THE EFFECTS OF GROUP PROCESSING ON ACHIEVEMENT IN
COOPERATIVE LEARNING GROUPS WITH GRADE-ONE STUDENTS

by

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B.A. Simon Fraser University, 1980

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS (EDUCATION)

Faculty
of
Education

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SIMON FRASER UNIVERSITY
February 1990

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THE EFFECTS OF GROUP PROCESSING ON ACHIEVEMENT IN COOPERATIVE LEARNING

GROUPS WITH GRADE-ONE STUDENTS

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ABSTRACT

Although the effectiveness of cooperative learning instruction in promoting academic achievement of older students is well documented, the benefits of cooperative learning instruction for primary students has been less clearly established. The overall purpose of this study is to examine the achievement effects of cooperative learning with primary children.

The present study examined the relative achievement effects of three forms of instruction: (a) individualized instruction, (b) cooperative learning and (c) cooperative learning with group-process training. Sixty-four grade-one students were assigned randomly to one of these instructional treatments. Irrespective of group membership, all children received six weeks of instruction in the same science curriculum. Children were administered pretest, posttest, maintenance and generalization tests through the course of the study.

Students assigned to individualized instruction worked independently on the science unit materials. Instruction in this group differed little from that typically found in grade-one classrooms. Students in both cooperative learning groups worked in heterogeneously grouped clusters of four students. All task structures, incentive systems and problem-solving in these groups
focused upon group efforts. In one of the cooperative learning groups, cooperative learning was augmented with the explicit instruction of group-processing skills. In this group, students were taught communication skills, group monitoring skills and group evaluation skills.

A comparison of pretest-posttest achievement indicated that students in each of the instructional treatments made statistically reliable gains during instruction. In addition, students maintained these achievement gains at follow-up testing. A comparison of the differential effects of instruction using a two-way analysis of covariance yielded no statistically reliable differences across instructional treatments. Furthermore, no interaction between students' ability levels and instructional treatments was detected.

In the closing chapter of the thesis, limitations of this investigation are discussed and recommendations for future cooperative learning research are provided. Implications of cooperative learning instruction and research for primary educators are also offered.
ACKNOWLEDGEMENTS

I wish to pay special recognition to my Senior Supervisor, Dr. John Walsh. His unstinting patience, advice, knowledge and gentle guidance have been invaluable in the writing of this thesis. I also thank the second member of my committee, Dr. Roger Gehlbach, for his assistance in designing the study and his feedback throughout.

In addition I extend my thanks to the principal and staff at Laronde Elementary School in Surrey. In particular, Karen Atkinson and Melanie Kuzminski, who generously allowed their classes to participate in the study. I also thank the children in those classes who entered energetically into a new program.

The final words of gratitude I offer to Thomas Melski. His encouragement, support and caring made the completion of this thesis possible.
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CHAPTER I

INTRODUCTION

Cooperative learning as an instructional method is not new to education. It has, however, been experiencing a revival in the past two decades in the North American educational community. Some view it as a trend, a ground swell action, arising from the ranks of concerned educators (Johnson, Johnson, & Holubec, 1986). Others perceive it as a reflection of a set of values that espouse the philosophy that educational planning and practice should provide opportunities for students to practice skills in a meaningful context as opposed to learning about the skills in isolation (Sharan & Sharan, 1976).

Resnick (1987) writes of the popular belief that the schooling received in educational institutions bears little resemblance to the knowledge and skills required to function effectively in the world outside of schools. While agreeing that school is a place where a particular kind of intellectual work is done, Resnick suggests that the broader perspectives of education need to be redirected in order to find a wider base for interaction with, and relevance in, today's society. One point at which formal education and education outside of schools have converged has been the common goal to develop children who are productive and resourceful members of society.
Traditionally the family has also played a large role in the socialization process of children; however, as the family unit has been systematically eroded by social and technological change a "socialization void" has occurred (Kagan, 1980). This socialization void refers to the fact that, without the extended family and the influences of traditional community structures, children are developing with fewer opportunities to engage in critical social interaction. They are in many instances becoming viewers of social interaction through the media of television and videos as opposed to active participants.

Schools have generally offered limited opportunities for meaningful social interaction. The competitive reward system, with its emphasis on working independently, and recitation or lecture styles of teaching have done little to redress the balance. The province of British Columbia's Royal Commission on Education (1988) expressed awareness of the changes in society that are reflected in the welfare of children and notes that "schools have increasingly been expected to assume a larger role in child rearing, the nurture [sic] of the young and the supervision of youngsters' play activities" (p. 15).

One of the results of the Royal Commission has been the drafting of a new Primary Program (1989). The preliminary version of this document, while outlining changes to the instructional methods and evaluation techniques, also addresses the problems of an isolated,
piecemeal curriculum and the socialization void. In the past schools have emphasized symbolic thinking to the neglect of cognitive activity involving objects and concrete situations (Resnick, 1987). In the new program a learning environment for intellectual growth is described as one that is "...experience rich, providing time and opportunities for first-hand experiences...." (p. 5). In other words, learning should have meaning and relevance to the learner.

The *Primary Program* also reflects an awareness of the socialization void and the need for schools to take a more active role in the socialization process of children. Provision for social interaction is evident in this description, "...the optimum learning environment is social in nature, providing time and opportunities for children to interact with others, to develop interpersonal skills, and to work and learn cooperatively and collaboratively" (p. 4). In the past schools have emphasized the individual's performance and have created an environment where students are isolated from the learning experiences of their peers. The shift in the new program seems to be toward the individual's performance in the context of socially shared tasks and experiences much as exists in society outside of schools.

Cooperative learning, because it is a social process requiring and fostering both intellectual and collaborative skills, provides a significant touchstone
for education to make the shift suggested by Resnick and proposed by the Primary Program. However, this is not to say that other forms of instruction should be left by the board. Research (Sharan, 1980a; & Slavin, 1983b) indicates that cooperative learning is at least as effective in increasing student achievement as competitive or individualized instruction. There is no reason why these three instructional models cannot be implemented on an as needed basis when their method is particularly suited to the goals of learning.

Research Intent

In light of the philosophical and methodological shift prescribed by the Primary Program research on the effects of cooperative learning with young primary students is particularly relevant. Determining which cooperative learning techniques are beneficial for young students and what types of training students will need in order to practice these techniques effectively is one of the goals of this thesis. The benefits of the group investigation model of cooperative learning with grade-one students are investigated. Particular emphasis is placed on group processing as a training technique to develop student collaborative skills. It is hypothesized that, if group processing is effective in developing collaborative skills, then improved collaborative skills will enhance the achievement benefits of
This thesis also examines students' ability levels in relation to cooperative learning and individualized learning, in order to determine if these instructional methods are more or less beneficial for a particular ability group.
Before reviewing the nature of cooperative learning it is helpful to examine it in relation to other instructional methods generally employed in schools. The purpose of the first section of this chapter is to provide this contextual backdrop. Once this is accomplished five basic programs utilizing the cooperative learning model will be discussed and the results of research briefly summarized. This chapter closes with a delineation of the questions posed for investigation in this thesis.

Slavin (1983a) maintains that for all its diversity, there are essentially two elements that comprise educational settings: task structure and reward structure. Task structure refers to the activities and procedures in which students engage to learn curricula. Lectures, independent reading, seatwork, group discussions and tests are examples of different task structure. Marx and Walsh (1988) expand this definition of task structure to include not only the tasks themselves, but also the conditions under which the task is set, the cognitive plans students apply to the task and the products that evolve as a result of task related efforts.

The second element of the education setting is the reward or incentive structure. This denotes the means by
which students are motivated to complete the various tasks prescribed by the teacher. The most common means used to motivate students is the grading system. Whether students are graded on the curve or not, only a few students achieve high grades, so that traditionally there is competition among students for those few top grades. Verbal praise, calling upon students, and rewards such as stickers and other tangibles are also part of the reward structure.

If task structure and reward structure are distinguishing features of educational settings, there is still scope for considerable variety across the education spectrum. Many traditional instructional approaches, such as direct instruction and recitation, typically employ a task structure that is teacher dominated (Marx & Walsh, in press; Rosenshine & Stevens, 1986). Teachers design and implement a combination of lecture, discussion and seatwork activities, according to their perception of what is required in order to achieve lesson objectives. This type of system has been described as one in which student-teacher and student-materials interactions are encouraged (Johnson & Johnson 1975, 1987). The teacher is perceived as the primary source of knowledge and assistance in learning, second only to the text or curriculum materials.

The incentive structure is the ubiquitous grading system in which students compete for a limited number of
high grades. Of necessity, those who achieve high grades do so at the expense of their fellow students who do not achieve at the top of the scale.

In addition to student-teacher and student-materials types of interactions in the classroom there are student-student interactions. In most traditional instructional models student-student interactions are discouraged. Except for limited small group-activities and group discussions that are mediated by the teacher, student-student interactions are relegated to extra-curricular activities. In an instructional setting where student-student interactions are not a part of the instructional process, and where student-teacher interactions, student-materials interactions and a competitive reward structure are emphasized, a state of negative interdependence exists among the goal structures (Johnson & Johnson 1987). Negative interdependence results when students compete for instructional time, teacher attention and rewards. In a situation of negative interdependence there is of necessity a winner and a loser.

An alternative to negative goal interdependence is individualistic goal dependence. This is achieved when a framework of individualized incentives is in place. Here students are asked to work alone and complete an independent program at their own pace. They are marked according to a preset standard and compete only against themselves and work only with the curriculum materials and
the teacher. Each student's goals are independent of all other students and the reward structure is also independent. Bloom's mastery learning approach is an example of an instructional model with individualistic goal dependence (Bloom, 1981).

The task structures of the two instructional models described previously are similar. In both instances the teacher is the significant source of lesson plans, activities, assistance and knowledge. The interactions which are promoted are either those of student with materials (e.g., Mastery Learning) or a combination of student-materials and student-teacher (e.g., recitation). The basic difference lies in the reward structures. In the competitive structure students operate under negative reward interdependence while in the individualized structure an independent reward structure exists.

Cooperative Models of Instruction

There is, however, a third reward structure, positive reward interdependence. This is the opposite of competitive or negative reward interdependence. Positive reward interdependence operates when cooperative learning methods are employed. Before detailing the four basic types of cooperative learning methods most commonly used in educational settings, the nature of cooperative learning methods in general will be examined.

In cooperative learning situations there is a greater
degree of influence and interdependence between students than in either competitive or individualistic classroom structures. Cooperative learning methods capitalize on the positive effects of student-student interactions in a way foreign to many of the traditional models of instruction.

Traditional educational settings generally contain either a competitive or an individualistic learning situation where the task structures are teacher based and independent. The reward structures in these settings are negative independence and independent, respectively. Cooperative learning methods use a cooperative task structure in which students work in 2 to 6 member heterogeneous groups. They also implement cooperative incentive structures in which students earn academic rewards, recognition or grades based on the academic efforts of the group (Slavin, 1983a).

Cooperative learning methods utilize cooperative incentives and task structures to achieve performance goals and cohesiveness goals (Slavin, 1980). Performance goals relate to the products students produce on a given task. Cohesiveness goals are more social in nature and include enhancing self-esteem, race relations, group evaluation and so on.

While the core of cooperative learning procedures is cooperative incentives structures and cooperative task structures, there is some variation in the actual
application of these structures within the classroom setting. Four basic cooperative learning methods have been identified by Slavin (1980) and five by Sharon (1980b). These five methods are subsumed into two major categories: those based upon peer-tutoring and those operating on the strength of group investigations (Sharon 1980b).

Peer-Tutoring Based Cooperative Learning

The first peer-tutoring based approach to cooperative learning is called Teams-Games-Tournament (Devries & Slavin, 1978). Teams-Games-Tournament has three main components. Teams of 4 to 5 heterogeneously grouped students study together materials taught and assigned by the teacher. Students then quiz one another in preparation for the tournaments. The tournaments take place weekly and students from the home teams are matched against students of similar ability from other teams in the class. Each team member in the tournament scores points which are then brought back to the home team. Home teams then total their scores and home team standings are posted each week. The third component of Teams-Games-Tournament is the set of games played in the tournament. These consist of skill exercises based on the subjects studied by the teams that week. There is a basic set of rules, that governs the form of play. Thus Teams-Games-Tournament begins with a teacher presented lesson, followed by students tutoring each other in teams using
teacher based materials. These base teams are then sent out to play in the tournament in teams composed of students of like ability with whom they compete to earn points in the game format. When the game is finished, students return to their base team to total the team score. This score is then compared to other team scores and the results are posted or published in a class newsletter.

In Teams-Games-Tournaments the task structure is similar to the traditional classroom in that the teacher provides the subject and the materials to be learned. It differs in that students are required to work cooperatively to insure that each student is prepared thoroughly for the tournament. Reward dependency is high enough to encourage children to cooperate even though the task dependency is quite low.

The second peer-tutoring method, Student-Teams Achievement-Divisions, was developed by Devries, Edwards and Slavin (1980) as a variation of Teams-Games-Tournament. Students are assigned to heterogeneous groups of 4 or 5 members and the teacher presents the lessons and provides the materials for study. Fifteen-minute quizzes replace the tournament and games found in the Teams-Games Tournament approach. The quiz scores are converted to team points using a system called achievement divisions where each division is comprised of students of equal status in achievement and a student's score is compared
only the members of his ability division. The ability divisions are determined initially by the teacher's assessment of students' classroom work. Once the system is in operation individual scores influence students' standings in the ability divisions and based on their scores, students may move up or down in ability divisions. Points are assigned according to ranking within the division. The total points of the base team are published in the weekly newsletter. Once again, it is the reward structure that encourages students to cooperate and insure that each member of the team learns the materials.

The last peer-tutoring cooperative learning method is Jigsaw. The original Jigsaw also has heterogeneous groups of 5 to 6 students. Each student is given a unique piece of information to learn. Students from the base group then meet in separate expert groups to learn the materials. They then go back to their base group and are required to teach their groupmates what they have learned. Students are then tested on the entire set of materials and graded individually. Quiz scores are not used to make team scores as in Teams-Games-Tournament and Student-Teams Achievement-Divisions. This form of Jigsaw is very high in task interdependence and low in reward interdependence.

Slavin (1980) modified Jigsaw to form Jigsaw II. Jigsaw II has 5 to 6 member teams, but instead of each student being assigned a specific area to learn, all students read the same material. However, each student is
assigned a topic in which the student is to become an expert. Students meet in expert groups to learn the material and return to their base teams to teach their teammates. Students then take individual quizzes that are used to determine team scores. Team scores are formed by taking individual improvement scores and totalling them for each base team. Team scores are then published in a weekly newsletter. Jigsaw II has both a high degree of task interdependency and reward interdependency.

**Group Investigation Based Cooperative Learning**

The group investigation cooperative learning methods fall into two categories, those developed by Sharan and Sharan (1976) and those devised by Johnson and Johnson (1975). They differ significantly from the peer-tutoring models in that there is no competition or games involved. The other unique feature of group investigation style of cooperative learning is that students are trained in group strategies such as communication skills and conflict resolution. The role of the teacher also changes from that of arbitrary source of knowledge to one of facilitator and observer.

The group investigation model developed by Sharon and Sharon (1976) perhaps best exemplifies the differences between this model and peer-tutoring methods. Students are still grouped, but not necessarily by the teacher. Students may choose their own groups in many instances.
The emphasis is on group inquiry and discussion in which students gather data on topics which may or may not be chosen by the teacher. The teacher does not present the information as in the peer-tutoring styles of cooperative learning. Students are encouraged to seek their own sources, interpret information gathered, synthesize it and complete a group project to present to their classmates.

There is considerable variation in the amount of teacher imposed standards, directions and feedback given to the students. However, the group investigation method of cooperative learning has six fundamental steps (Sharan 1980b). The steps are as follows:

1) Students choose subtopics of the original topic which is chosen by the teacher. They then organize into heterogeneous groups of 2 to 6.

2) Students and teacher cooperatively plan precise learning experiences, tasks and goals for the subtopics.

3) Students carry out the plans initiated in Step 2 under the guidance of the teacher.

4) Students analyze and evaluate the information learned and determine how to summarize it for display or presentation.

5) The teacher coordinates the presentation of projects to allow students to achieve the broad perspective of the subject.

6) The final step is evaluation by the teacher and
the class. This may include individual or group assessments or a combination of the two.

Group investigation strategies are high in student autonomy and task interdependence. The degree of reward interdependence will vary with the type of assessment used by the teacher. The teacher may elect either individual or group-referenced assessment.

The group investigation method proposed by Sharan and Sharan (1976) requires training and preparation of the student groups before the six steps of the process can be implemented. They define a group using Gibb's (1969) definition which states that a group consists of interdependent individuals with mutual relatedness in their activities and a common goal. The small groups involved in the group investigation method coordinate their activities and work on mutually agreed upon goals. These groups are not static and are determined by student's interest in studying a particular topic or working on a particular project.

Effective and productive groups do not simply happen because students gravitate together through a mutual interest or friendship. Sharan and Sharan recognize that group cohesiveness and communication training are essential to the optimal functioning of small groups. They recognize four areas of training that have to be addressed before group investigation methods of learning can be implemented in the classroom. These four areas
are: a) reading and understanding instructions, b) distributing materials and tidying the work area, c) helping each other, and d) evaluating the group activity. Specific instruction that includes modelling, practice, and discussion is given to the students in each of these spheres before the group investigation method is implemented on a full scale. Exercises in communication skills, in particular listening and questioning techniques, are outlined by Sharan and Sharan (1976).

Johnson and Johnson (1975, 1986a, 1987) provide a structure for cooperative learning that has a greater degree of teacher input than that designed by Sharan and Sharan (1976). Although teachers still maintain the role of facilitator, they have considerably more control over instructional aspects such as topic, group composition, format of group activities, types of assignments for groups, assessment and the like. Reward interdependence, as well as, task interdependence is of prime importance. Training in group skills with the addition of group processing is also emphasized in Johnson's programs. The training in collaborative skills stressed by Johnson and Johnson (1985) is particularly relevant to the questions investigated in this thesis.

Johnson and Johnson (1987) list eight steps that encompass the teacher's role in teaching collaborative skills. Briefly, these steps include:

1) Ask students what skills they think they will need
in order to cooperate successfully.

2) Help the students get a clear understanding of what the skill is both conceptually and behaviorally.

3) Schedule practice sessions to learn the skills.

4) Provide feedback to each student on how well he/she is performing the skill.

5) Encourage students to persevere in practicing the skill.

6) Create situations in which skills can be used successfully.

7) Require skills to be used with enough frequency to become integrated into students' behavioral repertoires.

8) Establish classroom norms to support the use of the skills.

Within the framework of these eight steps Johnson and Johnson recommend teaching students fundamental skills of cooperative behavior: communication skills, trust enhancing skills, leadership skills and conflict resolution skills. Each of these domains will be examined briefly in order to clarify further Johnson and Johnson's methods.

Communication may be defined as the transmission and reception of information, knowledge, and feelings. There are essentially two aspects of communication between individuals, sending messages and receiving messages.
Johnson and Johnson (1987) maintain three elements are necessary in sending messages: clarity, specificity and congruency between verbal and nonverbal messages. When receiving messages it is important that the listener provide feedback that is not evaluative until a full understanding of the message is established. The fundamentals of receiving skills are paraphrasing, checking perceptions of feelings and determining the meaning of the message. Although acknowledging that these skills seem to be simple, Johnson and Johnson maintain that they are difficult to master, and are prerequisites for interacting effectively with others.

Building and maintaining trust is an element that has great influence on both communication and cooperation. Trust is essentially believing that a choice will lead to gains as opposed to losses in terms of the reactions of the person with whom you have placed your trust (Johnson & Johnson, 1987). Trust involves openness in sharing ideas, information and feelings, as well as acceptance of contributions made by others.

To build such a trusting environment, teachers should encourage students to contribute to the group. Further, they should model and train students in supportive social behavior. During training it is also desirable for teachers to monitor students working in cooperative groups and to provide feedback on their behavior. Sharan (1976), Johnson and Johnson (1987,
Kagan (1988) and Graves and Graves (1988) provide exercises and activities to develop a trustful environment.

Johnson and Johnson's views on the constituents of leadership are derived from the distributed-actions theory. Rather than one individual being in sole charge, any person can perform acts that allow the group to complete its task successfully and to maintain cohesive working relationships among its members. Such acts constitute leadership. Skill is required on the part of members to know when to act and to know what form action should take. In addition, students must learn when to accede to the leadership of a given member of the group.

If individuals do not agree with the statements or actions of other group members, controversy develops. Controversy can be constructive, if group members view it as a problem-solving situation and if they are critical of ideas, not the participants. It is also important to learn to take another point of view in order to understand someone else's frame of reference. Such actions enable group members to examine as many ideas, perspectives or solutions as possible in order to determine the best one rather than having one imposed upon the group by a strong or aggressive member. Without the necessary skills to debate issues and not personalities, without the ability to see other sides of an issue and without the desire to discuss ideas rationally, group discussions may degenerate into arguments and acrimony that depress a group's ability
to be effective.

All of the collaborative skills outlined are considered to be fundamental to effective and productive cooperative learning situations. Johnson and Johnson also emphatically maintain that an essential aspect of instruction in collaborative skills is group processing.

**Group processing.** A process is a recognizable sequence of events that takes place over time. Process goals or objectives refer to the set of events instrumental in attaining outcome goals (Johnson & Johnson, 1975, 1987; Yager et al. 1986). Group processing occurs when members of a group discuss and analyze how well their group is functioning and how they may improve the group's productivity. Group processing may be directed toward the social aspects of the group, that is, which actions of the group are helpful, and promote a climate conducive to constructive discussion. In such a case, the group would identify those actions that are not productive and make decisions regarding how to change or replace those behaviors.

Group processing may also be viewed with reference to the content of the learning assignment. It is possible to distinguish the content of the lesson from the process by which the discussion is being conducted. The content is what is discussed and the process is how the group members are interacting. The processing of group interactions includes examining such items as effective leadership,
communication skills, decision making, trust building and conflict resolution skills.

Johnson and Johnson (1982, 1987) propose two models of group processing. The first is the counselling model in which self-examination leads to insight which in turn results in increased effectiveness. In a group, the members examine the working of the group and identify strengths and weaknesses. The group then determines a course of action which capitalizes on strengths and eliminates future weaknesses.

Johnson and Johnson, (1987) and Yager et al. (1986) refer to the research of Sarason and Potter (1983) that examines the impact of individual self-monitoring on thoughts of self-efficacy and successful performance. They concluded that the more individuals are aware of what they are experiencing, the more conscious they will be of their control over their success. Applying this to group processing, the more a group is aware of what it is experiencing, the more conscious members will be of their role in determining group success.

The second model of group processing is the feedback model (Johnson, 1979). The goal of this model is to provide accurate and nonthreatening feedback about the procedures in which the group is engaging in order to achieve outcome goals. The feedback provides information that allows group members to improve their performance. Constructive feedback also reinforces students for
engaging in collaborative behaviors. The information and
the reinforcement elements of feedback are essential
aspects of group processing (Yager et al. 1986).

Just as collaborative skills must be taught, so too
must processing skills. The first step in enabling a
group to gain self-control over its task performance
processes and performance activities is to develop an
awareness of the factors influencing group processes and
group performances (Hackman & Morris, 1975). This is
synonymous with Graves and Graves' (1985) advocacy of
teaching cooperative independence. In order to do so, it
is necessary to teach students to identify the salient
aspects of their experiences and to analyze how these
factors contribute to the group's functioning.

As students are learning to recognize and to practice
the collaborative skills necessary for an effective group
learning situation, they should be simultaneously
developing expertise that will enable them to respond
adaptively to this newly acquired knowledge (Hackman &
Morris, 1975). Once they have identified and analyzed the
various elements contributing to their group's functioning
they must generalize from past to future experiences
(Graves & Graves, 1985) and set goals and behavioral
objectives (Johnson & Johnson, 1986b).

Johnson and Johnson (1986b) outline a set of
procedures for group processing. These include
establishing the collaborative skills which will be the
focus of group self-examination time; having an observer complete a checklist indicating when the specific collaborative skills were demonstrated and by whom; having the students evaluate their own performance of the collaborative skills in question; reporting the observer's information to the students; providing constructive feedback on their use of the collaborative skills; and finally, establishing goals for future performance of collaborative skills.

Initially the teacher will be the main source of process training, observations of group behavior and setting behavioral goals for the group to work towards. Gradually, however, as students acquire the necessary skills and understanding of the group processes responsibility will shift to them. This gradual shift from the outside intervention of the teacher to a more autonomous, internal locus of control is necessary if members of the group are to develop a sense of ownership and commitment to the group as a whole and to its endeavours (Hackman & Morris, 1975, Johnson & Johnson, 1985).

Cooperative Learning Research

With the description of the features of various cooperative learning instructional models now in place, the discussion turns to an examination of the empirical literature on the effects of cooperative learning. This
section begins with a broad overview of recent literature reviews in the general area. Following this, the discussion narrows somewhat in order to provide a more detailed description of studies which are particularly germane to the thesis. The aim of this latter section is to offer a backdrop to specific questions examined in the present investigation.

Research on cooperative learning has examined two areas: performance and cohesiveness (Slavin, 1980). Performance is viewed in terms of academic achievement, while cohesiveness outcomes refer to such variables as liking of others, race relations, self-esteem, attitude toward school and helping others. A number of authors (DeVries & Slavin 1978; Johnson et al., 1981; Sharan, 1980b; Slavin, 1980, 1983a, 1983b) have surveyed the literature on cooperative learning research and provide an overview of the findings in terms of both performance and cohesiveness effects.

Ten classroom experiments of Teams-Games-Tournaments were summarized by DeVries and Slavin (1978). The grade levels in these studies ranged from grade three to grade twelve, while the subjects taught included social studies, arithmetic, language arts and reading vocabulary. The length of cooperative learning interventions in the studies varied from a minimum of four weeks to a maximum of twelve weeks. The control groups in these studies were classes of comparable students in traditional
instructional settings (e.g., students in the same grade in similar school settings).

The results of nine out of ten of these comparative studies indicated a significantly greater gain in students' academic achievement in Teams-Games-Tournaments. DeVries and Slavin (1978) suggest that the team reward structure was a more important contributor to this effect than the peer tutoring component of this cooperative learning approach.

Cohesiveness factors evaluated in this survey of research include mutual concern, race relations, peer norms and attitudes toward school. Seven of the studies measured mutual concern. Of the seven, five studies showed an increase in mutual concern among students compared to traditional treatments. Race relations, defined as friendships among students of different races, were measured in four of the studies. Three of the four studies found an increase in cross-racial friendships compared to control groups. It is important to note here that friendship was determined by the number of friends of the opposite race that students named on a questionnaire. Work by Amir (1976) and DeVries, Edwards, & Slavin (1978) indicate that these findings refer to increased cross-racial friendships in school and that the effects may not generalize to contexts outside of the school setting.

Five studies examining peer norms, or the value students placed on performance in the classroom, yielded
inconsistent results. Three studies indicated positive effects as a result of Teams-Games-Tournaments, one found only marginally significant effects, while one reported no effect on peer norms. Efforts to measure attitudes toward school also produced inconsistent results. Of the eight studies examining this variable, only three had positive effects on attitudes toward school. DeVries (1978) concludes that Teams-Games-Tournaments had relatively consistent positive effects on academic achievement, mutual concern, race relations and peer norms.

A broader perspective of cooperative learning methods was examined by Slavin's (1980) survey of four major models of cooperative learning; Teams-Games-Tournaments, Student Teams-Achievement Divisions, Jigsaw and Small-Group Teaching. In this review, Slavin examined academic achievement, race relations and mutual concern among students in twenty-eight different studies. The subject areas included mathematics, language arts, reading vocabulary, social studies, science, spelling, English and geography over a range of grade levels from grade two to high school. All of the studies reviewed were field experiments conducted in classrooms. Selection of control groups within studies ranged from teachers who volunteered their classes, to those who were assigned to the project and were supplied with the same curriculum materials as the experimental group. The studies themselves varied widely.
in terms of design, measures, population and other features. Because of these variations direct comparison of these techniques is difficult.

The general results of Slavin's review suggest, however, that Teams-Games-Tournaments had fairly consistent positive results on student achievement, race relations and mutual concern. Slavin noted that the effects on achievement appeared to be due to the use of a cooperative reward structure, rather than the instructional effects of peer-tutoring.

In the six studies that focused on Student Teams-Achievement Divisions, Slavin concluded that similar positive results were shown for the effects of cooperative learning structures on academic achievement and race relations. The effects on mutual concern and self-esteem were not conclusive.

Only three studies of the Jigsaw method of cooperative learning were reviewed by Slavin. Positive effects of Jigsaw on academic achievement were found in only one of these studies and the effects on mutual concern and race relations were unclear. There were generally consistent positive effects on student self-esteem in the three studies.

One study of the Small-Group Teaching method of cooperative learning was assessed in terms of academic achievement. While no differences on recall of information or understanding type learning were measured,
there were positive effects on students' knowledge of high-level concepts such as identifying concepts, and the evaluation and analysis of problems.

The eleven remaining studies in Slavin's review were combined programs of cooperative learning or simply classed as other classroom studies. The results of these studies were mixed, with four indicating positive effects on academic achievement, two having positive effects on race relations and one having positive effects on mutual concern.

Slavin's overall conclusions were that cooperative learning had positive results on academic achievement, but these results were dependent on the particular techniques, settings, experimental designs and the rigour with which these experimental components were applied. The effect of student teams on race relations was consistent with Teams-Games-Tournaments and Student Teams-Achievement Divisions being the best established. The effects of cooperative learning techniques on students' mutual concern tended to be positive, but again this finding was not consistent across studies.

A third, comprehensive review of classroom research on the effectiveness of cooperative learning methods was conducted by Sharan (1980b). In his review, cooperative learning was divided into peer-tutoring and group-investigation. Fourteen studies investigated the peer-tutoring model, ten of which were also reviewed by
DeVries (1978), while one two-year field experiment, and six short term studies examined the group-investigation model. Participants in these studies ranged from grade one to grade twelve students, who were taught a variety of academic subjects. While in most instances a traditional whole-class method of instruction comprised the control group, in some studies, generally those involving Teams-Games-Tournament or Student Teams-Achievement Divisions, the control group was a modification of the cooperative techniques employed.

The peer-tutoring models of cooperative learning included Teams-Games-Tournaments, Student Teams-Achievement Divisions and Jigsaw. Overall, these instructional models produced positive effects on academic achievement. Students' mutual concern was enhanced in some studies, and unaffected in other studies. The overall results in terms of mutual concern were inconclusive. The effects of peer models of cooperative learning on race relations were generally positive. However, these cross-racial relations were assessed only in school settings and there is no indication whether improved cross-racial relations generalized to the community or remained within the school.

The group-investigation models of cooperative learning, in particular a two-year project involving small-group versus whole-class instruction (Sharan et al., 1980a), indicated high achievement gains on high-
level questions in the small-group instruction when compared to the whole-class. Five studies by Johnson and Johnson and their associates also found higher achievement results for cooperative as compared to competitive and individualistic learning methods on lower level skills such as drill (Johnson et al., 1976, 1978, 1979a, 1979b, 1981). The Johnson studies reported positive student gains on interpersonal liking, trust, acceptance and attitudes toward school and learning arising from cooperative learning.

The most extensive review of the literature on cooperative learning methods and their comparative effects over traditional or competitive methods was done by Johnson, Maruyama, Johnson, Nelson and Skon (1981). They reviewed 122 studies involving a range of students from elementary to adult. The years in which the studies were published extended from 1924 to 1980. The subject areas taught in these investigations included language arts, reading, mathematics, science, social studies psychology and physical education.

Using a number of meta-analytic techniques, Johnson et al. (1981) drew four conclusions regarding cooperative methods of learning. They conclude that cooperation, or positive reward dependency, is superior to competition, or negative reward dependency, and to individualized, or independent reward structures in promoting student achievement and productivity. They suggest further that
cooperation without intergroup competition, such as group investigation, promotes higher achievement and productivity than cooperation with intergroup competition, for example, Teams-Games-Tournaments. Finally, they report no significant difference between interpersonal competitive goal structures, such as grading on a curve, and individualized goal structures, such as individualized instruction on achievement and productivity.

Researchers (Cotton & Cook, 1982; McGlynn, 1982) have questioned some of Johnson et al.'s (1981) conclusions regarding inter-group competition and achievement results. Further, DeVries and Slavin (1978) conclude that Teams-Games-Tournaments had significant positive results on achievement. Slavin (1983a) also concludes that group competition increases the instructional effectiveness of cooperative learning by providing group rewards based on group members learning.

The meta-analysis procedures employed by Johnson et al. (1981) have been called to question by Cotton and Cook (1982). They suggest that the conclusion that cooperation is most effective for achievement and productivity is not wholly supported by the research reviewed. They further maintain that the review contained a large number of potentially flawed or inadequate studies. For example, they consider studies from pay journals or older studies to be not as reliable and accurate in both their execution and interpretation. Johnson and Johnson's failure to
discuss potential problems and weaknesses of some of the studies gives less credibility to the conclusions found in their review. For example, studies published prior to 1966 or after 1975, and articles from less reliable sources, tend to suggest that cooperation is more effective than competition. Studies from 1966 to 1975, or from better journals, do not find this effect. The Johnson team does not consider this information in their analysis of the data.

Another criticism of the meta-analysis is that Johnson et al. did not report all of the effects reported in the studies. They did not include interaction effects between reward systems and situational variables. Cotton and Cook view this as a significant oversight in view of research (Rosenbaum, 1980) that states task interdependence is critical in understanding the effects of reward systems.

Cotton and Cook reach conclusions that are somewhat different from those of the Johnson team. They conclude:

1. Neither cooperative nor competitive reward systems are necessarily superior in promoting productivity or achievement. Superiority of one reward system over another is determined by situational factors.

2. Neither cooperation nor individualistic rewards are necessarily better in promoting productivity or achievement. Again, superiority of a reward system depends on situational factors.

3. Pure cooperation has not been shown to be more effective than individual cooperation with group competition. Once again, situational factors appear to be involved.
4. Neither competition nor individualistic rewards are necessarily more effective in promoting greater productivity and achievement. Once more, superiority of a particular reward system appears to depend on situational factors. (p. 181)

Slavin (1983b) also notes that fewer than one third of the studies in the Johnson et al. meta-analysis had individual achievement as a dependent measure. The majority of the studies involved group productivity, not individual achievement. Therefore, the conclusions of the meta-analysis are influenced by the results of group productivity studies. Slavin goes on to argue that group productivity bears little resemblance to individual achievement. Yet in the meta-analysis study, Johnson and Johnson discuss achievement in terms of individuals while arriving at these conclusions utilizing studies based on group achievement. For these reasons the sweeping conclusions of Johnson et al. are questionable.

McGlynn (1982) argues that the significance of the Johnson et al. meta-analysis does not lie in the evidence it provides for the superiority of cooperative learning models of instruction on achievement and productivity. What the study does do is provide an analysis of the relationship between the mediating variables, such as the type of task, and the goal structures in each study. This in turn provides a focus for future research on conceptual variables.

Slavin (1983b) examined forty-six studies of
cooperative learning instructional methods to determine their effects on student achievement. Twenty-nine or 63% of the studies had positive effects on students' achievement. He also found support for the following conclusions: a) the use of group rewards and individual accountability consistently increase students' achievement over control methods; b) group study without the use of group rewards does not increase students' achievement more than control methods; and c) the use of task specialization and group rewards increases students' achievement.

Although Slavin (1983a) looked only at student achievement in the preceding review, he has also made an extensive study of the effects of cooperative learning procedures on cohesiveness elements, as well as, achievement. In reviewing a wide range of research studies with diverse age levels, subject areas, duration and experimental designs, Slavin concludes that cooperative learning methods have positive effects on cohesiveness elements such as race relations, self-esteem, and mainstreaming handicapped students.

Slavin (1983a) examined studies of the effects of cooperative learning on three areas of cohesiveness; intergroup relations, mainstreaming of academically handicapped students and self-esteem. He found strong positive effect of cooperative learning on intergroup relations. Similarly, integration of handicapped students
in cooperative learning situations had positive effects on peer relations and support, as well as, acceptance. All of the major cooperative learning methods were found to have positive effects on self-esteem in at least one study. Some studies also found peer norms favouring achievement were influenced positively, as were locus of control and time on-task.

It has been suggested (Slavin 1983a) that the non-cognitive outcomes of cooperative learning, such as race relations, self-esteem, mutual concern etc. are as important as academic outcomes of cooperative learning. It might be argued that, providing academic achievement is not hindered, the social benefits of cooperative learning structures are worthwhile in and of themselves.

Cooperative Learning with Primary Students

The majority of studies on the effects of cooperative learning methods on academic achievement and cohesiveness elements have been undertaken with subjects in the intermediate or high-school age range. Some research involving primary students has been done, however.

Johnson et al. (1980) examined the effect of cooperative, competitive, and individualistic conditions on first-grade students' problem solving performance. In the cooperative group, students worked in triads sharing materials and helping each other. In the competitive
setting, students were assigned to triads homogeneous in reading and arithmetic ability and instructed to compete for first, second and third place. In the individualistic setting students were instructed to work alone, do their best and were separated to minimize distractions. Fifteen students were assigned to the each of the three conditions with an equal percentage of high, medium and low ability students in each condition. Three levels of tasks were assigned; a) retrieval and categorizational problems, b) a spatial reasoning problem, and c) verbal problem-solving tasks. In addition to the academic tasks, all students were measured on their perception of peer support. All students received six instructional sessions of 60 minutes each.

The results of the study indicated that on three out of four task measures, students in the cooperative condition outperformed students in the competitive condition. On all four task measures students in the cooperative condition outperformed students in the individualistic condition. The cooperative condition also promoted greater perceptions of support and encouragement for achievement than did the competitive and individualistic conditions. This evidence supports the claim that cooperative learning methods increase problem-solving performance and perceptions of peer support when compared to competitive and individualistic instructional methods.
A study of cooperative peer interaction versus individual competition and individualistic efforts was conducted by Skon et al. (1981). Eighty-six grade one students were assigned with equal percentages of high, medium and low ability to one of three conditions: cooperative, competitive or individualistic. Subjects in the cooperative and competitive conditions were assigned to triads based on past academic performance. Half of the triads in both the cooperative and the competitive conditions were grouped homogeneously, while the other half were grouped heterogeneously according to ability. Students in the cooperative setting were instructed to complete one set of papers as a group, share materials and help each other. They were given feedback as a group. The competitive triads were instructed to compete for first, second and third places and to work alone. They were praised and rewarded individually. Students in the individualistic setting were separated to minimize interaction. They were instructed to work alone at their own pace, and were rewarded and praised individually. All subjects participated in three instructional sessions of forty-five minutes each. The three learning tasks included categorization and retrieval, metaphor paraphrase and explanation, and math story problems. Students were also measured on their perceptions of peer support.

The results of the study indicated that of the eight measures taken for the three learning tasks, cooperation
promoted higher achievement when compared to the competitive condition. When compared to the individualistic condition cooperative efforts attained higher achievement on seven of the eight measures. Students in the cooperative condition indicated that they perceived their peers to be more supportive than did the students in either of the other two conditions.

The Skon et al. (1981) study appears to further support the claim of Johnson et al. (1980) that cooperative peer interaction promotes higher achievement on problem solving tasks than does either competitive or individualistic learning settings.

The third study involving young students examined specific verbal interactions between students (Yager et al. 1985). In this study of 75 second-grade students, cooperative learning with structured verbal interactions was compared to both cooperative learning with unstructured verbal interactions and to individualized learning. In the structured interactions group, students were trained to summarize and explain the lesson, as well as, to listen and check the accuracy of the summary during the discussion portion of the lesson. Students in each cooperative group rotated these roles so that all students had equal opportunity to practice each role. In the unstructured verbal discussion groups, students were instructed to continue working and to discuss the assigned materials during the discussion section of the lesson. In
the individualized condition students were instructed to work independently. During the class discussion portion of the lesson these students participated in teacher-led discussions. All students in this study received thirty-six minutes of instruction for eighteen days on a district assigned map unit. Students were assessed individually on daily, unit and retention tests.

The results of the study showed that both cooperative learning conditions had higher achievement scores across ability levels than did the individualistic condition. The students in the structured oral discussion cooperation condition had higher achievement levels than the unstructured cooperative learning condition. These results support the claim that structured oral discussion in cooperative learning increases achievement and retention. The results also indicate that cooperative learning, with or without structured discussion, promotes higher achievement and retention than individualistic learning conditions within the sample used in this study.

A fourth study involving grade-one students compared achievement gains and group to individual transfer in cooperative and individualistic learning situations strategies (Gabbert et al. 1986). Students were assigned to the conditions so that equal percentages of high, medium and low ability students and equal percentages of boys and girls were included in both conditions. Students received 10 instructional sessions
of 40 to 50 minutes each involving learning tasks representing different levels of cognitive learning on Bloom's taxonomy (Bloom, 1956).

The results of the study showed that on all six of the learning tasks the cooperative learning condition outperformed the individualistic condition. Students in the cooperative learning condition used more higher level reasoning strategies than students in the individualistic condition. Students in the cooperative condition also perceived greater peer encouragement and support for achievement than did students in the individualistic condition. These results corroborate other research reviewed earlier in this chapter which indicates that cooperative learning conditions supported higher achievement than individualized conditions in grade-one and grade-two students.

These four studies have examined specific interactions and group procedures that affect cooperative learning outcomes. In addition to problem-solving strategies and structured versus unstructured oral interactions, there are numerous other internal dimensions that affect the outcomes of cooperative learning situations. One of these other factors is group processing. As has been discussed previously, group-investigation models of cooperative learning advocate group processing and perceive it as essential structure within the cooperative learning instructional setting.
The next section will survey research on some of the other characteristics of students in cooperative learning groups and how these factors affect group outcomes.

Ability and Achievement in Cooperative Settings

Questions have been raised in the literature regarding whether less able students benefit more from interaction with higher ability students, than higher ability students benefit from their interaction with their less able peers (Skon, Johnson, & Johnson, 1981). In an effort to determine whether cooperative learning is more or less beneficial for students of varying ability, research has examined the effects of cooperative learning on students of high, middle and low ability (Johnson, Skon, & Johnson, 1980; Webb, 1980; 1982; 1985; Yager, Johnson, & Johnson, 1985; 1986). Research in this area has been limited and much of the research focuses on the effects of student interactions, ability and achievement.

Webb (1982) investigated the effects of peer interactions, students' ability level and learning in cooperative small-groups. She based her study on Wittrock's (1974) model of generative learning. In this model, the learner generates associations between new information and concepts already learned. This model predicts a positive relationship between giving explanations and achievement because giving explanations
involves verbalizing associations between new and learned information and may involve generating new concepts and relationships. The generative model also leads to the prediction of a positive relationship between receiving explanations and achievement in cooperative learning.

In order to test this theory Webb had 77 students of high school age work on a 2 week mathematics unit. Students were assigned to either a mixed ability group consisting of one high, two middle and one low ability student, or a uniform ability group containing three or four students of middle ability. Results showed that students of middle ability who worked in uniform groups scored higher on achievement tests than their peers who were in mixed ability groups. In mixed ability groups the relationship between ability and achievement was positive. High ability students were high achievers, middle ability students were middle achievers and low ability students had the lowest achievement.

In an earlier study, Webb (1980) compared students working independently with those working in heterogeneous ability groups. In this study high-school students worked in either mixed ability groups of four or individually as they solved mathematical problems. In the individual settings high ability students achieved best and low ability students scored the poorest. When compared to the cooperative groups, high ability students did better working independently, middle ability students performed
the same individually as in cooperative groups and the low ability students in cooperative groups outperformed their peers who worked independently.

These two studies by Webb do not clarify the question of ability and achievement in cooperative learning settings, because the studies examine two different situations. In the first situation, middle ability students had higher achievement when working in homogeneous small group settings when compared to heterogeneous small group settings. In the second study, middle-ability students did equally well in heterogeneous small groups and independent situations. High-ability students in the same study benefited from independent settings and low-ability students benefited from heterogeneous small-group settings. Further research is necessary to compare the effects of independent, heterogeneous and homogeneous small group settings for ability groups.

Skon, Johnson & Johnson (1981) compared the effects of cooperative, competitive and individualized settings on general achievement and the acquisition of high-level cognitive reasoning strategies. The subjects were 86 grade-one children who were assigned to one of three conditions. In the cooperative setting students were distributed amongst triads either heterogeneously or homogeneously according to their ability level. In the competitive setting the triads were similarly mixed. The students in the individualized setting worked
independently.

On all achievement measures and irrespective of ability level, students in the cooperative and competitive groups out performed students in the individualized condition. Low and middle-ability students achieved higher in the cooperative setting than comparable students in the competitive setting. High-ability students achieved similar scores in both the cooperative and competitive settings with some variation depending on the task. In this study cooperative learning benefited both middle and low-ability students, while high-ability students in the cooperative learning setting had similar scores on most of the tasks to their peers in the competitive setting.

Of particular interest to Skon et al. was the fact that high-ability students benefited as much from interacting with middle and low-ability students as did their peers who interacted with other high-ability students. This fact, in conjunction with the other two studies where high ability students achieved comparable scores in competitive and cooperative settings, supports the use of cooperative learning techniques with high-ability students.

A fourth study compared cooperative and individualized learning situations while examining verbal interaction between high, middle and low ability students (Johnson et al., 1986). The subjects were 48 fourth-grade
students who participated in a social studies unit for 3 weeks. Half of the students were placed in a cooperative learning class structure and the other half in an independent class structure. The results of the study indicated that in the cooperative condition vocalizing was more important for achievement than listening to peers vocalize. In terms of achievement students in the cooperative condition tended to achieve at a higher level than did students in the individualized condition. Differences in achievement were greater for low-ability students when compared to their peers in the individualized condition. Middle-ability students tended to achieve higher in the cooperative condition than in the individualized condition. High-ability students had similar achievement scores in both conditions. This result coincides with the Skon et al. (1981) findings for high-ability students.

One difficulty encountered when reviewing this research is the diverse nature of the instructional variables employed in the studies. Cooperative learning in homogeneous and heterogeneous groups is compared to independent and competitive settings in a number of combinations. This leads to problems when attempting to relate similar findings in the research since they have generally compared different variables. The trend in the research examined in this chapter supports the claim that cooperative learning benefits low-ability students. The
issue is less clear for middle and high-ability students. Given this lack of clarity, further research on the benefits of cooperative learning for middle and high-ability students is needed. This is one of the questions investigated in the present study.

Group Processing and Student-Interactions

Much of the research reviewed in the preceding pages has been concerned with the products of cooperative learning. The general consensus of this research appears to be that these outcomes, academic achievement, race relations, mutual concern, and self-esteem, have been produced by cooperative learning instruction. It is clear that in addition to the products of cooperative learning, the processes, or what it is that occurs within cooperative groups that makes them effective learning situations, must also be examined. The nature of student interactions in cooperative learning groups has been a focus of some researchers.

Student interactions that are supportive and accepting have been found to influence educational aspirations and achievement (Johnson, 1982; Johnson et al., 1986; & Webb, 1980; 1982a; 1982b). Research in such diverse areas as conflict resolution (Smith, Johnson & Johnson, 1981), questioning, listening and speaking strategies (Cosgrove & Patterson, 1977; 1978; Patterson & Massad 1980; Skon et al., 1981; & Yager et al., 1985) and
metacognitive and elaborative activities (Larson et al., 1985) supports the claim that training in communication skills results in improved academic achievement. The question of whether training in these group processing skills is a useful adjunct to cooperative learning, however, remains largely untested (Yager et al., 1986).

Educators working with the peer-tutoring model of cooperative learning have placed little emphasis on the subject of student interactions, communication skills or group processing. Based on the results of a survey of studies on peer-tutoring methods of cooperative learning, Slavin (1980), concluded that training in group processing skills was not a useful addition to the cooperative learning model. However, in later work he concedes that training in group interaction skills is one of the unresolved issues in cooperative learning research. Other experts in the field of cooperative learning (Graves & Graves, 1988; Johnson & Johnson, 1975, 1982; Johnson et al. 1984; Kagan, 1988; Sharan, 1980; Sharan & Sharan 1976; 1988) write of the necessity for group processing in order to maximize cooperative learning results. The issue of whether group processing is required for successful outcomes of cooperative learning appears to be split between those who advocate peer-based models (Aronson et al., 1978; DeVries & Slavin, 1978; Slavin, 1978) and those who emphasize group investigation models.

Research on the direct effects of group processing
on academic achievement is limited at this time. Yager et al., (1986) have conducted the only empirical investigation of the utility of group process training. In this study eighty-four third grade students were assigned to one of three conditions: cooperative learning with group processing, cooperative learning only and an individual instruction condition. The independent variables were the above three conditions and ability level of students. The dependent variable was student achievement. All students received the same amount of instructional time on a transportation unit. A pretest, midterm, posttest and retention test were administered. The results indicated higher levels of achievement for high, middle and low-ability students in the cooperative learning which was augmented by group processing, when compared to the other two conditions. The cooperative learning only group had higher levels of achievement than the individual instruction condition. The mean scores on achievement measures for the experimental and control group in this study are presented in Table 1.

This study provides some evidence that cooperative learning with group processing has a positive effect on student achievement. This result adds support to the claims made by proponents of a group investigation model of cooperative learning that group processing is a necessary and vital element of cooperative learning instruction.
TABLE 1

Achievement Reported by Yager et al.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Retention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperation with processing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>29.67</td>
<td>48.00</td>
<td>45.33</td>
</tr>
<tr>
<td>Middle</td>
<td>26.20</td>
<td>43.00</td>
<td>44.20</td>
</tr>
<tr>
<td>Low</td>
<td>21.56</td>
<td>39.78</td>
<td>41.10</td>
</tr>
<tr>
<td>Cooperation with no processing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>28.22</td>
<td>43.56</td>
<td>39.67</td>
</tr>
<tr>
<td>Middle</td>
<td>25.40</td>
<td>38.10</td>
<td>37.60</td>
</tr>
<tr>
<td>Low</td>
<td>21.11</td>
<td>34.89</td>
<td>32.78</td>
</tr>
<tr>
<td>Individualistic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>29.11</td>
<td>40.56</td>
<td>37.22</td>
</tr>
<tr>
<td>Middle</td>
<td>24.60</td>
<td>31.90</td>
<td>28.50</td>
</tr>
<tr>
<td>Low</td>
<td>19.67</td>
<td>24.89</td>
<td>21.67</td>
</tr>
</tbody>
</table>
The Yager et al., (1986) study had three omissions that hindered the precise replication of the research design and the comparison of the resulting data. The lack of the exact title and publication information concerning the unit taught made it impossible to replicate the subject matter in the new research. The failure to include the names or types of standardized tests that were used to determine the ability levels of students also complicated matters. The report of the research indicated that three training sessions were given to each condition, but the nature and design of that training was not specified. This lack of clarity made it difficult to duplicate the type of cooperative instruction and processing necessary to the study. Complete analysis of the data in the Yager et al. study and comparison with the new research results was not possible since the standard deviations of the mean scores on achievement measures were not included in the Yager et al., (1986) research data.

The deficiencies in the Yager et al., (1986) study do not place the study's results in question. Clearly, however, one study is not in anyway conclusive support for the benefits of group processing, and as such further research on this issue is warranted. This is the major focus of the present study.
Weaknesses in the Extant Literature

While the present survey of the literature on cooperative learning is by no means complete, it does indicate a number of areas requiring further research or clarification. Perhaps the most salient point evident from the research is the lack of studies replicating other research. A wide range of research on various types of cooperative learning in diverse subject areas with a variety of populations is available, but replication of any research was not found. This lack of replication not only fails to provide substantial support for research findings, but also makes it difficult to determine which form of cooperative learning is optimum for which subject or age level of students. The widely varying studies complicate reviewing and comparing results from study to study and from technique to technique (Slavin, 1980).

Research in the areas of Teams Games Tournaments, Student Achievement Divisions and other peer tutoring based cooperative learning methods make it clear how lessons are structured and what the sequence of activities is for each method. A number of group investigation models of cooperative learning described in the literature (Johnson, Skon, & Johnson, 1980; Johnson et al., 1981; Johnson et al., 1986; Skon, Johnson, & Johnson, 1981; & Yager et al., 1985) fail to provide detailed descriptions of precisely what techniques of cooperative learning were used and how they were structured during the lessons. This lack of
clarity not only makes replication of studies difficult, but also the task of determining exactly what was successful in increasing learning outcomes. Given the diversity and range of group investigative cooperative learning techniques available for classroom use, it is essential that researchers be specific when detailing the particular strategies used. Much of the research in group investigation types of cooperative learning is neither detailed nor precise in its delineation of the methodologies and procedures used.

Researchers in both peer tutoring and group investigative models of cooperative learning have also frequently been lax in their reporting and structuring of control group instructional formats. Measurement of achievement is always difficult (Slavin (1980) and it is important that content and rate of progress in experimental and control groups be held constant. If instructors of control groups are simply given the materials and instructed to teach it without careful attention to the length and content of instruction it is not surprising that students in cooperative learning settings achieve higher on achievement measures. Something as simple as time on task relating to the content may become the critical variable for achievement if the control group is not receiving equivalent instructional time with the same content as the cooperative learning group.

A final weakness in the research, particularly that
done by Johnson and Johnson and their associates, is the fact that they seem to obtain the research results that best suit their purposes as consultants on cooperative learning. Other researchers such as Slavin (1980) and Sharan (1980) acknowledge that not all of the research available has determined that cooperative learning methods result in higher achievement gains than other forms of instruction. Slavin (1983b) in fact noted that only 63% of the studies he reviewed found cooperative learning instruction had positive effects on student achievement, while 33% found no differences and 4% found significantly higher achievement for the control group. It is perhaps wise to consider not only the rigor with which a study has been conducted and the clarity that has been employed in reporting it, but also the reason behind the research and the possible motivation of the researchers.

The bulk of the research reviewed for this study has supported claims that cooperative learning has a positive effect on achievement when compared to control groups employing individualized instruction. It is important, however, not to lose sight of either the quality or the quantity of the research done to date. While undoubtedly in most instances experimenter integrity and high standards of experimental design, execution and reporting have been maintained, it is also apparent that there is room for improvement in a number of areas concerning cooperative instruction research. The present
study, in attempting to replicate such research, found such weaknesses as lack of replication, incomplete descriptions of the types of cooperative learning employed, a concern that consultants may be biased in their approach to research and need for stricter monitoring of control groups.

Questions Investigated in the Study

Three questions are raised in this thesis. Because research to date has tended to focus on older students of intermediate, high school or university age, there is a lack of research concerning the relative effects of cooperative learning and individual instruction on young primary students. The first question investigated is whether or not cooperative learning methods of instruction result in higher academic achievement than individualized methods of instruction with grade-one students.

This thesis also examines whether or not there are differential effects on the academic learning of high, medium and low ability primary students when cooperative learning instructional settings results are compared to individualized instructional settings results. Since research specifically related to primary children is limited in general, investigation of the interactions between student ability and cooperative learning outcomes is warranted.

The final question examined in this thesis regards the effects of group processing on achievement in
cooperative learning settings. Does group processing, in combination with cooperative learning, result in higher academic achievement when compared to cooperative learning instruction without processing and to individualized instruction? Proponents of the group investigation models of cooperative learning confirm that group processing is critical to the effective operation of cooperative learning groups. Webb (1985) in a summary of research on cooperative learning and peer interactions, concluded that student interaction is important to achievement in small groups. She suggests training students in interaction strategies to maximize student achievement in cooperative learning settings. Such training is an important component of group processing. Research in this particular area of training is limited to Yager et al. (1986). Therefore, further investigation is necessary before any definitive statements on the benefits of group processing can be made.
CHAPTER III

METHOD

Participants and Setting

Seventy-one full-time grade-one students from three classes of a suburban elementary school were recruited for the study. A letter of information and consent was sent to the parents or guardians of prospective participants (see Appendix A). Participation in the study was voluntary and all of the parents consented to having their children participate. Consent was also obtained from both the school's principal and the individual classroom teachers.

Data from seven of the students were excluded from the study. One student moved out of the school, two students went on holidays and missed three weeks of lessons, and two students missed lessons due to illness. A sixth student's data were excluded due to speech and language deficiencies which interfered with her academic functioning in the classroom.

The final sample was composed of 64 students, 38 boys and 26 girls. The mean age for the entire sample was 6.62 years.

Students were placed in classes prior to the research commencing; therefore, each class was assigned randomly to one of three experimental conditions: (a) cooperative
learning with processing condition, (b) cooperative learning only condition, and (c) individualized instruction condition. All three instructional conditions were taught by the researcher.

The 22 students assigned to cooperative learning with processing consisted of 11 boys and 11 girls. Their mean age was 6.59 years. Students were placed in cooperative learning groups of four based on their WISC-R Vocabulary score and the classroom teacher's assessment of their academic ability. As close as possible, all groups were balanced proportionately in terms of gender and ability, with one student of high ability, one of low and two of average ability placed in the groups.

Condition Two, cooperative learning only, totalled 21 students, 8 girls and 13 boys with a mean age of 6.69 years. As with the first condition students were placed in cooperative learning groups of four based on their score on the WISC-R Vocabulary Subtest and their teacher's assessment of their ability level. Again, a balance of boys and girls, as well as, ability levels was attempted when establishing the cooperative groups in this condition.

Condition Three, individualized instruction consisted of 14 boys and 7 girls, totalling 21 students. Their mean age was 6.60 years. Rather than being grouped, this condition placed the students in rows in separate desks for each lesson.
Instructional Materials and Dependent Measures

The unit of instruction was based on a Science unit entitled SEEDS: The Energy and Literacy Series 1. This material was chosen for two reasons: (a) it provided a comprehensive, district-approved set of materials, and (b) the topic was one that the students had not been taught previously in any of their classes.

The unit itself consisted of a Teacher's Guide to the twenty lessons, supplemented by Student Activity Sheets and two filmstrips with cassettes. The unit was augmented by teacher-made charts, games and library books. The content and presentation of the lessons were modified to accommodate cooperative learning teaching methods as well as recitation teaching methods.

Measures and Procedures

Before initial instruction began, a pretest was devised and tested. A first draft of the pretest was written and administered to the grade-two class in the school by the classroom teacher. Both the grade-two students' and the teacher's comments on the clarity of the questions, format, presentation and content were taken under consideration when the second draft was written. The grade-seven students administered this test as a part of their training for working with the grade-one students. Upon completion of the test the students' and the teacher's
comments were considered when the third and final draft of the test was written (see Appendix B).

Prior to the commencement of instruction the revised test was administered individually by the grade-seven students. This and all subsequent tests were orally administered in order to reduce any effects of student reading levels on test results. The tests consisted of multiple-choice questions, a labeling question and essay questions. Grade-seven students were trained to administer the tests to the grade-one students and to record the answers on test sheets. They were instructed to not provide feedback to students during test administration.

All students were given the WISC-R Vocabulary Subtest (Wechsler, 1974) to provide a baseline estimate of ability for participants. Parent volunteers were trained to administer and record students' responses to this test. The tests was scored under the supervision of a registered psychologist.

In addition, the Gates-MacGinitie Reading Test scores for the Vocabulary, Comprehension and Total test were recorded for each student.

Instructional Procedures

Subsequent to the pretest, lessons on the Science unit began. Students received 35 minutes of instruction,
four days per week, Monday through Thursday, for six weeks. An additional five minutes at the end of the cooperative learning with processing condition, consisted of the processing of the lesson (e.g. a teacher lead discussion of cooperative behaviors practiced or a processing sheet completed by individual students). In the two other conditions, those five minutes were spent returning desks to regular positions, hearing a story, silently reading a library book or playing a game. In this way, each condition received equivalent instructional time.

Cooperative Learning. Procedures employed in both cooperative learning conditions followed closely the recommendations of Johnson and Johnson (1986), Kagan (1988) and Graves and Graves (1988). Because the students were learning cooperative skills as well as content, the number of cooperative learning strategies employed was limited to team building strategies, Johnson and Johnson's (1975) structuring activities and four of Kagan's (1988) practice structures.

Johnson and Johnson's method of structuring activities based on role, goal, task and material dependency were used. For example, in Lesson 1, both cooperative learning conditions had one banner per group, one crayon per child and a common goal to complete the team banner. Everyone was required to participate, and group consensus was necessary before designing the banners. Similar conditions
were employed when a poster and a mural were made by each cooperative learning group in Lessons 8, 12 and 15 (see Appendix B). Elements of role, materials and task dependency were also used when partners completed Activity Sheets in Lesson 4 and planted seeds in Lesson 6. For example, in Lesson 6, the task required each group to plant two bean seeds in one of four possible growing conditions. There was one pot and two seeds per group, thus establishing materials dependency. The roles were those of direction checker, soil collector, seed planter and waterer of the seeds.

Kagan's (1988) team building structures, such as choosing team names, designing team banners, and cooperative games such as Beanbag or Team Juggling were employed to build team identity, synergy and mutual support and appreciation. Brainstorming was also incorporated into lessons. Brainstorming occurred in the cooperative groups and in teacher-led whole-group discussions.

Four of Kagan's (1988) practice structures were chosen. This version of Roundtable was used in Lessons 7, 22, 14 and 16. One pencil and one worksheet was given to each group. The student with the worksheet read out the first question, the group discussed it and determined the answer. The student with the worksheet recorded the group's answer and passed the paper and pencil to the next person in the group. This process was repeated until the worksheet was complete. The Roundrobin version used in
Lesson 3 was the same except that the responses were verbal, not written.

The second practice structure was Pairs Check (Kagan, 1988). This was used in Lessons 1 and 13. Cooperative teams were divided into two sets of pairs. One partner was to do the first problem while the second acted as a coach. When both agreed on the answer they switched roles. Upon completion of the second question the two sets of pairs compared answers and made necessary corrections. This switch of role and checking with the other pair continued until the worksheet was completed. Pairs Check builds in the necessary discussion and justification of answers that encourages higher level thinking and reinforcement of knowledge.

The third strategy, Think-Pair-Share (Kagan 1988) promotes student participation, as well as, providing an opportunity for students to think about and rehearse their response to a given question before sharing it with the entire class. Four steps are involved: (a) students listen to the question, (b) students think about their response, (c) students discuss their response with a partner and (d) students share their response with the group or the whole class. Lessons 2, 7, 15 and 17 utilized this strategy.

Kagan's (1988) strategy of Numbered Heads was used in numerous lessons. The students numbered off from one to four and kept this number throughout the unit. After the
teacher posed a question students put their heads together and discussed the answer. All members were responsible for ensuring that everyone knew and agreed to the answer. The teacher then called on ones, or threes etc. to respond to the question. This strategy facilitates participation, discussion and dependency among group members.

The Numbered Heads technique was also used to assign students to partners ie. one and four, two and three for one lesson with numbers rotated for the next lesson. This ensured that students got to know and work with several people on a one to one basis.

Two team-building activities from Graves and Graves (1988) were also used during the instructional unit. Squeeze is a simple game in which a team strives to place as many objects on a circle or set shape as they possibly can without touching or moving any other pieces on the board. As soon as a piece is touched or moved the game is over and the team score is the total number of pieces placed on the board. The game is repeated and each time the team attempts to improve upon their last score. No one individual wins or losses as it is the team score that counts. The score is only improved when the team cooperates and encourages each other to place the pieces carefully and strategically.

The second activity taken from Graves and Graves (1988) was Broken Circles. This is a simple, non-verbal group problem-solving and team-building exercise. It is
designed to illustrate that in a cooperative team no one can "win" until everyone wins. To be successful each team member must be sensitive to the needs of others on their team and everyone must be prepared to put aside their own concerns in order to assist their fellow team-mates.

The game is quite simple. Each person receives an envelope with a set of pieces inside. These pieces do not fit together to complete a circle, which is the object of the exercise. In order to complete their own circle team members must share their pieces with others on the team. However, pieces cannot be requested or taken, only given. Once all of the teams have completed all of their circles, a group discussion, lead by the teacher occurs. The purpose of the discussion is to help participants identify some of the more important things that happened, to analyze why they happened and to generalize to other group learning situations. Broken Circles was not played during the unit lessons, but was conducted by the classroom teachers in the cooperative learning conditions. This was done because the tight schedule of the unit allowed no time for it during the lessons. It was also considered advantageous for a trusted and known person to be the group leader during the discussion time.

Cooperative Learning with Group Processing. Students in the cooperative learning with group processing condition engaged in discussion about group functioning during the last five minutes of each lesson. These
processing sessions took one of two forms. Initially, because the students were unfamiliar with the procedures and lacked the skills to process effectively, the researcher lead the processing discussions. These were whole-class discussions in which the teacher directed the discussion with questions designed to encourage the students to focus on behaviors that were being observed in each lesson (e.g. use of quiet voices, taking turns, listening to the speaker, praising etc.).

Students were also encouraged to analyze their own behavior during the lessons. Students were asked to set either group or individual goals for the next lesson at the end of each lesson. These behavior goals were generally taken from the class chart listing behaviors that help a group to function well. These behaviors included such things as being quiet, talking about the task, working together and taking turns. The group goals were recorded on the chalkboard by the teacher and reviewed at the beginning of each lesson in an effort to focus students' attention on their own behavior and its effect on group work. Processing sheets (see appendix B) were filled out at the end of every second lesson to encourage group and self-analysis and to permit the teacher to note students' attitudes towards, and perceptions of, the cooperative process.

As students became more proficient at discussing their behavior and goals, team processing occurred
spontaneously more and more often with the teacher merely observing the groups' processing and collecting the processing sheets. Group discussions were continued, although at a reduced rate of one per week by the end of the unit. Observation sheets were maintained by the researcher throughout the lessons and these results were shared with students.

**Individualized Instruction.** Students in the individualized learning condition were instructed using recitation methods and independent seatwork (Gage and Berlinger 1984). These methods comprised the teacher structuring the lesson, providing information, soliciting responses and the teacher reacting to the students' responses. The content of the lessons was identical to the cooperative conditions, but the format and manner of presentation was changed to meet the requirements of the recitation teaching. As with the cooperative conditions, students in this condition created a class chart of rules suitable for that learning environment. Quietness, listening to the teacher, working alone on assignments and directing all questions to the teacher were emphasized.

These rules were reviewed at the beginning of each class. Students were praised individually for their ability to adhere to the rules and for their individual effort on assignments.

Following the review of the class rules, the teacher structured the lesson by stating what was to be
taught that day. The content of the lesson was presented by a lecture, reading a story, using a chart, or a teacher-led class discussion. During discussions the teacher posed a question, required one student to respond to the question and then the teacher reacted to the student's response. Interaction between students was discouraged both during discussion periods and seatwork time.

Individual seatwork generally followed the presentation of the content of the lesson. Worksheets to be completed independently were the main source of seatwork. During this time the teacher circulated and praised individual students for their behavior and their work. Students were discouraged from seeking help from each other during seatwork time and were repeatedly directed to the teacher for all of their questions.

Midtest and Posttest Procedures

All three conditions wrote the same test three weeks through the unit. This test (see Appendix B) was designed by the researcher and administered by grade seven pupils. All children were tested in the morning rather than during the instructional time in the afternoon. This was true for all of the tests including the pretest, midterm, posttest and retention test. This was done to allow time for all twenty-four lessons of the unit to be completed, as well as, to accommodate the grade-seven students during
their instructional time. The posttest was administered in lieu of a lesson on the last day before Spring Break. The pretest, posttest and part of the retention test (see Appendix B) were identical in order to maintain the same level of difficulty throughout testing. All of the tests consisted of a series of multiple choice questions, a question requiring the labelling of the parts of a plant and an essay question describing the function of the water cycle.

The retention test was administered three weeks after the posttest. The test was administered at the same time of day as the previous tests and by the same grade seven students. The retention test had two additional pages, referred to as the generalization test, in an effort to overcome the possibility of students remembering the test from prior experiences with it.

These two pages consisted of multiple choice questions similar in content to the pretest and posttest questions, and a second essay question. This question was designed to test the student's overall understanding of the unit. It required an assimilation of all of the facts taught to date about the water cycle, food chains, energy sources and recycling in an effort to explain what earth would be like without the sun and why it would by this way.
CHAPTER IV

RESULTS

The results of this study are discussed in three sections. The first section reports descriptive statistics for the sample. The second section describes pretest posttest comparisons for the sample. The final section assesses group differences on all five dependent measures.

PRELIMINARY ANALYSIS

The mean age in years for the entire sample was 6.62. Group One, the cooperative learning with processing condition, had a mean age of 6.59 years. Group Two, cooperative learning only had a mean age of 6.69 and Group Three, individualized learning, had a mean age of 6.60 years.

In the overall sample of 64 subjects, the proportion of males and females was 38 and 26 respectively. Group One, cooperative learning with processing, had 11 males and 11 females. In Group Two, cooperative learning only, the sample contained 13 boys and 8 girls for a total of 21 subjects. Group Three, individualized learning, had a total of 21 subjects, of which 14 were boys and 7 were girls.

Two measures were administered to determine the level of ability of each student in the sample. The first
measure, the WISC-R Vocabulary Subtest (Wechsler, 1975), had a mean score of 11.5 with a standard deviation of 2.85 for the entire sample. The cooperative learning with processing group, had a mean score of 10.3 with a standard deviation of 2.95 on the Vocabulary test. Group Two, cooperative learning only, had a mean score of 12.1 and a standard deviation of 3.10 on the Vocabulary test. The mean of the Vocabulary test results for Group Three, individualized learning, was 12.8 with a standard deviation of 1.83. A one-way analysis of variance was performed on WISC-R Vocabulary scores. This analysis revealed statistically reliable differences between the three groups \( F(2, 60) = 4.7; p < .01 \).

This difference in ability level between the groups was not born out on a second measure of achievement, the Gates MacGinitie Reading Test. A one-way analysis of variance on the Gates-MacGinitie Reading Scores revealed no statistically reliable differences among the three groups \( F(2, 60) = .69, p > .05 \). These results indicate that the groups were equivalent in reading achievement at the beginning of the instructional unit. Means and standard deviations for the test are presented in Table 2.

The accuracy of the WISC-R Vocabulary scores was questioned for a number of reasons. The Vocabulary scores are very high, much higher than would be expected for a group of heterogeneously grouped students. Conversely, the Gates means are normatively average and as such are much
closer to the expected performance of children in the sample.

A second difficulty with the WISC-R Vocabulary scores is that the scoring and administration of the test requires skilled examiners. In the study, only limited training of the test administrators was possible; hence, the unexpectedly high performances of students may be a function of inexperienced examiners, and thus not a valid reflection of the children's ability.

Finally, in other studies (Yager et al., 1986) achievement tests have usually been used as indicators of student ability. Since part of the task of this thesis is to replicate previous findings regarding the interaction of student ability and cooperative learning, it is advisable to use a measure adopted in previous studies. For these reasons the Vocabulary scores were not included in subsequent analyses of the results of this study and reading achievement scores were used as a proxy for ability.

The reliability of the multiple-choice tests used as part of the pretest, posttest and retention measures was estimated using Cronbach's alpha. Cronbach's statistic is a lower-bound estimate of the true reliability of a test. The alphas from this test ranged from .34 to .53. The complete data for these reliability estimates are found in Table 3.
TABLE 2

Means and Standard Deviations for Experimental Groups on the Gates MacGinitie Test

<table>
<thead>
<tr>
<th>Experimental Conditions</th>
<th>Total (n = 64)</th>
<th>1 (n = 22)</th>
<th>2 (n = 21)</th>
<th>3 (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>SD</td>
<td>SD</td>
<td>SD</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>50.09</td>
<td>49.50</td>
<td>49.05</td>
<td>51.85</td>
<td></td>
</tr>
<tr>
<td>(11.1)</td>
<td>(12.6)</td>
<td>(7.6)</td>
<td>(12.66)</td>
<td></td>
</tr>
</tbody>
</table>

Note. 1 is the Cooperative Learning with Processing Group. 2 is the Cooperative Only Group. 3 is the Individualized Group.
The reliability estimates for the multiple-choice tests are consistently low. For this reason, other measures of achievement, a number of free response questions, were combined with the multiple-choice tests to yield an aggregate measure of achievement. This aggregate measure included 17 multiple-choice questions, a five mark item which required students to label parts of a plant, and a three mark essay item which required students to explain the water cycle. The total possible score for this aggregate measure was 25.

A correlation matrix on aggregate achievement measures was done as part of preliminary analyses. This matrix is contained in Appendix D.

The measures used in the pretest and the posttest were the same in order to enhance the detection of group differences. The maximum possible score on the pretest was 25, and the mean score for the entire sample was 12.29 with a standard deviation of 3.14. For the posttest, also out of 25, the mean score for the entire sample was 20.45 with a standard deviation of 2.60. Means and standard deviations for the pretest and posttest measures are presented in Table 4.

In order to examine whether learning had occurred in each of the three instructional groups, a series of t-tests for dependent observations was conducted on pretest and posttest total scores. Students in group one made statistically reliable gains from pretest ($m = 11.59$) to
<table>
<thead>
<tr>
<th>Achievement Measure</th>
<th>Alpha</th>
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</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>.34</td>
</tr>
<tr>
<td>Posttest</td>
<td>.58</td>
</tr>
<tr>
<td>Retention Test</td>
<td>.43</td>
</tr>
<tr>
<td>Generalization Test</td>
<td>.53</td>
</tr>
</tbody>
</table>
### TABLE 4

Means and Standard Deviations for Groups on the Pretest and Posttest

<table>
<thead>
<tr>
<th>Experimental Conditions</th>
<th>1 (n = 22)</th>
<th>2 (n = 21)</th>
<th>3 (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Pretest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>7.8 (2.28)</td>
<td>8.95 (2.06)</td>
<td>8.38 (2.13)</td>
</tr>
<tr>
<td>P</td>
<td>3.3 (1.58)</td>
<td>3.3 (1.31)</td>
<td>3.7 (0.96)</td>
</tr>
<tr>
<td>E</td>
<td>.45 (.74)</td>
<td>.14 (.36)</td>
<td>.81 (.98)</td>
</tr>
<tr>
<td>Total</td>
<td>11.59 (3.25)</td>
<td>12.43 (2.83)</td>
<td>12.90 (3.32)</td>
</tr>
<tr>
<td>Posttest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>12.9 (2.26)</td>
<td>13.7 (1.65)</td>
<td>14.2 (2.73)</td>
</tr>
<tr>
<td>P</td>
<td>4.9 (.29)</td>
<td>4.86 (.36)</td>
<td>4.9 (.39)</td>
</tr>
<tr>
<td>E</td>
<td>2.0 (.78)</td>
<td>2.0 (.92)</td>
<td>1.76 (.77)</td>
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<tr>
<td>Total</td>
<td>19.86 (2.59)</td>
<td>20.62 (1.80)</td>
<td>20.90 (3.24)</td>
</tr>
</tbody>
</table>

Note. 1 is the Cooperative Learning with Processing Group.  
2 is the Cooperative Learning Only Group.  
3 is the Individualized Group.  
MC is Multiple Choice questions = 17.  
P is the plant question = 5.  
E is the Essay question = 3  
Total = 25.
posttest \((m = 19.8), (t = -11.42; p < .01)\). Statistically reliable changes were present for group two, cooperative learning only, from pretest \((m = 12.42)\) to posttest \((m = 20.61), (t = -15.92; p < .01)\). Group three, individualized instruction, also achieved statistically reliable gains from pretest \((m = 12.90)\) to posttest \((m = 20.90), (t = -8.43; p < .01)\). To summarize, all three groups showed statistically reliable achievement gains from the pretest to the posttest.

**POSTTEST TO RETENTION TEST CHANGES**

The overall posttest mean scores and retention test mean scores were examined using a series of t-tests. The retention test contained the three parts that comprised the pretest plus an additional two sections called the generalization test. The generalization test contained a 5 mark essay question and 9 multiple-choice questions. The retention test and generalization test are treated as two separate tests in the statistical analysis. Both tests were administered three weeks after the posttest. The scores for each section of the retention test are displayed in Table 5.

To determine whether learning had been maintained in each of the three instructional groups, a series of t-tests for dependent observations was conducted on posttest and retention test total scores. Statistically reliable gains were not present for group one from posttest \((m = \)
19.86) to retention test \((m = 19.90), (t = -0.10; p > .05)\). Similar results were found for the students in group two from posttest \((m = 20.61)\) to retention test \((m = 20.52)\), \((t = 0.24; p > .05)\). Group three also failed to achieve statistically reliable results from posttest \((m = 20.90)\) to retention test \((m = 21.28), (t = -0.84; p > .05)\). These figures indicate that all students retained information regardless of their instructional group.

GROUP DIFFERENCES

Findings at the pretest revealed no significant difference among the three groups when a one-way analysis of variance was performed \([F (2,61) = .39, p > .05]\). These results indicated that the three groups had equivalent prior knowledge of the subject area taught in the study. The means and standard deviations for each group are found in Table 5.

In order to examine group and ability differences, a two-way analysis of covariance was calculated for students' posttest achievement. The covariate used for this analysis was students' pretest achievement. The Gates MacGinitie scores for the students served as an ability measure. Scores on this test were used to create three levels of ability - low, medium and high. This was done by examining the distribution of scores on the Gates MacGinitie and splitting students into three equal groups - lower third, middle third and upper third.
<table>
<thead>
<tr>
<th>Measures</th>
<th>1 (n = 22)</th>
<th>2 (n = 21)</th>
<th>3 (n = 21)</th>
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</thead>
<tbody>
<tr>
<td>Posttest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>12.9 (2.26)</td>
<td>13.7 (1.65)</td>
<td>14.2 (2.73)</td>
</tr>
<tr>
<td>P</td>
<td>4.9 (.29)</td>
<td>4.86 (.36)</td>
<td>4.9 (.39)</td>
</tr>
<tr>
<td>E</td>
<td>2.0 (.82)</td>
<td>2.0 (.92)</td>
<td>1.76 (.77)</td>
</tr>
<tr>
<td>Total</td>
<td>19.86 (2.59)</td>
<td>20.62 (1.80)</td>
<td>20.90 (3.24)</td>
</tr>
<tr>
<td>Retention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MC</td>
<td>13.0 (2.0)</td>
<td>13.5 (1.6)</td>
<td>14.4 (1.8)</td>
</tr>
<tr>
<td>P</td>
<td>4.87 (.47)</td>
<td>4.8 (.47)</td>
<td>4.85 (.48)</td>
</tr>
<tr>
<td>E</td>
<td>2.0 (.99)</td>
<td>2.14 (.85)</td>
<td>2.0 (.70)</td>
</tr>
<tr>
<td>Total</td>
<td>19.9 (2.39)</td>
<td>20.52 (2.11)</td>
<td>21.29 (2.39)</td>
</tr>
</tbody>
</table>

Note. 1 is the Cooperative Learning with Processing Group. 2 is the Cooperative Learning Only Group. 3 is the Individualized Group. MC is the Multiple Choice questions = 17. P is the Plant question = 5. E is the Essay question = 3. Total = 25.
The two-way ANCOVA for the posttest achievement measure found no statistically reliable differences between instructional groups \(F(2,53) = .63; p > .05\). Statistically reliable results were found for the ability groups \(F(2,53) = 4.38; p < .05\). The high ability group achieved the highest score with a mean of 21.86 and a standard deviation of 2.05. The medium-ability group had a mean score of 19.71 with a standard deviation of 2.47, while the low-ability group had a mean score of 19.62 with a standard deviation of 2.65. The interaction between ability and instructional grouping, however, was not significant \(F(4,53) = .54; p > .05\). Complete information on the ANCOVA for the posttest is found in Table 6.

The retention test achievement measure consisted of the same set of questions as appeared on the pretest and the posttest. On the retention test no statistically reliable differences were found between groups \(F(2,53) = 1.01; p > .05\). For the ability groups no statistically reliable differences were found \(F(2,53) = 2.36; p > .05\). The interaction between instructional and ability grouping was also not significant \(F(4,53) = .55; p > .05\). Complete figures for the retention test analysis of covariance are found in Table 7.

On the generalization section of the retention test no statistically reliable differences were found between instructional groups \(F(2.53) = .51; p > .05\). However,
### TABLE 6

**ANCOVA on Posttest Achievement**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>P</th>
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</thead>
<tbody>
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<td>1</td>
<td>40.92</td>
<td>7.07</td>
<td>.01</td>
</tr>
<tr>
<td>Groups</td>
<td>7.38</td>
<td>2</td>
<td>3.69</td>
<td>.63</td>
<td>.53</td>
</tr>
<tr>
<td>Ability</td>
<td>50.72</td>
<td>2</td>
<td>25.36</td>
<td>4.38</td>
<td>.01</td>
</tr>
<tr>
<td>Interaction</td>
<td>12.66</td>
<td>4</td>
<td>3.16</td>
<td>.54</td>
<td>.70</td>
</tr>
</tbody>
</table>
# TABLE 7

## ANCOVA on Retention Test

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
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<td>1</td>
<td>47.81</td>
<td>10.4</td>
<td>.01</td>
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<tr>
<td>Achievement</td>
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<td>2</td>
<td>4.67</td>
<td>1.01</td>
<td>.36</td>
</tr>
<tr>
<td>Groups</td>
<td>21.72</td>
<td>2</td>
<td>10.86</td>
<td>2.36</td>
<td>.10</td>
</tr>
<tr>
<td>Ability</td>
<td>10.23</td>
<td>4</td>
<td>2.55</td>
<td>.55</td>
<td>.69</td>
</tr>
<tr>
<td>Interaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
statistically reliable differences were found for the ability groups \[ F (2.53) = 4.89; p < .05 \]. The high-ability group achieved the highest score with a mean of 10.52 and a standard deviation of 1.91. The medium-ability group had the second highest score with a mean of 8.62 and a standard deviation of 2.26. The low-ability group had the lowest score with a mean of 8.19 and a standard deviation of 2.42. No statistically reliable differences were found between ability and instructional groupings \[ F (4.53) = .82; p > .05 \]. Complete figures for the generalization test analysis of covariance are found in Table 8. Means and standard deviations for the generalization test are found in Table 9.

Qualitative Data

The data analyzed in this thesis failed to indicate differences in student achievement between the cooperative learning with processing, cooperative learning only and the individualized conditions. Pertinent data, in the form of teacher observation sheets and student processing sheets, that was originally collected were lost. Thus detailed analysis of the possible benefits of processing with cooperative learning is impossible. Anecdotal notes and discussions with the classroom teachers involved do provide some information regarding the effects of processing.
TABLE 8

ANCOVA on Generalization Test

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
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<td>33.18</td>
<td>6.86</td>
<td>.01</td>
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<tr>
<td>Achievement</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Groups</td>
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<td>.51</td>
<td>.59</td>
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<td>Ability</td>
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<td>2</td>
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<td>4.89</td>
<td>.01</td>
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<tr>
<td>Interactions</td>
<td>15.90</td>
<td>4</td>
<td>3.97</td>
<td>.82</td>
<td>.51</td>
</tr>
</tbody>
</table>

84
### Table 9

Means and Standard Deviations for Groups on Generalization Test

<table>
<thead>
<tr>
<th>Experimental Conditions</th>
<th>1 (n = 22)</th>
<th>2 (n = 21)</th>
<th>3 (n = 21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>MC</td>
<td>6.77 (.40)</td>
<td>6.76 (.35)</td>
<td>7.23 (.33)</td>
</tr>
<tr>
<td>E</td>
<td>1.95 (.24)</td>
<td>2.28 (.31)</td>
<td>2.33 (.29)</td>
</tr>
<tr>
<td>Total</td>
<td>8.73 (2.62)</td>
<td>9.05 (2.13)</td>
<td>9.57 (2.39)</td>
</tr>
</tbody>
</table>

Note. 1 is Cooperative Learning With Processing Group.
2 is Cooperative Learning Only Group.
3 is Individualized Group.
MC is Multiple Choice = 10.
E is Essay question = 5.
Total = 15.
It was apparent from the onset that students in cooperative learning were confused by this new learning method. They had difficulty understanding why they were required to share work materials and work space. Questions as to why they could not have their own paper or use just their own crayons were common. They experienced difficulty sharing materials and often argued over whose turn it was or who should do what although task specialization usually made it clear who was to do what. As they grew more experienced with the structured cooperative tasks, such as Round Robin worksheets or putting together the four parts of a food chain, they showed more cooperation and completed tasks more efficiently and amiably.

Less structured tasks such as making a group poster or mural continued to pose a problem for students throughout the unit. Arguments over what should go on the paper, who should do it and with what materials were common. One or two children tended to dominate while others remained passive. Occasionally one student in a group would go entirely their own way, ignoring the rest of the group and simply doing what they wanted. During these times of conflict the students were critical of one another's efforts and made punitive remarks. After a certain point in the conflict, they invariably called upon the teacher to settle the dispute. They were further frustrated when the teacher encouraged them to provide
their own solutions to the conflict.

During group processing these types of problems were discussed and alternative solutions to future problems were brainstormed by the students. A few of the students made attempts to try these alternative methods, but without the cooperation of their peers, who continued to argue and create dissension, they made little progress. It seemed that the children could calmly discuss and agree on viable ways of dealing with conflict outside of the context of the problem. Once involved in a dispute, however, they reverted to the behavior they were most familiar with, name calling, arguing, tears and calling on the teacher.

During group processing when the students were required to fill in group or individual processing sheets disagreements also occurred. They had difficulty focussing on the pertinent issues. For example, if the question was, did our group take turns, students approached it in one of two ways. Either they all said yes we did, regardless of whether they did or not, or they argued about it and accused one another of doing this or that and failed to reach consensus. Most often those who said yes did so without thought and often it was contradictory to the observations made by the teacher in that lesson. The desire to be right or to please the teacher seemed to influence how the children responded.

This wish to please the teacher was also evident
during lessons when the teacher was near a group. For example, if the teacher was observing for listening to each other, when she was close to a group everyone made sure to look at the speaker and listen. As the teacher moved out of range, however, random discussion and student intrusions were noted frequently. The use of cooperative skills such as listening, sharing and taking turns were more in evidence when the presence of the teacher was felt than when she was at a distance. The students had apparently not internalized these skills to the point where they used them naturally and freely during work periods.

From these informal observation it is possible to make two inferences. First of all, during group processing students were able to describe and to define cooperative behavior and alternative behavior to quarrelling, name calling and other inappropriate actions. During the actual lessons, however, students experienced great difficulty implementing the strategies discussed during processing.

Secondly, students were able to practice cooperative behavior most successfully when the teacher was in close proximity. Without the physical presence of the teacher or authority figure, students reverted to their natural behavior patterns. Perhaps with more time to practice cooperative behavior and continued processing of the cooperative options these behaviors may have become more natural to the students and replaced the inappropriate
By the end of the unit students were more readily sharing supplies and were able to do the structured cooperative tasks more efficiently. The more open ended cooperative activities still presented a problem for most groups and students, but again with more practice they too would have begun to operate smoothly. Without hard data it is difficult to ascertain the specific effects of group processing, but from informal observation a degree of improvement in cooperative skills, if not academic achievement, was discernable. Whether this improvement was the result of the processing or because the students were becoming more familiar and comfortable with the cooperative methods is also difficult to determine given the loss of the data.

Summary of Results

In order to summarize the results of the study, the questions posed for investigation will be presented once again in this section. As each question is reiterated, the findings pertaining to each question will be summarized and discussed in light of the foregoing analysis.

The first question concerned achievement gains for the three groups. Were there changes from the pretest to the posttest that would indicate that learning had taken place in each group? The results of the t-tests on
pretest and posttest total scores showed statistically reliable gains for the three groups, thus learning did occur.

The scores on the posttest and the retention tests were examined in order to determine whether the instructional groups differed in their achievement. It was hypothesized that both cooperative learning groups would show higher posttest and retention test scores than the individualized group and that the cooperative learning with processing group would have higher retention than the cooperative only group. The results of an analysis of covariances on the posttest and retention test scores did not support this conclusion. Statistically reliable gains were not found for any of the three groups. These results indicate that the techniques of cooperative learning and cooperative learning with processing yielded comparable achievement gains to that produced by individualized instruction.

The study also addressed the question of whether the instructional effects of cooperative learning interacted with students' learning ability. Previous studies (Johnson et al., 1985; Yager et al., 1986) found that low-ability students benefited more from cooperative learning when compared to those in individualized conditions. The data in the present study were examined using a two-way analysis of covariance comparing posttest achievement with three ability levels. The two-way ANCOVA
found no statistically reliable differences between instructional groups. There were statistically reliable results for the ability groups, but the interaction between ability and instructional grouping was not significant. These results indicate that, within this study, cooperative learning and cooperative learning with processing did not effect the achievement of students with varying ability levels differentially when compared to individualized learning.

The question of whether ability and instructional grouping would have an effect on retention was also examined. The results of the two-way ANCOVA, indicated no statistically reliable differences for instructional groups or ability groups, nor was there significant interaction between the two on the retention test. The two-way ANCOVA of the generalization test also found no statistically reliable differences between instructional groups. Statistically reliable differences were found for ability, but the interaction between ability and instructional groupings was not significant. These results do not support the hypothesis that cooperative learning and cooperative learning with processing instruction will effect higher retention than individualized instruction. In this study, all students irrespective of instructional grouping retained information to a comparable level.
CHAPTER V

GENERAL DISCUSSION

This chapter discusses the substantive findings of the present study in relation to prior research on cooperative learning in general, and the Yager et al. (1986) study in particular. Possible reasons for the results of this study are examined in light of limitations of the investigation. Suggestions are also provided for future research on the effects of cooperative learning with young children. The chapter concludes with a discussion of the implications of cooperative learning research for educators.

A COMPARISON OF THE RESULTS OF THE TWO STUDIES

The present study's findings are substantially different from those of Yager et al. (1986). In the Yager et al. study, students in the cooperative learning with processing group achieved higher on both the posttest and the retention test than did students cooperative learning or individualized instruction groups. The cooperative learning only group also had higher achievement than the individualized group on both achievement measures. The results obtained in this thesis did not replicate Yager et al.'s results, and showed all three groups achieving at comparable levels. In further contrast to the Yager et al.
study, which found that the difference between the high-ability and low-ability groups in both cooperative learning groups was less than in the individualized learning group, this study found no such differences. There was no significant interaction between ability and grouping in the present research. These results raise the general question of why the present study should obtain such different results.

One of the foci of this thesis was on whether cooperative learning with processing instruction would benefit grade one students more than cooperative learning only instruction or individualized instruction. The results on the achievement measures indicate that, for the grade-one students in this sample, processing did not affect achievement. The age of the children in the sample may have been a determining factor in these results.

According to Piaget (1958) a child of six lacks the intellectual skills and the ability to decenter in order to effectively process either his behavior or the behavior of the group in which he is a member. The egocentricity of young children prohibits them from self- or group-analysis of their learning. They in effect lack not only the self-control and desire to monitor their own behavior and learning, but are incapable of doing this due to the stage and limits of their intellectual development.

More recent research with young children (Hughes, 1978) has found that even preschool children are able to
decenter and take another person's perspective providing the situation is couched in terms that the child can understand. Donaldson (1978) in reviewing the research on young children concludes that children are able to decenter, and are capable of deductive reasoning, conserving number and classifying. The intellectual limitations of children entering school is not a result of an absence of skills, but rather in the deployment of skills (Grieve, Tunmer & Pratt, 1983). Children of six may well have the intellectual capacity to do group processing, that is they are able to reason, observe their own and other's actions and determine if a particular behavior was present or not, but these intellectual skills are context-dependent, not context-free. In other words, children of six may have the skills required to do group processing, but they are limited in the number of contexts in which they can effectively use them. Thus, asking children to apply these techniques to their own or their group's behavior is a totally new application of these skills. In a new context, such as group processing in cooperative learning, errors and difficulties can be expected before the application of knowledge is smooth and efficient.

Brown and DeLoache (1983) state that novices frequently do not perform efficiently not only from a lack of skills and knowledge of the task, but from a deficiency in the meta-cognitive skills of self-interrogation and monitoring in relation to the new task. Because children
may not have the necessary knowledge about how and what to think in new circumstances, they tend not to bring self-regulation strategies to bear on new problems. Brown and Deloache affirm that it is not necessarily the case that young children are incapable of self-regulation, but that it takes experience before they build up the knowledge and confidence to assume the self-interrogation mode of the expert.

These findings may be pertinent to the use of group processing with students of any age, not just those in grade one. Brown and DeLoache (1983) refer to Chi (1977) and Markman (1977) when they assert that both children and adult novices experience similar difficulty adopting the self-interrogation mode of the expert unless there is significant transfer from prior knowledge. In the present study the children were inexperienced in both the formal cooperative settings in which they were asked to function and in the group processing procedures they were asked to perform. The failure of the majority of students to monitor their behavior and effectively employ self analysis is not unexpected in light of Brown and DeLoache's findings. While Piaget might argue that the children were incapable of such intellectual activities, others (Brown & DeLoache, 1983; & Donaldson, 1978) would maintain that the students failed in their tasks due to lack of experience in the particular context in which they were expected to function. Given further training and
experience in both cooperative learning and group processing tasks the students may have been able to function more as experts rather than novices and thus been able to adopt the self-interrogation and self-regulation techniques required in group processing.

The fact that children in the group processing condition did not exhibit relatively more potent achievement gains from the processing in which they presumably engaged could be a consequence of the intellectual limitations due to their age or their inexperience with the tasks in that particular context. Similarly, it is possible that the students who participated in the cooperative learning only condition did not show greater achievement gains than the children in the individualized setting, because they were novices at formal cooperative learning instruction. While the two cooperative learning groups were coping with a new instructional setting in addition to learning the content, the students in the individualized instructional setting were able to focus solely on learning the content of the curriculum. In this respect, the cognitive demands placed on students in both cooperative learning groups were substantially greater than those placed on their counterparts in individualized instruction.

It is not known whether the students in the Yager et al. study had prior experience with cooperative learning or with group processing. They may or may not have been
novices to the same degree as students in the present study. Moreover, it is important to note that students in the Yager study had two additional years of school experience and development. This may have been a mitigating factor which enabled them to benefit more from cooperative learning and group processing.

This study encompassed six weeks. The Yager et al. (1986) study was also six weeks long. Other research with young children (Skon et al. 1981; & Yager et al. 1985) ranged from one week to three weeks duration. These studies were concerned with very specific behaviors or with limited curriculum content. Slavin (1983b) in his survey of research on cooperative learning instructional methods found studies varied in length from 2 to 30 weeks, with the average length between 4 and 6 weeks. None of these studies involved group processing or grade-one students.

Given the complexity of the tasks required in processing personal and group behavior, extensive training is needed to develop the requisite skills of self and group observation and analysis, discussion techniques and decision-making strategies. In the present study every effort was made to model and to instruct the students in appropriate listening, interaction and processing skills; however, the short duration of the study and the lack of prior experience of the students, limited the degree of success attained in this area. Long term, intensive
training in group processing strategies would seem to be necessary before the benefits of group processing would be reflected in achievement gains with grade-one students.

Graves and Graves (1985), have developed a sequence of cooperative skills that delineate six levels of cooperative learning activities with corresponding cognitive and social skills. These activities range from playing cooperative games in which they take turns and follow directions, to creative group problem-solving where divergent thinking and the use of metaphor and analogy are emphasized. Graves and Graves advocate spending time developing class cohesiveness and team building when small-group activities are introduced. The introduction of small-group activities is greatly facilitated by the prior establishment of the appropriate classroom climate and fostering skills such as trusting others, listening, taking turns and sharing. Graves and Graves believe that without the necessary groundwork in collaborative and group monitoring skills coordinated teamwork and group research are more difficult to implement and will require remedial work, especially in developing requisite social skills.

In the present study, four lessons attempted to develop the appropriate classroom climate and to teach the collaborative and processing skills required in cooperative learning. Unfortunately, the observational records and individual and group processing sheets were
lost following the completion of the study. Without the student evaluation forms, goal statements and teacher observation sheets it is impossible to assess accurately the extent and quality of group processing; however, certain facts and occurrences were recorded in other ways. These anecdotal notes support Graves and Graves' claim that without the required preparation in collaborative skills students' learning time is spent redressing social skills.

Students in the cooperative learning with processing group had particular difficulty sharing materials, tasks and work space. For example, they frequently questioned the reason for having one pencil and one worksheet when the strategy of materials dependency was employed. Some children seemed to resent having other students work on what they considered their task. They wanted their own worksheet, to do their own mural and did not want to rely on others or have others dependent on them.

The students seemed to have difficulty not only understanding the logic behind the cooperative tasks, but accepting them as well. They experienced frustration as a consequence of this lack of understanding and acceptance. In one instance, the frustration resulted in one student stabbing another with a pencil. As a result of this altercation, both students were removed temporarily from the group and appropriate consequences for their behavior meted out. Time was also spent with the whole group
discussing the problem and acceptable solutions to future disagreements.

Teacher-led group discussions attempted to pose solutions to the various problems that occurred during group work. The five minutes at the end of each lesson allocated to processing severely limited these discussions. Kagan (1985) advocates the use of a three-step procedure to examine the interactions that occur in a group situation. The first stage is the identification of the problem or situation under discussion. The second step is an analysis of how aspects of the situation affected the individuals involved, while the third step, called generalization, includes generating better outcomes for future situations. This entire procedure requires extensive training and practice. The children in the cooperative learning with processing group experienced limited success with this type of discussion due to lack of time and training available for students to practice Kagan's three steps.

Within the time constraints of the study, group processing did occur. During these discussions the children were often able to verbalize viable solutions to difficulties. In the context of actual group work time, however, they seldom seemed to employ these strategies. They resorted to familiar methods of resolving disputes such as arguing, crying, name calling or coming to the teacher seeking a solution. In order for new strategies
and behaviors to be internalized, they have to be known and practiced extensively. During the course of this study there was not enough time for all the students to master either the processing skills or the collaborative skills required to function successfully in a cooperative group. Without a high level of expertise in these skills, the benefits of processing and cooperative learning were difficult to realize. Indeed, it might be argued that cooperative learning in a fully functioning form was not present and hence not assessed in the study.

Further evidence of the students lack of success with the cooperative strategies was evidenced by their continued reliance on the teacher as opposed to their group as a source of reinforcement and solutions to difficulties. Teacher approval was readily sought by the students. Teacher dependency was most apparent when a specific strategy, for instance praising, was observed on a particular day. Students would make praising statements in very loud voices, looking at the teacher to be sure that their actions were being recorded. When they were unaware of the teacher's proximity praising was less evident. Johnson and Johnson (1986) confirm that new behaviors will seem artificial and may be done for the teachers approval until they become a part of the student's repertoire of behaviors. Behaviors become natural and spontaneous only after much practice.

Based on the comments of the regular classroom
teacher and the general impressions of the researcher, the cooperative learning with processing condition did make some progress in sharing tasks and materials. Their initially strong desire to work alone and use their own supplies gradually changed to a more accepting attitude toward working with their peers on a project and toward a more equitable sharing of jobs and materials. Critical comments and aggressive behavior decreased, as did the noise and tension levels in the classroom. Students were still very teacher oriented, however, and modified their behavior when she was within hearing range.

It was also noted, that when filling out their group or self-evaluation sheets, students tended to circle happy faces whether or not they had met the goal in question. This inability to report their behavior objectively could reflect a desire to be "right" or to please the teacher. A few students did recognize when they had failed to reach a goal, but in general students circled happy faces regardless of what had actually occurred during the lesson. This could have occurred because the students were not clear on what the behavior statements on the processing sheets meant in relation to themselves. Their inexperience with monitoring their own behavior and recording the results may have made it difficult for them to complete the processing sheets accurately.

Just as the maturity and experience of the students may have effected the outcome of the study, so too the
inexperience of the teacher may have had effects. The teacher was implementing cooperative learning and group processing for the first time. She had done extensive reading on cooperative learning methods and research and had approximately 16 hours of formal instruction in cooperative learning, but no actual classroom experience. The Yager et al. (1986) study does not indicate how much experience or training the students and teachers received prior to the study. In other studies of cooperative learning (Johnson, Johnson, Roy, & Zaidman, 1986; Johnson, Skon, & Johnson, 1980; & Skon, Johnson, & Johnson, 1981), however, the teachers implementing cooperative learning had up to 90 hours of training in how to structure the learning settings, as well as, considerable experience teaching both cooperative and individualized lessons. It is reasonable to assume that the teachers in the Yager et al. study were similarly trained and experienced in cooperative learning. The expertise of these teachers may have been a factor in the success of cooperative learning in these studies, just as the inexperience of the teacher in the present study may have been instrumental in the results obtained here.

The assessment measures used to determine achievement levels in the present study were found to have low reliability. The low reliability of these measures severely limits their capacity to detect group differences. This is obviously a further limiting feature of the
present investigation.

While on statistical matters, it should be noted that the rather small sample size used in the present study lessens the power of statistical tests to detect significant group differences. This limitation is particularly severe in the two-way ANOVA test where cell sizes were in the order of nine or ten.

A final factor which may have influenced the outcome of this study concerns the social-economic status of the students involved in the study. The majority of the students came from upper middle-class families. Kagan (1980) refers to a study (Knight & Kagan, 1977) which found that upper income children were more competitive than lower income children. That is, children who presumably have more toys of their own share fewer toys with a peer when given the opportunity.

Evidence of this phenomenon was found in the present research. Most of the children had large, expensive collections of crayons or pencils that they were reluctant to share with their group. Disagreements within the cooperative groups frequently centered upon the use of these materials.

Kagan also noted that competitive children appear to achieve higher in a competitive learning setting while children from more cooperative backgrounds, such as Black or Mexican-American students achieve higher in cooperatively structured settings. Aronson et al. (1978)
and Slavin (1977) found that achievement differences between cooperative classrooms and competitive classrooms were due largely to improved minority students' achievement. There were no minority students in the present study. It was composed of upper-middle class students, who may not benefit from cooperative learning to the same degree as minority students. Thus the composition of the three groups involved in the present study may have been responsible for the comparable outcomes of the learning conditions. Simply put, the lack of lower-income or minority students, who would tend to benefit more from cooperative learning than upper-income students, may explain in part why the two cooperative learning conditions did not benefit more than the control group.

In summary, a number of limiting features in this study may have contributed to the failure to replicate the Yager et al. findings. The age difference between the subjects in the two studies may explain the different results. The level of maturity and experience of the students may also have affected the study's results. The length of the study may have been inadequate to allow for the development of the necessary collaborative and processing skills required to enable students to benefit from the procedures. The loss of the data relating to the group processing makes an accurate examination of the cohesiveness effects of processing impossible; although, informal observations of group processing suggest that
students did develop greater tolerance and acceptance of working with their peers. The limited training and experience of the researcher in cooperative learning teaching strategies may have contributed to the lack of finding in the study. The fact that the achievement measures had low reliability made the exact assessment of achievement difficult and hindered the detection of group differences. The small size of the sample also lessons the power of the statistic analyses to detect group differences.

IMPLICATIONS FOR FUTURE RESEARCH

To date the major focus of research on cooperative learning has been at the intermediate and high-school levels. Recently, (Johnson et al., 1986; Yager, Johnson & Johnson, 1985; & Yager et al., 1986) have directed their research toward primary aged children. Their findings have all been positive concerning the effects of cooperative learning instruction, when compared to individual instruction, on achievement scores. Further research is, however, still required in a number of areas in order to establish the types of cooperative learning that are most effective with young children, the subject areas best suited to cooperative learning and the effectiveness of group processing with young children.

Given the diversity of cooperative learning techniques it is essential that those most effective with
primary students be established. Therefore, researchers should conduct comparative studies which investigate the full variety of cooperative learning techniques advocated by Johnson and Johnson (1976, 1986), Graves and Graves (1985), Slavin (1983a) and Kagan (1985) in order to determine the best methods to serve the needs of primary children.

The optimum size of cooperative learning groups for primary students should be examined. Would pairs be more effective with very young children, with triads and quads being introduced later? Comparative studies should be conducted to determine what affect the size of the cooperative groups has on the achievement and cohesiveness outcomes of both early and late primary students.

The question of which subject areas lend themselves to the cooperative learning structure should also be studied. Do primary students benefit more from cooperative learning instruction than from individualized instruction in particular subject areas? In the present study this was found to not be the case for science; whereas, in the Yager et al. study cooperative learning did benefit students in social studies.

There is a need to establish more efficient methods of testing very young children to determine the benefits of cooperative learning. Besides pencil and paper tests, which are difficult to administer to young children who have limited reading and writing skills, what other means
are available to researchers? Direct observation of students performing set tasks where the observer is able to observe and listen to the children, as well as to question what they have done might be a valuable evaluation tool. Observation and conferencing as a means of assessment enable the instructor to determine what the child is able to do and to clarify the reasons behind the child's actions. The use of video recordings to monitor student progress would assist in the time management aspects of observation and be an alternative to personal interviews and written tests.

Studies of longer duration need to be done in order to determine long-range effects of cooperative learning on both academic achievement and social cohesiveness. Cooperative learning studies have usually been between 3 and 8 weeks in duration. Particularly with very young students who are inexperienced in the use of cooperative learning, long-term studies of 6 to 10 months would permit students to learn the skills required to be effective learners in cooperative settings. Long-term studies would enable researchers to gain a truer assessment of the effects of cooperative instruction.

Studies of cooperative learning with primary children that address the question of what effects cooperative learning instruction have on affective and social skills are also needed. Exactly what social skills are influenced by cooperative learning and in which settings
particular skills are promoted is a question requiring investigation. The effects of cooperative instruction on primary students' attitudes toward their peers, particular subjects, school and themselves as learners is relevant, particularly in light of the six goal areas that are outlined in the Primary Program.

Also at issue with younger primary students is the question of how much prior training in collaborative skills is necessary before the benefits of cooperative learning are evident? In the present study, clearly one week was insufficient time to provide adequate training and practice in collaborative and processing strategies. Comparative studies that implement the steps outlined by Graves and Graves (1985) over different time periods would be beneficial in determining the amount of training essential prior to implementing cooperative instruction with young children.

Research on teacher training is also necessary. How much training and what form the training should take are important considerations. Research on professional development (Joyce & Weil, 1986) indicates that repeated sessions followed by modeling and practice with feedback and a system of peer coaching are necessary before a new teaching strategy has been internalized and becomes a part of a teacher's repertoire of teaching methods.

Further investigation of the effects of group processing on academic achievement is necessary given the
inconclusiveness of the research to date. What specific strategies need to be taught in order to streamline process training? How much instructional time needs to be spent on processing? What is the optimal age of process training?

More efficient means of recording and reporting the effects of processing are also needed. Tape recording or video taping children during group processing and cooperative learning lessons for later analysis would provide objective evidence of what is occurring during group lessons. These methods would provide valuable support for teacher observation sheets and student processing sheets.

While there are clearly a wide range of questions about the nature and application of cooperative learning instruction that require answers, research to date lends itself to a spirit of optimism with respect to the place cooperative learning has in education in general and primary education in particular.

IMPLICATIONS FOR PRIMARY EDUCATORS

This chapter concludes with a summary of the implications the present study and recent research on cooperative learning instruction have for teachers. It also notes the relevance of cooperative learning instruction given the changes being implemented throughout British Columbia in the area of primary education.
The first point that educators should note is that cooperative learning instruction is a successful model to employ at the primary level. While the research remains predominately focussed on older students, several studies with primary students have indicated cooperative learning instruction can have beneficial effects on achievement. In the present study, early primary children with no prior experience of cooperative learning achieved at a level comparable to their peers in individualized instruction.

Educators also need to be aware that implementing group processing techniques are likely to require extensive training and practice before the benefits can be measured in terms of either student behavior or achievement. While the present study was unable to provide data relating to the effects of group processing, there were informal indications that the discussions and analysis done by students may have had some transfer to their classroom behavior.

A third point made clear in this study was the need to spend time before and during cooperative instruction teaching, modeling and allowing students to practice, the collaborative skills necessary to effective cooperative lessons. Graves (1985) advocates a progression of skills training and it was clearly shown in the present study that without such training cooperative learning instruction is difficult to implement and often fails to run smoothly due to students' lack of these essential
skills.

In conclusion it is also important for primary educators to note that the Primary Program (1989) draft copy indicates a philosophical shift in emphasis for primary education in British Columbia. The focus is no longer on teaching the curriculum and training children's intellects, but on fostering the children's personal growth in six main goal areas. The six goal areas in the program are: the intellectual, emotional, social, physical, aesthetic and artistic development of the child. This new mandate clearly indicates that education "as a primary agent of socialization has the responsibility to create enlightened, well-adjusted, respectful members of society" (Friesen & Wieler (1988, p. 50).

While the development of productive citizens may have been a laudable goal of education in the past, the Primary Program now provides specific statements of both intent and procedures to educate children in the six goal areas. Imbedded in its rationale are statements such as this one quoted from Johnson, Johnson & Holubec (1986) "Nothing we learn is more important than the skills required to work cooperatively with other people. Most human interaction is cooperative. Without such skills in cooperating effectively, it is difficult ...[to] be part of a community, society, and world (p. 28). The Primary Program emphasizes the need for young children to have a safe and secure learning environment in which they can
communicate with other children and adults and investigate and respond to their world in diverse ways. This type of learning environment would be difficult to maintain in classroom based exclusively on traditional teaching models.

Many traditional classroom teaching models are based on learning tasks that are structured by teachers for individuals. Most interaction between teachers and students in these models is based on the recitation method where the teacher directs questions about what has been studied, calls on an individual who responds, and then affirms the response or corrects its (Sirotnik, 1983). Such patterns of instruction are inadequate to provide the type of interactions with peers and teachers that are advocated by the Primary Program.

In order to provide a learning environment compatible with the criteria listed in the Primary Program, other methods will need to be employed. One such method advocated by the Primary Program is cooperative education. Within the structure of cooperative education all six goals of the primary program can be met, in varying degrees, depending on the subject area in which the strategy is utilized. For example, in the present study, the subject area was science. To some extent all six goal areas were addressed during the course of the lessons. Social development was emphasized as the children shared, cooperated and learned from each other. Social responsibility was evident when the children were required
to understand and respect the ideas and wishes of others in their group. As the children accepted the challenge of learning in a new way and expressed their feelings toward the task and each other they were developing emotionally. Physical development was perhaps the least evident in this subject. Painting murals and making collages developed their artistic and aesthetic skills and appreciation. Intellectual development was provided for by reading, writing, listening and speaking activities, as well as problem-solving tasks and concept attainment activities on the topic of energy sources and applications. Employing cooperative learning instruction in other subjects will allow teachers to emphasize different goal areas than those that were emphasized in the present study, while maintaining the type of learning environment advanced by the new program.

Cooperative learning instruction is just one of a variety of instructional methods approved by the program. Researchers (Johnson & Johnson 1975, 1986; & Kagan, 1980) believe that cooperative learning models will best serve students and educators if they are one of a diversity of teaching methods employed by teachers according to the subject matter and the needs of the students being taught. Used in the appropriate form and in the correct context, cooperative instruction can serve as a versatile tool for teachers.
REFERENCES


Dear Parents,

One of our experienced grade 1 teachers, Ms. Beaman, is in the final year of her Masters Program at Simon Fraser University. Part of her thesis work involves a study of cooperative learning methods with grade one students.

All three grade one classes in the school will participate in a district approved Science unit to be taught by Ms. Beaman. The unit will entail 45 minutes of instruction, four days a week for approximately 5 weeks. Children will work in their regular classroom in either a cooperative learning or an individual (traditional) learning situation. Each child will be tested orally before implementation of the unit and afterwards to determine the achievement gains in Science of the students in the two learning situations.

Although the Director of Instruction and the school have approved this project, the regulations of Simon Fraser University require your consent as parent/guardian for your child to participate in this project. Please sign the form below and return it to the school. If you would like further information about the study Ms. Beaman will be pleased to respond to your questions. Thank you for your anticipated support.

Sincerely,

B. Cominetti
Principal

As parent/guardian of _________________ I give consent for participation in the project studying cooperative learning in Science at Laronde Elementary School.

Signature __________________
Date __________________
This appendix contains the twenty-four lessons plans used during the methods stage of this thesis. The pre-test, mid-term, post-test and retention test instruments are also included in this appendix.
TRAINING LESSONS

Lesson A:

Objectives:

1. To place students in cooperative learning groups in Conditions 1 and 2.

2. To place students in rows preparatory to individualized instruction in Condition 3.

3. To orientate students and teacher to each other and the new class routines and seating orders.

Lesson Plan:

Conditions 1 and 2 - 35 minutes

1. Place students in cooperative learning groups and rearrange classroom furniture.

2. Choose team names within each group.

3. Play circle name game.

Condition 1 - 5 minutes

4. Processing - teacher-led discussion of positive points of group interactions.

Condition 2 - 5 minutes

4. Free time.

Condition 3 - 35 minutes

1. Place students in rows.

2. Play circle name game.

3. Use pattern blocks with independent activity cards.

4. Free time - 5 minutes.
Lesson B:

Objectives:
1. To build team identity and cohesiveness.
2. Identify behaviors conducive to cooperative learning, promoting team unity or to working independently.
3. Give students in each of the three conditions practice working in their new situations.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Brainstorm collaborative skills and behaviors. Teacher to record them on chart paper.
2. Discuss original list and make a class chart of the key elements.
3. Each group create a team banner.

Condition 1 - 5 minutes
4. Processing - teams discuss which collaborative skills they used. Set goal for next lesson.

Condition 2 - 5 minutes
4. Free time.

Condition 3 - 35 minutes
1. Brainstorm independent learning behaviors. Teacher record on chart paper.
2. Discuss original list and make a class chart of the key elements.
3. Use pattern blocks and activity cards.
4. Free time - 5 minutes.
Lesson C:

Objectives:
1. To build team identity and cooperative behaviors.
2. To model and role play effects of eye contact on listening skills.
3. Condition 1 only - to practice setting and meeting team goals.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Review class chart and behavior goals.
2. Play beanbag juggling game.
3. Model poor and good listening skills using two volunteers who were briefed prior to the lesson.
4. Assign partners and have whole class experience the role play activity.
5. Whole class discussion of role play.

Condition 1 - 5 minutes
6. Processing - groups determine if they improved in goal area. Set new goal.

Condition 2 - 5 minutes
6. Free time.

Condition 3 - 35 minutes
1. Review chart and behavior goals.
2. Review alphabetical order, and sing alphabet song.
3. Using cards have students line up in ABC order.
4. Complete an ABC order cut and paste worksheet.
5. Free time - 5 minutes.
Lesson D:

Objectives:
1. To have all three Conditions work towards behavior goals.
2. Introduce teacher observation and check lists in Conditions 1 and 2.
3. To review and practice alphabetical order.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Review class chart and group goals in Condition 1.
2. State teacher observation goals.
3. Plan roundrobin ABC game using food names.
4. Read alphabet and sing alphavet song.
5. Use sets of word cards and have teams put them in alphabetical order following demonstration lesson.

Condition 1 - 5 minutes
7. Have groups discuss how well their goal was met and set a new goal for next lesson.

Condition 2 - 5 minutes
6. Review teacher observations - free time.

Condition 3 - 35 minutes
1. Review class chart.
2. Review alphabet and sing alphabet song.
3. Students work independently on sets of word cards after demonstration lesson.
4. Free time - 5 minutes.
UNIT CONTENT LESSONS

Lesson 1

Objectives:
1. Teacher observation for taking turns in Conditions 1 and 2.
2. Recognize energy as motion and ability to do work.
3. Recognize that people use a little or a lot of energy depending on the activity involved.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Review class chart and behavior goals.
2. Student Book Seeds p. 3 and class discussion.
3. Seeds Activity Sheet 1 as partner activity.
4. Cover 1 leaf of a plant and list possible effects.

Condition 1 - 5 minutes
5. Processing - complete clown process sheet and set new goal.

Condition 2 - 5 minutes
5. Beanbag juggling game.

Condition 3 - 35 minutes
1. Review class chart of behavior expectations.
2. Student Book Seeds p. 3 and class discussion.
4. Cover 1 leaf of a plant and list possible effects.
5. Beanbag juggling game - 5 minutes.
Lesson 2

Objectives:
1. Observe for listening and looking at the speaker.
2. Review definition of energy.
3. Recognize that animals use energy to move.

Conditions 1 and 2 - 35 minutes
1. Review class chart and behavior goals. State teacher's observation areas.
2. Student Book p. 6-7 and class discussion.
3. Activity Sheet 3 as an overhead for discussion.
4. Have each group cover group folder with magazine pictures to create a collage showing different ways energy is used. Create task dependence by assigning roles ie. cutter, gluer, picture finder.

Condition 1 - 5 minutes
5. Processing - teacher reviews observation results and leads discussion of goals and goal attainment.

Condition 2 - 5 minutes
5. Free time.

Condition 3 - 35 minutes
1. Review class chart and behavior goals.
2. Student Book p. 6-7 and class discussion.
3. Activity Sheet 3 as an overhead for discussion.
4. Each student make a collage with magazine pictures to show how energy is used. Make into folder.
5. Free time - 5 minutes.
Lesson 4

Objectives:
1. Teacher observe for taking turns, sharing materials and praising group members.
2. Recognize that people and animals get their energy from food.
3. Recognize that many machines get energy from gas and electricity.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Review class chart and group goals.
2. Read story Zoo Animals and discuss food as an energy source.
3. Student Book p. 8 discuss machines energy sources.
4. Seeds Activity Sheet 4-5 complete with partners.
   Task dependence established ie. 1 cutter, 1 gluer.

Condition 1 - 5 minutes
5. Processing - teacher review observation results.
   Students set new goals and assess previous ones.

Condition 2 - 5 minutes
5. Silent reading.

Condition 3 - 35 minutes
1. Review class chart.
2. Read Zoo Animals, discuss food as energy source.
3. Student Book p. 8 discuss machines' energy sources.
4. Seeds Activity Sheets 4-5 completed individually.
5. Silent reading.
Lesson 5

Objectives:
1. Observe for sharing, talking on task and praising.
2. Recognize the four things plants need to grow.
3. Practice filling in an individual process sheet.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Share story in Student Book p. 10 and discuss.
2. Discuss four things plants need to grow.
3. Label large chart with parts of a plant.
4. Play game, Plant Match, in teams.

Condition 1 - 5 minutes
5. Processing - complete individual clown process sheets re: teacher observations.

Condition 2 - 5 minutes
5. Play beanbag juggling game.

Condition 3 - 35 minutes
1. Share story in Student Book p. 10 and discuss.
2. Discuss four things plants need to grow.
3. Label large chart with parts of a plant.
5. Beanbag juggling game - 5 minutes.
Lesson 6

Objectives:
1. Teacher observe for sharing and praising.
2. Review four things plants need to grow.
3. Plant seeds in 5 conditions, 1 per group.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Review four things plants need to grow, use chart.
2. Assign each group 1 condition and have them plant seeds accordingly.
3. Discuss and hypothesize results in each condition.

Condition 1 - 5 minutes
4. Processing in - discuss as a class how sharing and praising behaviors felt.

Condition 2 - 5 minutes
4. Free time.

Condition 3 - 35 minutes
1. Review four things plants need to grow, use chart.
2. Assign each student to a growing condition and plant individual seeds.
3. Discuss and hypothesize results in each condition.
4. Free time.
Lesson 7

Objectives:

1. Teacher observe for talking on task and praising.
2. Recognize what qualities constitute living and non-living things.
3. Build team cohesiveness.

Lesson Plan:

Conditions 1 and 2 - 35 minutes

1. Review parts of plant and play Plant Match Game.
2. Do Seeds Activity Sheet 12 as roundtable activity.
3. Demonstrate how to play Squeeze.
4. Students play Squeeze.

Condition 1 - 5 minutes

5. Processing - complete team clown process sheets.

Condition 2 - 5 minutes

5. Extend Aqueeze game.

Condition 3 - 35 minutes

1. Review parts of plant and match them on chart.
3. Silent reading - 5 minutes.
Lesson 8

Objectives:
1. Teacher observe for praising, listening and cooperating.
2. Review qualities of living and non-living things.
3. Make poster illustrating living and non-living things.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Play game using living and non-living things to illicit qualities of each.
2. Use Seeds Activity Sheet 13 as overhead, discuss.
3. Do group posters illustrating living and non-living things. Ensure task dependence by limiting supplies.

Condition 1 - 5 minutes
4. Processing - class discussion of how much sharing, listening and cooperating occurred.

Condition 2 - 5 minutes
4. Silent reading.

Condition 3 - 35 minutes
1. Play game using living and non-living things to illicit qualities of each.
2. Do Seeds Activity Sheet 13 as overhead, discuss.
3. Do individual posters of living and non-living things.
4. Silent reading - 5 minutes.
Lesson 9

Objectives:
1. Develop awareness of and provide practice in praising each other.
2. Review what the sun does in terms of energy.
3. Review sources of energy for people and animals.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Uncover plant leaf and see effects of no sun.
2. Use "T" bar to determine what praise looks and sounds like.
3. Have volunteers model praising fellow students.

Condition 1 - 5 minutes
5. Processing - discuss how the role play felt and set goals for next lesson.

Condition 2 - 5 minutes
5. Play Squeeze.

Condition 3 - 35 minutes
1. Uncover plant and see effects of no sunlight.
2. View filmstrip - Energy.
3. Do Seeds Activity Sheet 15 on alive versus not alive.
4. Play Squeeze - 5 minutes.
Lesson 10

Objectives:
1. To practice praising teammates.
2. To demonstrate and introduce the vocabulary for the water cycle.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Discuss sources of energy and determine that the sun is most important source for the world.
2. Demonstrate how the water cycle works. Relate this to the natural world.
3. Use large chart and have individual students label parts of water cycle.
4. With partners take turns explaining how the water cycle works.

Condition 1 - 5 minutes
5. Processing - complete clown sheet.

Condition 2 - 5 minutes
5. Finish posters re: alive and not alive things.

Condition 3 - 35 minutes
1. Discuss sources of energy and determine that the sun is most important source for the world.
2. Demonstrate the water cycle and relate to natural world.
3. Use large chart and have individual students label parts of the water cycle.
4. Finish posters - 5 minutes.
Lesson 11

Objectives:
1. Observe for praising and taking turns.
2. Reinforce the water cycle and its vocabulary.

Lesson Plan:

Conditions 1 and 2 - 35 minutes

1. Review class rules and state observation goals.
2. Review water cycle on overhead.
3. Demonstrate and have students play Water Cycle Game.
4. Do Activity Sheet 6 as a roundtable activity.

Condition 1 - 5 minutes

5. Processing - as a class discuss how praising behavior felt.

Condition 2 - 5 minutes

5. Play Squeeze.

Condition 3 - 35 minutes

1. Review class rules.
2. Review water cycle on overhead.
3. Complete Activity Sheet 6 as an individual activity.
4. Color worksheets and put into folders - 5 minutes.
Lesson 12

Objectives:
1. Introduce and role play food chains.
2. Observe for praising and cooperation.
3. Make group samples of food chains.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Discuss what a chain is. Brainstorm definition of a food chain.
2. Use cards to build, discuss and model food chains.
3. Review class rules and teacher observation goals.
4. Teams choose one food chain to illustrate. Team members each do one part of chain to be glued onto a strip to illustrate a completed food chain.

Condition 1 - 5 minutes
5. Processing - complete clown sheet individually on how well they cooperated and praised.

Condition 2 - 5 minutes
5. Silent reading.

Condition 3 - 35 minutes
1. Review Class rules.
2. Discuss what a chain is and develop class definition of a food chain.
3. Use cards to build and model food chains.
4. Students illustrate food chains independently.
5. Silent read - 5 minutes.
Lesson 13

Objectives:
1. Observe for taking turns and discussing topic.
2. Review all concepts taught to date.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Watch filmstrip Energy Everywhere as review.
2. Look at seedlings and discuss growth. Hypothesize why each one is at the stage it is.
3. Do Activity Sheets 16 and 17 with partners to review food chains.

Condition 1 - 5 minutes
4. Processing - discuss as a class praise and staying on topic - were they able to or not?

Condition 2 - 5 minutes

Condition 3 - 35 minutes
1. Review class rules.
2. Watch filmstrip Energy Everywhere as review.
3. Look at seedlings and discuss progress to date. Hypothesize why they are as they are.
4. Do Activity Sheets 17 and 17 individually.
5. Color worksheets - 5 minutes.
Lesson 14

Objectives:
1. Teacher observe for cooperation and doing fair share of the group's task.
2. Introduce the concept of an environment and look at four examples of environments.
3. Have each team or student choose an environment to make a mural of and begin work on it.

Lesson Plan:

Conditions 1 and 2 - 35 minutes

2. Discuss other possible types of environments.
3. Have each team choose an environment and plan a mural depicting it. Begin work on it.

Condition 1 - 5 minutes

4. Processing - discuss teacher observation results and complete process sheets.

Condition 2 - 5 minutes

4. Play Squeeze.

Condition 3 - 35 minutes

2. Brainstorm for other types of environments.
3. Students choose and begin work on individual pictures of environments.
4. Silent read - 5 minutes.
Lesson 15

Objectives:

1. Teacher observe for discussing, praising and doing fair share of group task.
2. Review concept of environment.
3. Complete murals or pictures of environments.

Lesson Plan:

Conditions 1 and 2 - 35 minutes

1. Each team discuss and reach group consensus of what an environment is. One spokesperson for each group explains definition.
2. Complete murals.

Condition 1 - 5 minutes

3. Processing - complete process sheet on team cooperation and discuss teacher observations.

Condition 2 - 5 minutes


Condition 3 - 35 minutes

1. As a class review concept of an environment.
2. Complete individual pictures of environments.
3. Silent reading - 5 minutes.
Lesson 16

Objectives:
1. Teacher observe for on topic discussion and taking turns.
2. Create a list of ways students can save energy.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Each group brainstorm for ways to save energy.
   Record ideas on class chart.
2. Read Arthur's New Power to the class and discuss.
3. Discuss Activity Sheet 19 on overhead.
4. Have groups do Activity Sheet 19 as a roundtable activity.

Condition 1 - 5 minutes
5. Processing - discuss teacher observations.

Condition 2 - 5 minutes
5. Listen to a story.

Condition 3 - 35 minutes
1. Brainstorm for ways to save energy and record on a class chart.
2. Read Arthur's New Power and discuss.
3. Discuss Activity Sheet 19 on overhead.
4. Do Activity Sheet 19 as an individual activity.
5. Listen to a story - 5 minutes.
Lesson 17

Objectives:
1. Teacher observe for on topic discussion, taking
turns and praising.
2. Students recognize fossil fuels as non-renewable.
3. Review how individuals can save energy.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Review class behavior rules and teacher
observation goals.
2. Read and discuss Student Book p. 14-15 and discuss
how energy is saved and what fossil fuels are.
3. Brainstorm in groups 6 ways we can save energy.
4. Begin work on cooperative poster Save Energy.

Condition 1 - 5 minutes
5. Processing - complete group processing sheet.

Condition 2 - 5 minutes
5. Silent reading - 5 minutes.

Condition 3 - 35 minutes
1. Review class rules of conduct.
2. Read and discuss Student Book p. 14-15 to discuss
how energy is saved and what fossil fuels are.
3. Class brainstorm and teacher record how we can
save energy.
4. Begin work on individual posters Save Energy.
5. Silent read - 5 minutes.
Lesson 18

Objectives:
1. Teacher observe praising, on topic discussion and sharing.
2. Review environments and food chains.
3. Complete Save Energy posters.

Lesson Plan:

Conditions 1 and 2 - 35 minutes

1. Each group present and discuss environment mural.
2. Each group present and discuss food chain mural.
3. Each group complete Save Energy poster.

Condition 1 - 5 minutes

4. Processing - class discussion of teacher observations.

Condition 2 - 5 minutes

4. Silent reading.

Condition 3 - 35 minutes

1. Review class rules from chart.
2. Through teacher-led discussion review the environments the students made.
3. Use large picture cards for students to build food chains for class to check.
5. Silent read - 5 minutes.
Lesson 19

Objectives:
1. Teacher observe for listening and participation.
2. Review all major concepts taught in the unit.
3. Increase awareness of individual responsibility for the environment and responsible use of energy.

Lesson Plan:

Conditions 1 and 2 - 35 minutes
1. Review rules of behavior and teacher observations.
2. Watch filmstrip *Energy Everywhere*.
3. Allow each group five minutes to determine the three most important things they have learned.
4. Spokesperson share ideas with class.
5. With partners complete word search activity.

Condition 1 - 5 minutes
6. Processing - complete process sheet about cooperative learning and unit in general.

Condition 2 - 5 minutes
6. Discuss unit in general.

Condition 3 - 35 minutes
1. Review rules of conduct.
2. Watch filmstrip *Energy Everywhere*.
3. Students list three most important things they have learned from unit. Teacher share with class.
4. Do word search activity individually.
5. Silent read - 5 minutes.
Lesson 20

Objective:
1. Administer post-test.

Lesson Plan:

Conditions 1, 2 and 3 - 35 minutes

1. Assign grade seven students with individual grade one students to administer the post-test. Students randomly assigned as they were for the pre-test and the mid-term test.
## SAMPLE OBSERVATION SHEET

Teacher's Group Observation Sheet

Date

### Interpersonal Skills

<table>
<thead>
<tr>
<th></th>
<th>taking turns</th>
<th>using names</th>
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<tbody>
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<td><strong>listening</strong></td>
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| Group 1       |              |             |
| Group 2       |              |             |
| Group 3       |              |             |
| Group 4       |              |             |
| Group 5       |              |             |
| Group 6       |              |             |
SAMPLE GROUP OBSERVATION SHEET

We took turns in our groups.

We listened and looked at the speaker.

We talked about the job.
SAMPLE INDIVIDUAL GROUP PROCESSING SHEET

Name ____________________

I took turns.

I praised my partners.

I used a quiet voice.
APPENDIX C

Appendix C contains the assessment measures used in the research in this paper. They consist of the pretest and posttest measures, the midterm, retention and generalization measure. It should be noted that the retention test is a combination of the pretest and the generalization test.
Pretest and Posttest Measures

Name

1. Circle the picture that shows energy:

2. Circle the picture that shows energy:

3. People get their energy from:

4. Some animals get their energy from:

5. Energy means being able to:
   a) work well
   b) feel glad
   c) do well

Pictures reproduced with permission of Seeds Foundation
6. Circle the picture showing energy being wasted:

7. Circle the picture showing energy being saved or conserved.

8. Circle the picture that shows where some machines get their energy.

9. Plants need 4 things to grow: sun, water, soil and
   a) rain       b) fertilizer       c) air

10. We save energy from gas and oil when we:
    a) go skiing    b) turn on the furnace    c) take a bus

Pictures reproduced with permission of Seeds Foundation
11. The most important thing in providing people with food is:
   a) a food store    b) a farmer    c) the sun

12. The most important thing plants need to make their food is:
   a) sunlight    b) air    c) fertilizer

13. Circle the picture that shows something that is not alive:

14. Circle the picture of a live thing:
15. Look at the picture of the food chain. Circle the picture of what is missing:

16. Look at the 3 sets of pictures carefully. Circle the set of pictures that shows a food chain or a food story.
17. Circle the picture that shows an environment:

![Environmental Pictures]

18. Look at the picture of the plant. Point to and name the 5 parts of a plant:

a) __________
b) __________
c) __________
d) __________
e) __________

Pictures reproduced with permission of Seeds Foundation
19. Look carefully at this picture of the water cycle. Tell how the water cycle works.
1. Look at the picture below. Explain how the water cycle works.
2. Circle what energy is:
   a) able to do work
   b) able to feel glad
   c) able to do well

3. Look at the picture of the plant. Point to and name the 5 parts of a plant.
   1) __________________
   2) __________________
   3) __________________
   4) __________________
   5) __________________

4. People get energy from:
   [Images of a person sleeping, riding a bike, and eating]

5. Some animals get energy from:
   [Images of plants, rock, and sun]

6. The most important source of energy for the world is:
   [Images of a gas pump, sun, and windmill]

Pictures reproduced with permission of Seeds Foundation
7. Plants need sunlight + soil + water +  
   to live and grow.

8. Circle the picture of a living thing:

9. Circle the picture of something not alive:

Pictures reproduced with permission of Seeds Foundation
1. Some animals get their energy from:

☐ Dog

☐ Fish

☐ People

2. Circle the picture that shows energy being wasted:

☐ Person heating water

☐ Man working

☐ Playing video game

3. Circle the picture that shows energy being saved:

☐ Frying

☐ Riding a boat

☐ Leaking water

4. Circle the picture that shows where some machines get their energy from:

☐ Battery

☐ Phone

☐ Plug

Pictures reproduced with permission of Seeds Foundation
5. We save energy from gas and oil when we:
   a) drive to the store
   b) turn down the furnace
   c) use the dishwasher

6. Energy means to have:
   a) enough sleep
   b) go power
   c) lots of money

7. Circle the picture that shows an environment:

8. Look at the picture of a food chain. Circle the picture that shows what is missing:

Pictures reproduced with permission of Seeds Foundation
9. Circle the set of pictures that shows a complete food chain:

10. Imagine the world without the sun. Tell what you think it would be like. How would it be different and why would it be different?
**Correlation Matrix**

<table>
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<th>PstA</th>
<th>RetentA</th>
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**Note.**
Vocab = WISC-R Vocabulary Test.
Gates = Gates-MacGinitie Reading Test.
PreA = Pretest Achievement.
PstA = Posttest Achievement.
RetentA = Retention Test Achievement.
GenA = Generalization Test Achievement.