Write the letter of the correct answer in front of each phrase or definition. There are more terms than there are phrases or definitions.

TERMS

A. Asteroid belt
B. Neptune
C. Michael Collins
D. Radar astronomy
E. Regolith
F. Saturn
G. Alpha Centauri
H. Pioneer
I. Uranus
J. SETI
K. Milky Way
L. Lunar eclipse
M. Ranger
N. Edwin Aldrin, Jr.
O. 248.4 Earth years
P. Infrared waves
Q. KREEP norite
R. Venus and Earth
S. Solar eclipse
T. Voyager
U. Exobiologist
V. Mercury
W. Viking
X. Spectographs
Y. Neil Armstrong
Z. Surveyor
AA. 88 Earth days
BB. Reflector telescopes
CC. Weightlessness
DD. Mariner
EE. Refractor telescopes
FF. Light year

Name_____
Date _____
Number_____

Test II - page two

___ 1. Pictures that use color to tell what stars are made of.

___ 2. Use mirrors and can be made larger than other telescopes.

___ 3. Region with material in orbit around the Sun between Mars and Jupiter.

___ 4. Has second largest number of satelittes and second fastest rotation.

___ 5. Nearest star - 4½ light years away.

___ 6. Pluto's orbit.

___ 7. Sun looks nine times as large from this planet as it does from Earth.

___ 8. Telescopes collect wavelengths we cannot see from the planets and stars of the universe.

___ 9. Rotates the Sun "lying on its side".

___10. Orbiting this planet is the largest of all our solar system's satellites; Triton.

___11. The first telescopes made; they used lenses.

___12. Experiment to soft-land craft on the Moon.

___13. Probes that landed on Mars carrying mini-labs to analyze soil.

___14. Stayed aboard Apollo 11 in orbit.

___15. One who studies extraterrestrial life.

___16. When Earth comes between the Sun and the Moon.

___17. Probe to Venus, Mars, and Mercury - 1st to photo close to Mercury.

___18. Moon rock containing rare Earth elements.

___19. First probe to leave our solar system.

___20. Condition experienced by humans outside of the gravity of Earth.

___21. Will be the first probes to fly by Uranus and Neptune.

___22. First to step onto the Moon.

___23. Ground up Moon rock.

___24. Distance light travels through empty space in 365 days.

___25. Method used to search the universe for extraterrestrial intelligence.

APPENDIX C

CURRICULUM - SAMPLE LESSON

Topic Order and 4-page Format

1. Sun - Basic facts, Comparison, Techniques, Effects on the Earth
2. Comets, asteroids, meteroids - one page on each, one comparison
3. Venus, Earth, Mars - Basic facts, Comparison, Techniques and Life on these planets
4. Pluto, Mercury - Same as 3.
5. Jupiter, Saturn - Same as 3.
6. Uranus, Neptune - Same as 3.
7. Moon - Basic facts, Comparison, Techniques, Life on the Moon
8. Unmanned Satellites - Lesson included
9. Apollo - Basic facts, Skylab and Salyut 6, Techniques, Beyond "Large step for mankind"
10. Myths - Names, Early Explanations, Mar's "Canals", Un-Myths

Ranger Program

The purpose of the Ranger Program was to get SOMETHING to the moon. Each Ranger carried six television cameras which were designed to send back pictures immediately before they crash-landed on the moon. The first six missions failed. But between July 1964 and March 1965, three Rangers sent back over 17,000 pictures of the lunar surface. The last were from roughly 1,500 feet above the surface and the picture showed rocks and craters as small as three feet across.

Surveyor and Orbiter Program

Simultaneously, these projects were launched. Between May 1966 and January 1968, five Surveyor spacecrafts successfully soft-landed on the lunar surface. Each was equipped with a television camera, an extendable shovel and instruments to analyze the lunar soil. (A bonus finding was that they did not sink into a hugh layer of dust.)

Between August 1966 and August 1967, five Orbiter space-craft were put in orbit around the moon. They sent a total of 1,950 close-up photos of the "front" (facing us) as well as the "hidden" side of the moon. It was our first indication that the far side of the moon had no maria.

Surveyor provided tests for soft-landing and Orbiter took pictures so that a landing site could be picked. They paved the way for Apollo.

MARINER AND VIKING UNMANNED FLIGHTS

Mariner was one of our earliest adventurous probes. Mariners traveled in the 60's and 70's. They have flown by and observed Venus, Mars, and Mercury.

Mariner 1, along with Russian Venera 1, malfunctioned on its way to Venus, 1961.

Mariner 2 was the first spacecraft to undertake a successful mission to Venus in 1962. It was also the first successful flyby of any planet. A flyby means just that, the spacecraft flies by and records data but does not orbit the planet nor land. The temperature was recorded as high as 750° F on Venus.

Mariner 4 flew within 10,000 kilometers of Mars. It shattered the view of many that Mars had canals created by intelligent organisms. It showed a cratered landscape. It recorded only 1% of the surface.

Mariner 5, in the late 1960's, recorded again the high temperatures on Venus and also the crushing atmospheric pressure. While we concentrated on Apollo, Russia's Venera craft found the bottom of the cloud layer at 22 miles above the surface of Venus. From both Mariner 5 and Venera we discovered an almost entirely carbon dioxide atmosphere.

Mariner 6 and 7, in 1969, showed 200 photos of the Martian surface. They discovered a hostile, arid (dry) environment. The temperature at noon at the equator is 50° F. Winter at the polar caps brings -185° F.

Mariner 9 was the first Mariner to go into orbit around Mars in 1971. In its 12 hour orbit, it managed to photograph the entire planet. It transmitted 7,329 photos to Earth. Olympus Mons, a mammoth volcano was one of the first highlights. It is three times the height of Mt.Everest.

A vast canyon, Valles Marineris, was photographed that would make the Grand Canyon look puny. Also noted were what seemed to be signs of water erosion.

Also during Mariner 9, scientists had the first close-ups of the two Martian moons, Phobos and Deimos.

Mariner 10 flew past Venus on February 5, 1974. The photos revealed that the Venusian high clouds travel around the planet at an extremely fast pace (225mph). Venera 9 and 10 soft-landed and found the surface wind-speed slows down to a slow and surprising 8 mph. Most exciting Mariner 10 proceeded on from Venus to Mercury and taught us more about Mercury in March of 1974 than we had known for all human history. The best photos were just before and just after the closest approach (470 miles). It measured surface temperatures and discovered Mercury had a magnetic field. It has craters but not the same as our moon. Mariner flew past Mercury again in September of 1974 and March 1975(300km.) and took more pictures. It has returned every 176 days and has photographed half the planet. It cost $98 million to view half of Mercury, less than 50 cents per person in the United States.

VIKING I AND II

Two Viking spacecraft landed on Mars in the summer of 1976. They sent back more detailed photos, but most importantly, they analyzed Martian soil in a search for life forms. None have been found but mysteries remain about the active chemical reactions of the soil.

PIONEER UNMANNED SATELLITES

Pioneer Venus 1 dipped within 90 miles of the surface of Venus to sample the composition of the upper atmosphere. It was December 5, 1978. The space vehicle weighed 1280 lbs. with about 100 lbs. of remote-sensing devices, control computers, and communication equipment designed to probe the planet for at least one Venusian year. From orbit it made radar measurements of the terrain and snapped daily ultraviolet and infrared pictures. Data was radioed to Earth, where computers processed it and generated brilliant false-colored pictures coded with information.

Pioneer Venus 2 arrived on December 9. At 7.8 million miles the spacecraft divided into 5 probes. All 5 dove through the clouds at points 6,000 miles apart. Each sent back information about wind, clouds and atmosphere before burning.

Instruments inside Pioneer Venus 2 were protected by special heat-resistant aluminized-plastic sheets and lightweight titanium shells able to withstand 100 times normal air pressure. A thirteen carat diamond window, the thickness of two pennies, let radiation into sensors. One capsule surprisingly survived the entry and sent back data for 67 minutes on the ground.

Pioneer 10 and 11 sped by Jupiter in 1973-74. They will be the first to go outside our solar system. Pioneer 10 will leave in 1987. They include gold anodized aluminum plaques that picture when, where, and by whom they were launched.

In 1977, Voyager 1 and 2 were launched to take advantage of the fact that Jupiter, Saturn, Uranus, Neptune and Pluto would all be lined up in a row. This happens only once every 171 years. (Next in 2147 A.D.) Voyagers encountered Jupiter in 1979. Using Jupiter's gravity, they will be slung on to Saturn in 1980-81. Next, with the help of Saturn's gravity, Voyager 2 will head for Uranus in 1986 and Neptune in 1989. The NASA budget did not allow funding for the trip to Pluto.

At the time of their launching they were the most sophisticated robot probes ever. They would be working farthest from Earth and needed to be more independent than any other probes. They care for themselves and perform complex scientific surveys without continued and specific directions from home. They each weigh 1,820 lbs., have cameras, radio astronomy equipment, ultraviolet, infrared and charged-particle sensors. Since they are too far from the sun to fly on solar energy, nuclear power is provided by radioisotope (plutonium 238) thermoelectric generators.

Voyager 1 discovered a thin rocky ring encircling Jupiter 34,000 miles out and 5000 miles wide and 18 miles thick.

Another exciting discovery came when films of Jupiter's moon Io showed a volcano plume on that moon. It was the FIRST evidence of active volcanism beyond Earth. Also discovered were the charged particles around Jupiter, hotter than the sun's interior.

When Voyager 2 arrived four months later, all these discoveries were seconded PLUS a new moon , the fourteenth, was detected.

When the missions are complete, Voyager 1 and 2 will exit our solar system also(Pioneer will be the first). Voyager will include a phonograph record of terrestrial sounds and electronically encoded photographs. Just think of space explorers from another solar system listening to our sounds and seeing our humans, animals, and buildings!

A. Answers for questions 1-4 will be found in the resource sheets.

1. How did Surveyor and Orbiter help pave the way for Apollo missions?

2. Which was the first Mariner to orbit Mars?

   What vehicle first soft-landed (Not crash- landed) on Venus?

3. Newer space probes travel in pairs, at least they are launched within days of each other. How did Pioneer Venus 1 and 2 differ?

4. What was the most exciting and important discovery of Voyager 1 about Jupiter?

B. This question requires that you use classroom and library resources. It is not covered in the resource sheets.

5. What would you put in a spacecraft like Voyager that will travel on out of our solar system? List two each and tell why you think they should represent Earth to other beings in the universe(if they exist and if they intercept Voyager).

LESSON EIGHT - QUIZ
Unmanned Satellites

Name_____
Number_____
Class_____

Matching

A. Mariner
B. Surveyor
C. Pioneer
D. Voyager
E. Ranger
F. Viking
G. Orbiter

Use the letters of one OR more than one of the listed satellites to answer 1 through 8.

____ 1. This program proved that there are no canals made by intelligent beings on Mars.

____ 2. Launched to take advantaged of the fact that Jupiter, Saturn, Uranus, Neptune, and Pluto are lined up in a row.

____ 3. Paved the way (found out a lot of information) for the Apollo missions to follow.

____ 4. Craft from this program split into 5 probes that dove into the clouds of Venus.

____ 5. First probe to show us that there are no maria on the hidden side of the Moon.

____ 6. Spacecraft that landed on Mars and analyzed soil.

____ 7. Took photographs that showed a volcano on Io.

____ 8. Space probes that will leave out solar solar system.

9. Name four jobs done by unmanned satellites that could not be done from Earth.

_____

_____

_____

_____

APPENDIX D

SUMMARY DATA

TABLE D-1

Treatment 1 Summary Data per Student on Observations and Science Tests

Student	OBSERVATIONS Pre Cat.	Pre Freq.	Post I Cat.	Post I Freq.	Post II Cat.	Post II Freq.	SCIENCE TESTS Pre	Post I	Post II
1	10	39	8	31	5	11	7	11	9
2	4	15	2	7	3	9	3	8	6
3	1	6	4	13	6	16	1	6	5
4	10	14	3	16	5	18	3	8	5
5	3	4	1	5	--	--	3	--	2
6	9	35	8	18	9	35	2	4	4
7	7	40	6	12	10	27	4	14	10
8	12	23	7	26	--	--	5	2	10
9	9	57	3	10	5	15	4	14	12
10	--	--	--	--	7	22	11	14	13
11	5	17	5	15	5	11	6	7	5
12	4	16	3	11	2	2	3	7	7
13	7	20	4	14	7	20	7	4	5
14	6	25	5	22	8	27	5	6	13
15	8	28	--	--	6	24	8	11	11
16	5	19	8	33	8	23	5	12	8
17	5	17	9	27	6	12	3	6	4
18	11	25	10	35	7	23	8	13	11
19	6	10	7	14	7	15	5	11	7
20	8	19	6	24	3	10	7	13	5
21	4	10	5	11	9	19	3	6	4
22	11	39	10	33	16	54	5	19	21
23	6	26	7	22	8	20	5	15	4
24	5	17	6	32	--	--	9	11	4
25	9	48	--	--	10	35	6	9	11

-- indicates student absent when data collected

TABLE D-2

Treatment 2 Summary Data per Student on Observations and Science Tests

Student	OBSERVATIONS Pre Cat.	Pre Freq.	PostI Cat.	PostI Freq.	PostII Cat.	PostII Freq.	SCIENCE TESTS Pre	Post I	Post II
1	5	12	6	16	5	24	7	12	12
2	9	32	4	19	5	12	2	4	4
3	3	6	4	18	3	6	6	6	8
4	7	26	7	20	8	17	7	9	14
5	4	7	7	32	3	9	3	15	13
6	6	12	5	20	6	12	6	5	5
7	5	14	5	32	9	33	1	4	7
8	4	15	6	27	3	7	2	7	10
9	4	16	5	29	2	3	12	16	16
10	13	57	11	31	9	26	10	13	7
11	--	--	6	18	10	20	--	16	16
12	12	47	8	12	2	7	4	10	6
13	11	31	9	21	5	27	14	21	19
14	--	--	5	17	7	26	--	16	16
15	5	7	--	--	3	4	7	6	14
16	8	37	8	36	9	22	8	12	9
17	8	41	6	17	8	26	7	11	7
18	5	14	5	20	4	13	7	17	8
19	8	14	4	13	3	5	6	8	7
20	6	16	6	18	6	17	5	5	14
21	9	20	7	28	8	33	11	18	19
22	5	16	7	31	7	19	3	3	9
23	--	--	--	--	11	47	8	12	15
24	--	--	6	21	4	11	7	10	14
25	5	12	5	12	--	--	--	3	4
26	7	32	5	27	2	8	3	8	0
27	4	12	5	38	12	29	3	6	10

-- indicates student absent when data collected

TABLE D-3

Treatment 3 Summary Data per Student on Observations and Science Tests

Student	OBSERVATIONS Pre Cat.	Pre Freq.	Post I Cat.	Post I Freq.	Post II Cat.	Post II Freq.	SCIENCE TESTS Pre	Post I	Post II
1	4	12	6	19	4	9	6	17	14
2	14	88	5	15	10	32	15	22	16
3	9	30	10	47	8	22	14	16	15
4	4	12	6	22	2	8	7	9	13
5	10	26	5	15	6	23	10	10	16
6	6	24	6	13	7	33	1	6	11
7	12	34	6	16	8	37	7	9	14
8	--	--	8	22	4	7	3	8	12
9	6	13	4	9	4	12	5	2	1
10	5	23	6	24	9	23	9	14	11
11	9	53	6	26	11	48	11	14	16
12	6	17	10	21	8	25	5	7	4
13	9	30	3	16	7	18	11	11	9
14	6	17	7	24	11	21	9	11	18
15	4	13	6	15	7	28	9	16	13
16	5	18	--	--	2	6	15	14	16
17	4	23	7	25	--	--	11	18	16
18	5	15	5	16	7	20	4	15	10
19	3	16	5	17	5	11	7	8	10
20	9	27	9	24	11	40	3	13	10
21	--	--	8	22	8	22	8	15	18
22	7	26	6	17	--	--	9	16	17
23	6	19	4	15	8	32	4	9	14
24	6	21	1	8	8	30	7	10	18
25	7	17	9	23	10	37	3	13	13
26	8	24	11	51	6	22	13	21	19
27	4	10	3	10	9	30	5	7	14

-- indicates student absent when data collected

TABLE D-4

Variance Accounted for by Covariates

Covariates	Science Posttest$_I$	Science Posttest$_{II}$
CTBS score	28.38	31.70
Pretest	22.61	10.29
Total	50.99	41.99

Covariates	Posttreatment$_I$ Ob. Cat.	Posttreatment$_I$ Ob. Freq.	Posttreatment$_{II}$ Ob. Cat.	Posttreatment$_{II}$ Ob. Freq.
Popularity	2.58	.28	.98	1.11
Influence	2	1.94	.11	.03
Acad. Cred.	4.98	1.62	4.20	8.57
Self-concept	11.05	.85	.00	1.87
Pretreatment Ob.	7.01	.11	9.80	3.35
Total	27.72	4.80	15.09	14.93

TABLE D-5

Mean Frequency - Behaviors Per Category

	Treatment 1			Treatment 2			Treatment 3		
Cat.	Pre	PostI	PostII	Pre	PostI	PostII	Pre	PostI	PostII
T 1	7.21	7.09	5.77	7.57	9.28	5.42	8.38	7.65	8.60
T 2	3.75	3.55	2.50	2.74	4.84	2.58	3.42	3.46	2.56
T 3	.13	.14	.23	.13	.08	.16	.12	.08	.20
T 4	4.25	2.14	3.09	1.65	2.04	2.85	2.96	2.73	1.92
T 5	.42	.50	1.18	.61	.59	1.27	.54	.38	1.44
T 6	.42	.27	.14	.43	.20	.38	.50	.27	.16
T 7	.29	.00	.00	.26	.04	.08	.15	.15	.00
T 8	.67	.14	.36	.91	.04	.23	.73	.19	.24
T 9	2.42	1.68	1.18	2.61	2.32	1.15	1.92	1.54	1.68
T 10	.17	.36	.45	.17	.16	.00	.23	.35	.48
M 11	1.71	.64	1.09	.91	.60	.92	1.27	.77	1.64
M 12	.04	.00	.09	.04	.08	.08	.23	.04	.12
M 13	.04	.00	.32	.22	.04	.00	.15	.33	.28
M 14	.21	.05	.32	.13	.08	.08	.23	.12	.32
M 15	.00	.00	.05	.00	.00	.00	.00	.04	.00
M 16	.00	.05	.05	.04	.08	.08	.04	.04	.12
M 17	.46	.27	.50	.09	.32	.58	.38	.46	.88
M 18	2.75	2.86	2.77	3.04	2.08	1.92	2.69	2.04	3.52
M 19	.04	.14	.05	.00	.12	.00	.00	.08	.08
M 20	.00	.00	.00	.00	.00	.04	.00	.00	.00
Total	24.98	19.88	20.14	21.55	22.99	17.81	23.95	20.72	24.24
Tot-T	19.73	15.87	14.90	17.08	19.59	14.12	18.95	16.80	17.28
Tot-M	5.25	4.01	5.24	4.47	3.40	3.69	5.00	3.92	6.96

Categories T 1 - M 20 correspond to the categories on the Summary of Task and Maintenance Functions in APPENDIX B.

TABLE D-6

Mean % - Behaviors Per Category

Cat.	Treatment 1			Treatment 2			Treatment 3		
	Pre	PostI	PostII	Pre	PostI	PostII	Pre	PostI	PostII
T 1	29.0	36.0	29.0	35.0	40.0	30.0	35.0	37.0	35.0
T 2	15.0	18.0	12.0	13.0	21.0	14.0	14.0	17.0	11.0
T 3	0.5	0.7	1.0	0.6	0.3	0.9	0.5	0.4	0.8
T 4	17.0	11.0	15.0	8.0	9.0	16.0	12.0	13.0	8.0
T 5	1.7	2.5	6.0	3.0	3.0	7.0	2.0	2.0	6.0
T 6	1.7	1.3	0.7	2.0	0.9	2.0	2.0	1.0	0.7
T 7	1.2	0.0	0.0	1.2	0.2	0.4	0.6	0.7	0.0
T 8	2.7	0.7	1.7	4.0	0.2	1.2	3.0	0.9	1.0
T 9	9.7	8.0	6.0	12.0	10.0	6.0	8.0	7.0	7.0
T 10	0.7	2.0	2.0	0.7	0.7	0.0	1.0	1.6	2.0
M 11	7.0	3.0	5.0	4.0	3.0	5.0	5.0	4.0	7.0
M 12	0.2	0.0	0.4	0.2	0.3	0.4	1.0	0.2	0.5
M 13	0.2	0.0	1.5	1.0	0.2	0.0	0.6	2.0	1.0
M 14	0.8	0.3	1.5	0.6	0.3	0.4	1.0	0.6	1.3
M 15	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2	0.0
M 16	0.0	0.3	0.2	0.2	0.3	0.4	0.1	0.2	0.5
M 17	2.0	1.3	2.0	0.4	1.3	3.0	1.5	2.0	4.0
M 18	11.0	14.0	14.0	14.0	9.0	11.0	11.0	10.0	15.0
M 19	0.2	0.7	0.2	0.0	0.5	0.0	0.0	0.4	0.3
M 20	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Total T	79.0	80.0	74.0	79.0	85.0	79.0	79.0	81.0	71.0
Total M	21.0	20.0	26.0	21.0	15.0	21.0	21.0	19.0	29.0

Categories T 1 - M 20 correspond to the categories on the Summary of Task and Maintenance Functions in APPENDIX B.

BIBLIOGRAPHY

BIBLIOGRAPHY

Aronson, E., Blaney, N., Sikes, J., Stephan, C., & Snapp, M. Bussing and racial tension: the jigsaw route to learning and liking. Psychology Today, 1975, 8, 43-49.

Aronson, E., Blaney, N., Stephan, C., Sikes, J., & Snapp, M. The jigsaw classroom. Beverly Hills, California: Sage Publications, Inc., 1978.

Atkinson, J., & Feather, N. A theory of achievement motivation. New York: John Wiley and Sons, 1966.

Bales, R. F. Personality and interpersonal behavior. New York: Holt, Rinehart, & Winston, 1970.

Benne, K., & Sheats, P. Functional roles of group members. Journal of Social Issues, 1948, 4, 41-49.

Berkowitz, L. Sharing leadership in small decision-making groups. Journal of Abnormal and Social Psychology, 1953, 48, 2, 231-238.

Bloom, B. S. Human characteristics and school learning. New York: McGraw-Hill Book Company, 1976.

Boehm, A., & Weinberg, R. The classroom observer: a guide for developing observation skills. New York: Teachers College Press, 1977.

Brandhorst, A. R. Toward a taxonomy of educational objectives in the relational domain. Paper presented at the Annual Meeting of the National Council for the Social Studies, Washington, D. C., 1976.

Brandt, R. M. Studying behavior in natural settings. New York: Holt, Rinehart, & Winston, 1972.

Bridgeman, D. Cooperative, interdependent learning and its enhancement of role-taking in fifth grade students. Paper presented at the American Psychological Association Convention, San Francisco, 1977.

Broadfoot, P. M. Communication in the classroom: a study of the role of assessment in motivation. Educational Review, 1979, 31, 1, 3-10.

Brown, G. I. (ed). The live classroom: innovation through confluent education and gestalt. New York: The Viking Press, 1975.

Bugental, D. E., & Lehner, G. Accuracy of self-perception and group perception as related to two leadership roles. Journal of Abnormal and Social Psychology, 1958, 56, 396-398.

Campbell, D., & Stanley, J. C. Experimental and quasi-experimental design for research. Chicago: Rand-McNally and Company, 1966.

Cartwright, D., & Zander, A. Group dynamics: research and theory (3rd ed.). New York: Harper & Row, Publishers, 1968.

Cooley, C. H. Human nature and the social order. New York: Free Press, 1956.

Dahllöf, U. S. Ability grouping, content validity, and curriculum analysis. New York: Teachers College Press, 1971.

DeCharms, R. Personal causation training in the schools. Journal of Applied Social Psychology, 1972, 2, 2, 95-113.

Dehaan, R. F. A study of leadership in school-age children. Hope College, Holland, Michigan, 1962. (ERIC document reporduction service no. ED 002926.)

Deutsch, M. A theory of cooperation and competition. Human Relations, 1949, 2, 129-152.

DeVries, D., & Slavin, R. Teams-games-tournaments (TGT): review of ten classroom experiments. Journal of Research and Development in Education, 1978, 12, 1, 28-38.

Doyle, W. Paradigms for research on teacher effectiveness. In L. Shulman (ed.), Review of research in education, 5. Itasca, Illinois: F. E. Peacock, 1977.

Ediger, M. The public school curriculum: competition or cooperation? School and Community, 1975, 62, 3, 8.

Eggleston, J. E., Galton, M. J., & Jones, M. E. A conceptual map for interaction studies. In G. Chanan, & S. Delamont (eds.), Frontiers of classroom research. Slough: NFER, 1975.

Eisner, E. W., & Vallance, E. (eds.). Conflicting conceptions of curriculum. Berkeley, California: McCutchan Publishing, 1974.

Erickson, F. Mere ethnography: some problems in its use in educational practice. Occasional Paper No. 15. East Lansing: Michigan State University, Institute for Research on Teaching, 1979.

Fiedler, F. E. A theory of leadership effectiveness. New York: McGraw Hill, 1967.

Finn, J. Expectations and the educational environment. Review of Educational Research, 1972, 42, 3, 387-410.

Fox, R., Luszki, M., Schmuck, R. Diagnosing classroom learning environments. Chicago: Science Research Associates, 1966.

French, J., Jr., & Raven, B. The bases of social power. In D. Cartwright (ed.), Studies in social power. Ann Arbor, Michigan: Institute for Social Research, 1959.

Galton, M. J. British mirrors: a collection of classroom observation systems. University of Leicester, School of Education, 1978.

Galton, M. J. Systematic classroom observation: British research. Educational Research, 1979, 21, 2, 109-115.

Garibaldi, A. Cooperation competition and locus of control in Afro-American students. Unpublished doctoral dissertation, University of Minnesota, 1976.

Glidewell, J. C., Kantor, M., Smith, L. M., & Stringer, L. Classroom socialization and social structure. In M. Hoffman & L. Hoffman (eds.), Review of child development research. New York: Russell Sage Foundation, 1966.

Gold, M. Power in the classroom. Sociometry, 1958, 21, 50-60.

Good, T. L. & Brophy, J. E. Looking in classrooms (2nd ed.). New York: Harper & Row, Publishers, 1978.

Gunderson, B., & Johnson, D. W. Using cooperative learning in French classes. University of Minnesota, submitted for publication, 1978.

Hamblin, R. L. Leadership and crises. Sociometry, 1958, 21, 322-335.

Harnischfeger, A., & Wiley, D. E. Teaching-learning processes in elementary school: a synoptic view. Curriculum Inquiry, 1976, 6, 1, 5-43.

Hemphill, J. Why people attempt to lead. In L. Petrullo & B. Bass (eds.), Leadership and interpersonal behavior. New York: Holt, Rinehart & Winston, 1961.

Hollander, R. P. Some effects of perceived status or responses to innovative behavior. Social Psychology, 1961, 63, 247-250.

House, W. C. & Perney, V. Valence of expected and unexpected outcomes as a function of locus of goal and type of expectancy. Journal of Personality and Social Psychology, 1974, 29, 4, 454-463.

Johnson, D. W. The social psychology of education. New York: Holt, Rinehart & Winston, 1971.

Johnson, D. W., & Ahlgren, A. Relationship between student attitudes about cooperation and competition and attitudes toward schooling. Journal of Educational Psychology, 1976, 68, 1, 92-102.

Johnson, D. W., & Johnson, F. P. Joining together: group theory and group skills. Englewood Cliffs, New Jersey: Prentice Hall, 1975.

Johnson, D. W., & Johnson, R. T. Cooperative, competitive, and individualistic learning. Journal of Research and Development in Education, 1978, 12, 1, 3-15.

Johnson, D. W., & Johnson, R. T. Cooperative learning: the power of positive goal interdependence. In R. Chasnoff (ed.), Structuring group learning: the 1979 handbook. Minneapolis: A Cooperation Network Publication, 1979.

Johnson, D. W., & Johnson, R. T. Instructional goal structure: cooperative, competitive, or individualistic. Review of Educational Research, 1974, 44, 2, 213-240.

Johnson, D. W., & Johnson, R. T. Learning together and alone: cooperation, competition, and individualization. Englewood Cliffs, New Jersey: Prentice Hall, 1975.

Johnson, D. W., Johnson, R. T., & Anderson, D. Relationship between student cooperative, competitive and individualistic attitudes and attitudes toward schooling. Journal of Psychology, 1978, 100, 183-199.

Johnson, D. W., Johnson, R. T., Johnson, J., & Anderson, D. Effects of cooperative versus individualized instruction on student prosocial behavior, attitudes toward learning, and achievement. Journal of Educational Psychology, 1976, 68, 4, 446-452.

Johnson, D. W., Johnson, R. T., & Scott, L. The effects of a cooperative and individualistic instruction on student attitudes and achievement. Journal of Social Psychology, 1978, 104, 207-216.

Johnson, D. W., & Norem-Hebeisen, A. Attitudes toward interdependence among persons and psychological health. Psychological Reports, 1977, 40, 843-850.

Kerlinger, F. N. Foundations of behavior research (2nd ed.). New York: Holt, Rinehart & Winston, Inc., 1973.

Kohlberg, L., & Turiel, E. Moral development and moral education. In G. S. Lesser (ed.), Psychology and educational practice. Glenview, Illinois: Scott, Foresman and Company, 1971.

Lilly, M. S. Improving social acceptance of low sociometric status, low achieving students. Exceptional Children, 1971, 37, 5, 341-347.

Lippitt, R. Unplanned maintenance and planned change in the group work process. Social work practice. New York: Columbia University Press, 1962.

Lippitt, R., & Gold, M. Classroom social structure as a mental health problem. Journal of Social Issues, 1959, 15, 40-58.

Lippitt, R., Polansky, N., Redl, F., & Rosen, S. The dynamics of power. Human Relations, 1952, 5, 37-64.

Martin, J. F. Analysis of John M. Mayfield's "Factors affecting rationality in the discussion of a problem by small groups of secondary school students." Science Education, 1976, 60, 2, 185-192.

Mayfield, J. M. Factors affecting rationality in the discussion of a problem by small groups of secondary school students. Science Education, 1976, 60, 2, 173-183.

Mead, G. H. Mind, self, and society. Chicago: University of Chicago Press, 1934.

Medley, D. M. & Mitzel, H. E. Measuring classroom behavior by systematic observation. In N. Gage (ed.), Handbook of research on teaching. Chicago, Illinois: Rand-McNally and Company, 1963.

Norem-Hebeisen, A., & Johnson, D. W. The relationship between cooperative, competitive, and individualistic attitudes and differentiated aspects of self-esteem. University of Minnesota, submitted for publication, 1977.

Perry, L. R. Competition and cooperation. British Journal of Educational Studies, 1975, 23, 2, 127-134.

Polansky, N., Lippitt, R., & Redl, F. An investigation of behavioral contagion in groups. Human Relations, 1950, 3, 319-348.

Rothkopf, E. Z. Writing to teach and reading to learn: a perspective on the psychology of written instruction. In N. L. Gage (ed.), The psychology of teaching methods, 75th Yearbook of the National Society for the Study of Education, Pt. 1. Chicago: University of Chicago Press, 1976.

Schmuck, R. A. Helping teachers improve classroom group processes. Journal of Applied Behavioral Science, 1968, 4, 401-435.

Schmuck, R. A., & Schmuck, P. A. Group processes in the classroom (3rd ed.). Iowa: Wm. C. Brown Company, Publishers, 1979.

Sears, P. Levels of aspiration of academically successful and unsuccessful children. Journal of Abnormal and Social Psychology, 1940, 35, 498-536.

Shaw, M. E. Group dynamics: the psychology of small group behavior (2nd ed.). La Jolla, California: NTL/Learning Resources Corporation, 1976.

Shaw, M. E., & Blum, J. M. Effects of leadership style upon group performance as a function of task structure. Journal of Personality and Social Psychology, 1960, 3, 2, 238-242.

Simon, A., & Boyer, E. G. (eds.). Mirrors for behavior: an anthology of classroom observation instruments. Philadelphia: Research for Better Schools, Inc., 1967, 1970, 1975.

Slavin, R. E. Classroom reward structure: an analytical and practical review. Review of Educational Research, 1977, 47, 4, 633-650.

Stanford, G. Developing effective classroom groups: a practical guide for teachers. New York: Hart Publishing Company, Inc., 1977.

Stanford, G., & Roark, A. Human interaction in education. Boston: Allyn & Bacon, Inc., 1974.

Stoghill, R. M. Handbook of leadership: a survey of theory and research. New York: The Free Press, 1974.

Sullivan, H. S. The meaning of anxiety in psychiatry and in life. Psychiatry, 1948, 3, 1-17.

Tjosvold, D., Marino, P., & Johnson, D. W. Cooperation and competition and student acceptance of inquiry and didactic teaching. Journal of Research in Science Teaching, 1977, 14, 281-288.

Tuckman, B. W. Developmental sequence in samll groups. Psychological Bulletin, 1965, 63, 384-399.

Walberg, H. J., & Anderson, G. J. Classroom climate and individual learning. Journal of Educational Psychology, 1968, 59, 6, 414-419.

Walker, D. Toward comprehension of curricular realities. In L. Shulman (ed.), Review of Research in Education, 4. Itasca, Illinois: F. E. Peacock, 1976.

Wheeler, R., & Ryan, F. L. Effects of cooperative and competitive classroom environments on the attitudes and achievement of elementary school students engaged in social studies inquiry activities. Journal of Educational Psychology, 1973, 65, 3, 404-407.

Wilson, S. R. Leadership, participation and self-orientation in observed and non-observed groups. Journal of Applied Psychology, 1971, 55, 5, 433-438.

Wynne, E. Teaching about cooperation and competition. Educational Forum, 1976, 40, 278-288.

Zander, A. The psychology of group processes. Annual Review of Psychology, 1979, 30, 417-451.