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ABSTRACT

This report describes a project to test the effectiveness of a small-group curriculum designed to teach cooperative group work. The sample of 53 groups of boys and 47 groups of girls was assigned to one of three conditions: (a) established groups, (b) ad hoc groups, and (c) control condition groups. Groups who had training were predicted to choose more cooperative rules for structuring an assigned task than untrained groups chose. Established groups were predicted to choose more cooperative rules and to be more cohesive than ad hoc groups. For each of three types of rules, trained groups more frequently selected the most cooperative rule options. Choice of rules was unrelated to the sex of the group or the type of training but was related to behavioral cohesiveness. Cohesiveness was unrelated to type of training. This curriculum, composed of interesting classroom activities having significant effects, has been shown to be usable. The study provides no evidence of a need to keep the children together during the treatment. A 34-item bibliography is included and the following are appended: (a) "Description of Cooperation Minicourse," (b) "Three Patterns of Rule Options Used in Simulation Activity," and (c) "Methodology Analyses." (Author)

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FINAL REPORT

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SMALL GROUP COOPERATIVE CURRICULUM AND EXPERIMENTAL EVALUATION

A Study of Cooperation Training

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INTRODUCTION

The problem of cooperation in small groups has been of long-standing interest to both social psychologists and educators. From the former, it has been learned that interpersonal relations between participants in cooperative tasks are more positive than those of participants in competitive tasks. Several authors have reported less aggressive behavior, greater personal attraction, and a "warmer" atmosphere in cooperative as compared to competitive groups. Of the latter, John Dewey was one of the first to posit the advantages of social cooperation in educational settings. He believed that the child's mind grew through meanings acquired in social interchange--social cooperation and the methods of scientific investigation were the constants of curriculum; subject matter was the variable in curriculum (1899).

Regardless of the stated merits of interpersonal cooperation, the American school has traditionally remained competitive. The findings of several investigators point to the competitiveness of school-age children, this being especially true of the white, middle class, urban child. In the past few years, the set of beliefs upon which the orientation of the schools is based has been seriously questioned empirically. For example, Johnson and Johnson (1974) conclude that many of these beliefs, e.g. that competition builds "character," increases achievement orientation, and is congruent with the norms of the American society, are unfounded.

This conclusion suggests the need for curricula and activities whose focus is to foster interpersonal cooperation. However, a stumbling block to the development of such curricula is the lack of guiding theoretical principles. In the absence of a clear understanding of the parameters of cooperative interaction, the development of a cooperative activity must be based on intuition and trial and error.

During the late winter and early spring of 1974, a field experiment on intra-group behavior was conducted in 21 seventh grade social studies classes from three junior high schools in Palo Alto, California. The experiment was designed to determine the effectiveness of two treatments in producing cooperative interaction within groups of youngsters of the same sex. This was done by systematic measurement of the ways in which the groups organized themselves, how they interacted with each other, and their perceptions of the interaction that occurred while they participated in a simulation game.

THEORETICAL FRAMEWORK

A review of the literature reveals two separate prerequisites for cooperative activity within a social group: learning and structure.

Cooperation As A Learned Behavior

Based on many years of anthropological research, Mead has stated that "competitive and cooperative behavior on the part of individual members of a society is fundamentally conditioned by the total social emphasis of that society" (1937). In separate cross-cultural studies Doob (1952) and Bronfenbrenner (1970) have reinforced her findings, concluding that both competition and cooperation are learned behaviors.

Ethnic differences. Another group of studies considered the variability of children's behavior based on subcultural comparisons within a single society. Goodman (1952) found four-year-old white children to be less competitive than Negro (sic) children. However, two other studies found that Anglo children were more competitive when compared to either Black children, or to both Black and Mexican-American children (Sampson and Kardush, 1965; Madsen, Nelson, and Shapira, 1967).

Another pair of studies compared inter-ethnic differences controlling for socioeconomic status (Nelson and Madsen, 1969; Richmond and Weiner, 1973). Again the findings are conflicting: the first authors did not find differences between black middle- and lower-SES children and white middle class four-year-olds. In the latter study, however, statistically significant differences were found between pairs of white, lower class, first and second graders who were more competitive than were pairs of black, lower class youngsters. The inconsistency of the findings may be attributable to the difference in tasks used in the experiments, age differences, and socioeconomic differences. Despite the lack of consistency, the literature suggests that Anglo youngsters tend to be more competitive than children of other ethnic groupings.

SES differences. It has frequently been surmised but infrequently studied that patterns of cooperation and competition are a function of socioeconomic status as well as ethnicity. The findings of two studies which considered the interrelationship between SES and competition-cooperation do not agree. McKee and Leader (1955) who studied preschoolers found those from low socioeconomic backgrounds to be significantly more competitive than a comparable group from upper-middle class backgrounds. However, no substantial relationship between socioeconomic factors and degree of competitiveness was found in a group of comparable age in a study by Madsen, Nelson, and Shapira (1967). One concludes that SES may not exert an independent effect.

Age differences. There is some evidence to suggest that competitiveness increases with age. McKee and Leader reported that the older children in their sample were more competitive than the younger children. Using the same technique Richmond and Weiner (1973) and Kagen and Madsen (1972) found an age trend toward increasing competitiveness. Using a different experimental task, Madsen (1971) also demonstrated the relationship between increasing age and competitiveness regardless of cultural group. This consistent evidence is found by researchers who studied children from pre-school age through pre-adolescence.

Sex differences. At least until the end of elementary school, sex differences have not been related to the cooperative-competitive behavior of children. This assertion is supported by previous research in the area using both the Madsen Cooperation Board as well as a task Madsen refers to as the Marble-Pull Game (Richmond and Weiner, 1973; Madsen, 1971). It has also received support from cross-cultural studies (Shapira and Madsen, 1969; Madsen, 1971).

Urban-rural differences. Researchers interested in the effects of learning on cooperative-competitive behavior of children have also been concerned with environmental factors such as whether the children live in a city or in a rural

area. In general, these studies show that urban children are more competitive than comparable children that live in a rural area (Madsen, 1967; Nelson and Kagan, 1972). The work of Shapira and Madsen (1969) is the most relevant to the present project. They found that when Israeli children from urban areas and kibbutzim were presented with rules that defined the situation as cooperative all the children interacted cooperatively. To be sure, the children from the kibbutz cooperated to greater extent than the urban children. In other words, 1) the structure of the task induced cooperative interaction, and 2) knowing how to cooperate increases cooperative interaction. When the rules were changed so that the situation was defined as competitive, the urban children reverted to competitive interaction, while many of the kibbutz children did not. This last point can be interpreted in light of the results of a second experiment that they reported. When no rules were offered, the kibbutz children offered more non-competitive responses than the urban children. In summary, these findings suggest that urban, Anglo children are more easily influenced by the norms in their environment than are either rural children or children of color.

Task differences. From a series of studies reported by Breer and Locke (1965) two empirical generalizations can be drawn. First, people learn skills and the concomitant attitudes through experiences with various tasks. That is, the process by which demographic factors such as age, sex, SES, ethnicity and location come to affect propensity of children to cooperate or compete is through task experience. Richmond and Weiner's finding of a statistically significant interaction between grade in school and reward condition (group or cooperative reward versus individual or competitive reward) suggests that task experiences in school may result in greater competition among children. Second, Breer and Locke found that the more successful a group is as a group, the greater the group's solidarity. This finding has been supported by the research of others as well (Blanchard, Adelman, and Cook, 1970). In

other words, positive task experiences in groups will increase the cohesiveness of the group members toward one another.

This review suggests that white, urban, older children are more competitive than comparable groups not possessing any one of these characteristics, and that there is little support for the belief that competitiveness varies by sex.

Cooperatively Structured Activities

In addition to the important assertion that cooperative behavior is learned, the literature reveals several structural elements that are critical to the concept of cooperation. These are goal structure, structure of means, and tenure of the group (the length of time group members have worked together). The impact of these three structural elements is affected by a fourth element: the effect of the reward system used in many experimental studies.

Goal structure. Early work by Deutsch (1949) provided insight into one of the elements of this process. He defined a cooperative social situation as one in which an individual can obtain their goals. The movement of any individual toward a goal increases the possibility of others reaching that goal. He found that subjects in a cooperative endeavor showed less hostility toward their fellow group members, enjoyed the task more, displayed a greater motivation, and completed the task more efficiently than those in a task situation in which goals of one member were inversely linked to that of another member (a situation which is commonly called competitive with respect to goals). General support for these findings is provided by the work of Grossack, (1954), Hammond and Goldman (1961), and Smith, Madden and Sobel, 1957). Other studies, however, agree with only some aspects of Deutsch's findings. Shaw (1958), for example, found that the cooperative situation, though more efficient, proved less satisfying. Similarly, Juian and Perry (1965) found that the group and individual competitive conditions created more motivation among group members than the purely cooperative conditions, as well as greater productivity.

Structure of means. An insightful analysis by Thomas (1957) of the differences in the structure of the experimental tasks reconciled the discrepancies in the findings and predictions between Deutsch and Shaw. He pointed out that in the discussion tasks utilized in Deutsch's research the exchange of information and ideas was crucial to efficient task completion. By contrast, in the studies by Shaw, subjects operated on parallel but means-independent tasks. In other words, the "cooperative" task in Deutsch's original study can be thought of as having both interdependent means and goals while the "cooperative" task in the experiments by Shaw had independent means and joint goals. All of the studies favoring competition over cooperation did not require interdependence between participants for task completion, while the studies favoring cooperation did. Raven and Eachus (1963) experimentally confirmed the importance of means interdependence in the structure of the task. This distinction has been integrated into Deutsch's (1962) most recent statement of his theoretical position.

Tenure of the group. The amount of time that members of a group have worked together is critical to whether they will be able to work together effectively. For Deutsch (1962), trust is a precondition to cooperative interaction. This is thought to come about as people get to know one another and work through conflicts. According to Hall (1971) when persons have not worked together before, they perceive disagreements differently than persons who have established working relationships. In groups that are brought together ad hoc, disagreement implies interpersonal hostility or a threat to the integrity of the group. Where there is little initial conflict, better group problem solving occurs. In contrast, established groups perceive conflict as natural, inviting further discussion and alternative solutions. Hence, in the groups which had a history of working together, the ones which had a great deal of conflict initially did much better than groups with less conflict.

Effect of reward system in experimental tasks. A common aspect of most of the experimental studies is the use of rewards to stimulate cooperative and competitive interaction. For example, in the "cooperative" condition, all children are equally rewarded for completing the task, while in the competitive condition rewards only some are rewarded (Kogan and Carlson, 1969; Madsen and Shapira, 1969; Kogan and Madsen, 1969; Richmond and Weiner; 1973; Raven and Shaw, 1970). In both conditions, when studied experimentally, the subjects work for extrinsic motivators. Only in a few studies had the reward system been internal to the task (Shaw, 1958). The importance of the reward system is highlighted in the recent work of Deci (1972; 1974). His work indicates that some extrinsic rewards, such as money, will reduce intrinsic motivation to perform a task at some future time, while this does not occur when intrinsically interesting tasks are performed without extrinsic rewards. This finding complicates the interpretation of many experimental studies, and suggests that the use of an external reward system appears inadvisable if an educational application of the results is intended.

Research Questions for This Study

Based on the theoretical ideas of Deutsch and the empirical work of Hall, established groups are expected to be more cooperative in their interactions than groups brought together ad hoc. Therefore, we predict that:

Hypothesis I. When groups have worked together throughout their training, cooperative structuring of task rules is greater than when groups have not been trained together.

When groups are assigned a task whose completion can be accomplished either independently or interdependently, groups who have received specific training in cooperation are expected to perceive that cooperative interaction will result in optimal outcomes. It is predicted that:

Hypothesis II. When groups have cooperation training, cooperative structuring of task rules is greater than when groups have not received cooperation training.

The final hypothesis relates tenure in the group with cohesiveness of the group. We expect that greater cohesiveness will be found between members of established groups.

Hypothesis III. When groups have worked together throughout their training, cohesiveness is greater than when groups have not been trained together.

Definition of Concepts

The review of the literature provides us with a useful definition of cooperation.

Cooperation. In a cooperative social situation, an individual can obtain his goal if and only if the others with whom he is interdependently linked can obtain their goals. The movement of any individual toward a goal increases the possibility of others reaching that goal.

We have predicted that task rules will be structured more cooperatively in some situations as compared to others. By task rules we mean:

Task Rules. Task rules are explicit understandings that have been agreed on by each of the members of the group and guide the actions of the group in completing the task.

The review of the literature suggests that cooperation is a learned behavior. Therefore, experiences can be offered to individuals which will provide them with the skills necessary to initiate cooperative interaction.

Cooperation Training. The Cooperation minicourse is a series of activities which will demonstrate some of the principles of cooperative interaction: (1) Group efforts produce higher quality results than do individual efforts. (2) The contribution of each member assist the other members in moving toward their common goal. (3) Each member utilizes

different and unique skills in contributing to task completion. (4) Individuals must perceive the task as requiring interdependent efforts for efficient task completion.

Bales' (1951) early work provides a theoretical definition of group cohesiveness.

Group Cohesiveness. "The obligation to identify one's self as part of a larger whole, to feel the other's concerns as one's own, to share the other's fate; and the right to expect these attitudes and actions from the others."

RESEARCH DESIGN AND METHODS

The design for the study was an attempt to set up a carefully controlled experiment and at the same time to move toward application of the results by carrying out the research in a school setting using teachers to teach and evaluate the cooperation minicourse. Meeting both of these objectives completely was not entirely possible.

The basic design principles were (1) the division of the experience into an intervention phase (Phase One) and an evaluation phase (Phase Two) and (2) the use of a control group and two experimental groups.

During the first phase, teachers taught the cooperation minicourse for six 45-minute class periods over a period of two weeks to the students in the two experimental conditions. Students assigned to the control condition also remained in their classroom, but did not experience the cooperation minicourse. Students did not come into contact with the members of the research staff during the intervention phase. One week after the last lesson of the minicourse was completed, the second phase took place. Groups composed of four persons of the same sex were excused from class to participate in the evaluation activities, which were conducted by the research staff and took place in another part of the school.

The control group did not experience the intervention. The two experimental groups differed in the ways in which groups

were formed. Children in the Ad Hoc Groups Condition participated in rotating groups during both the intervention phase and the evaluation phase, while the children in the Established Groups Condition, once assigned, remained in the same group during both phases of the experiment.

The Sample

Composition of Sample. Only Anglo students from middle-class backgrounds were included in the study. The rationale for this decision is based on research findings which suggest that ethnicity and possibly socioeconomic status are differentially related to the propensity to cooperate. The Palo Alto Unified School District draws from a relatively homogenous urban population. In addition, the age range of the student population was only 11 to 13 years. On the variables of ethnicity, SES, urbanness, and age the sample was thus kept homogeneous to prevent the effect of nonanticipated variables from entering into the experiment. Both boys and girls were included in the study to allow for variability in cooperativeness by sex.

Selection of classrooms. Eight seventh-grade social studies teachers from the three junior high schools in the district agreed to participate in the study. Included in this group of teachers were all of the teachers from one junior high who taught seventh-grade social studies, two teachers from another school, and one teacher from the third.* The distribution of classrooms for each condition and for each teacher is displayed in Figure 1.

*Another teacher from this school agreed to participate, but his offer was not accepted because he has only one period of seventh-grade social studies.

Figure 1

Distribution of Classrooms by Condition and By Teacher

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Number of Teachers (N=8)	Condition		
	Control	Ad Hoc	Established
3	3		3
1	1	1	
1	1	1	2
1	1	2	1
1		2	
1		1	2
Total (N=21)	6	7	8

Classrooms were randomly assigned to conditions. More classrooms were assigned to each of the treatment conditions than to the control condition, and more classrooms were assigned to the established groups condition than to the ad hoc groups.

Assignment of students to groups. Individuals were randomly assigned to four-person groups within each classroom. Three criteria were used in the sampling procedure: (1) groups were composed of members of the same sex; (2) friends were not assigned to the same group; (3) only Anglo-American individuals were assigned to groups for the evaluation phase. Insofar as possible, rotation of individuals assigned to ad hoc groups eliminated the same persons from participating in more than one activity together.

Loss of subjects and groups. There were two major causes of loss of potential groups for the second phase of the study. The first cause was a flu epidemic during the winter of 1974 which accounted for the loss of four groups. Human error which occurred prior to the second phase of the experiment accounted for the loss of three more groups. By chance most of the losses

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occurred in the Control and Ad Hoc Conditions rather than in the Established Groups Condition as expected. Mechanical error in the video recording equipment resulted in the loss of data rather than groups. The final sample consists of 100 groups. The distribution of these groups by sex and by condition is displayed in the figure below.

Figure 2

Distribution of Groups for Each Condition and For Each Sex

Sex of Students	Condition			Total
	Control	Ad Hoc Groups	Established Groups	
Male Groups	14	17	22	53
Female Groups	15	16	16	47
Total	29	33	38	100

The Tasks

The training task. The cooperative skills training minicourse consists of a series of five activities demonstrating the principles of cooperative interaction. Three of these activities (Puzzle, Broken Squares, and Pantomime) had been developed earlier and used in an interracial summer school in a cooperative curriculum. The Survival Simulation activity was developed for the study; the Lost on The Moon activity has been widely used in adult groups as well as with children (see pp. 29-31 for teacher's evaluation of the curriculum). The activities and the principles of cooperation each demonstrates are described below.

- (1) Group efforts produce higher quality results than do individual efforts. Students were asked to do a task individually and then collectively. The efficiency and quality of the two outcomes are compared and discussed. The NASA "Lost on the Moon" game, used by seventh graders, successfully and forcefully demonstrates this principle (Hall, 1971).

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- (2) The contribution of each member assists the other members in moving toward their common goal. Two of the activities effectively conveyed the importance of each member's contribution for task completion. The most famous and commonly used activity to demonstrate this principle is "Broken Squares," which was originally developed by Bavelas (1949). The students also had to put a puzzle together in order to find out the instructions for completing the Broken Squares activity.
- (3) Each member utilizes different and unique skills while cooperatively contributing to task completion. The use of group Mime to convey a message demonstrates this principle well (Bloom and Stulac, 1972).
- (4) One must perceive a task as requiring cooperative efforts for efficient task completion. The Survival simulation is developed to be played by individuals or groups and forcefully demonstrates the differential advantages of cooperative interaction (Schuncke, 1973).

The new activities were pretested during their development, first to develop the activity, and second to pretest the teacher instructions. In addition, the entire procedure, including the skills training minicourse, was field tested prior to the actual study (a more detailed description is found in Appendix I).

The evaluation task. The Seal Hunting simulation activity was adapted for research purposes from an existing game. Seal Hunting is a board game that simulates a seal hunt among Eskimos. The board, a simulated ice floe, looks somewhat like one used in Chinese Checkers. In some of the holes "seal meat" is placed. A cover over the board prevents the players from seeing where these seal meat stickers have been placed. The players take turns poking holes in the board to try and catch seals. Each player has twenty turns "hunting." Unsuccessful hunters "starve" if they cannot get food, and can also "die" and be out of the game. There are strategies that hunters can use if they band together.

Two modifications were used. First, we increased the number of seals in the board and changed their placement from that in the original game. Second, we offered the students a choice of three types of rules: (1) rules for sharing or not sharing seal

meat stickers, (2) territorial rules, and (3) rules for planning their hunting strategy.

Upon pretesting we determined that selecting rules for the activity was a difficult procedure for children of this age. We therefore developed three types of rules, each with several options, and offered the children a choice of one of each type of rules. The order in which the choices of rules were presented to the students was determined randomly. Three sets of randomly ordered choices were developed. The effect of the order of the rules on the choices made by these youngsters is presented in Appendix III.

Procedures

The training task. A week prior to the planned starting of the skills training minicourse, two members of the research staff met with the participating teachers. First the teachers went through the activities as if they were student; then the activities were discussed from the perspective of the teachers. Activities were discussed to determine potential problems and possible solutions. For example, in the Lost on the Moon activity, the group scores should be higher than the mean of the individual scores. If an individual in the class brings up the fact that his own score is higher than the mean score for the group, the way the teacher approaches the question can be critical to the effectiveness of this activity. Alternate methods of handling this possibility were discussed in the teacher's training; they are also included in the teacher's manual.

During the latter part of the session, the teachers were given a manual which included lesson plans, copies of forms given to the students, and evaluation forms for each activity. In addition, they were given the randomly assigned groupings for the students, a schedule of rotations for classes assigned to the ad hoc group condition, and all the expendable materials they would need. Nonexpendable materials such as puzzles, and Broken Squares pieces were rotated between teachers. The teachers were requested to complete the six periods of activities within

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a two-week block. They were also told how to handle absentees in the groups. The teachers were reimbursed for the time spent in the training and preparation necessitated by the study.

While the research staff often consulted with the teachers during the first phase of the experiment, they did not go into the classrooms. The teachers made every effort to separate the activities during the first phase of the study from the activities during the second phase of the study.

The experimental task. Appointments for the group sessions in the second phase of the study were arranged with the teacher. The students were excused from their regular social studies class to participate. After all of the children arrived, they chose straws to determine where they would sit. The instructions for the activity were tape recorded. First, the students were asked to select the rules to be used in completing the seal hunting simulation activity. They were given five minutes to discuss and select a food distribution rule (sharing rule), a territorial rule, and a strategy rule from the lists provided. Before the discussion began, a video tape-recorder was unobtrusively turned on. After the rules were chosen, the remainder of the audio tape-recorded instructions were given. Before the students began the activity, nails for opening holes in the board and seal meat stickers (a three-day food supply) were provided.

Finally, the participants were given a questionnaire in which they were asked to rate the performance of the group members on a number of dimensions. After all of the participants had completed the questionnaire, the students were requested to keep confidential what they had done. This instruction was effective; we later discovered that one sister had not told her twin what she had done prior to her sister's participation. In fact, the youngsters would not even confide in their teachers when requested.

The experimental environment. The study took place within the facilities of the three junior high schools in Palo Alto, California. The first phase occurred in the regularly scheduled

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classrooms. For the second phase, we selected rooms, either classrooms or multi-purpose rooms, sufficiently large to set up equipment for two groups at the same time. The room was arranged to provide maximum privacy to the two groups of students, and through the use of remote microphones sound distortion was eliminated. Usually, two members of the research team ran the experiment. The coordinator for the group was of the same sex as the group members. These precautions were taken because of research evidence of experimenter effects in situations where a male experimenter worked with female subjects (Kruse, 1972). In a few groups where scheduling precluded this arrangement, a female coordinator was used with male groups. While the same script was used, a female voice gave instructions for the female groups and a male voice gave instructions for the male group.

The video equipment was in place when the subjects arrived. As previously stated, it was turned on when the students began the discussion of rules. In a few cases it was obvious that the children were aware of the equipment. Often the children were rather oblivious to it. This school district does have similar equipment and the children are frequently exposed to it. Overall, because of the unobtrusiveness of the procedure, the students' previous exposure to the equipment, and the time between turning the equipment on and collecting data, little if any, biasing can be attributed to the video equipment. The second phase of the study took approximately thirty minutes to complete.

Data Collection

Data were collected from three sources: (1) the initial group discussion; (2) videotapes of the group process during the completion of the simulation activity; and (3) a questionnaire filled out after the simulation activity ended. Potential experimenter effects were controlled in two ways. First, coordinators of the groups were unaware of the hypotheses being tested. Second, only one member of the team did the scheduling, using a single-blind system which precluded either the coordinators

of the groups or the scorers of the videotapes from knowing to which condition a particular group belonged.

Task rules. The rules selected by each group are the indicator of cooperative structuring. The options for each of the three types of rules form an ordinal scale. (See Appendix II for chart of options for the three patterns of rules.)

The food distribution rule determines if and how the food that is caught by the "hunters" will be allocated during the twenty days that the hunters are on the ice floe. The most cooperative choice is the "equal sharing rule," which provides for the pooling of the food supply for all to use equally regardless of their hunting success. The "unlimited" and the "limited" sharing rules can be likened to charity -- giving food away when the supply is abundant. The "loaning rule" is an acceptable rule in a capitalistic society -- seal meat stickers which are loaned must be repaid. The fifth rule is the most individualistic, i.e. the "personal" food rule implies that one eats only as long as a personal food supply exists.

The four territorial rules concern possession of the ice floe by the hunters. The most cooperative choice is the "free territory rule," followed by "temporary possession," under which with one option the owners are free to grant hunting rights to others and with the other option hunting rights are exclusively the possession of the owner. Once a seal is found, hunting is improved in the surrounding air holes because "sometimes seals are found in pairs." Students may not want others to hunt in the area where a seal was found if they see the activity's goal as being independent. The least cooperative choice is the division of the ice floe into permanent territories, using a priori division of the board provided on the reverse side of the board's cover.

The third type of rule concerns the type and amount of interdependency allowed in the planning of hunting strategies. Joint planning is the most interdependent of the options. A second choice involves the joint planning of an overall strategy, but

independent planning of each move. Slightly less interdependent is an overall strategy for each member with group advice allowable. The final option is complete independence of the means.

In this study, the type of goal is left ambiguous. The task allows for either an individual or an interdependent goal. The data from this measure were used to test the first two hypotheses.

The measurement of behavioral cohesiveness. Behavioral cohesiveness is an indicator of the trust developed in the group. The observers coded all the socio-emotional participation in the group using the Roper (1970) modifications of Interaction Process Analysis (Bales, 1951). They coded all acts classified as Group Solidarity (GS), Tension Release (TR), Raising Status (RS), and Lowering Status (LS).

The observers noted the number of the persons making the remark (the initiator) and to whom the remark was addressed (the recipient) for both RS and IS acts, while only the initiator was coded for GS and RT acts. An act was defined as an uninterrupted speech of varying length containing one complete thought of an actor addressed to another actor in the group or to the group as a whole. If a speech were interrupted by another actor or if the recipient changed, another act was scored.

Two independent scorings of every third group formed the basis for determining interobserver reliability. Comparisons were made between the total acts scored for each member of the group on initiator of acts and receiver of the act. A chi-square test of significance was used to determine whether the disagreement between the observers' coding could be reasonably attributed to change. A $p \geq .90$ was used as the criterion that the scoring was reliable.

The four observers were trained using videotapes from pre-test groups. Coding of the tapes did not begin until the criterion reliability was met. When a subsequent reliability check failed to meet the criterion, all tapes from the last criterion test (two tapes) were recoded and checked. Data from this measure were used to test Hypothesis 3.

The measurement of perceived cohesiveness. Group members' perceptions of cohesiveness of the group is a second indicator of the development of trust within the group. This measure is a Guttman scale used by Heinicke and Bales (1953). The five items from their scale included in the questionnaire are:

1. The atmosphere in this group is pleasant and congenial.
2. There is plenty of freedom to talk in this group.
3. I am well satisfied with my position in this group.
4. The morale of this group at this point is high.
5. This is one of the best groups I have worked in.

Item Two was eliminated from the final scale in order to get adequate reproducibility; the elimination of Item Three increased the scalability sufficiently to insure the underlying unidimensionality of the scale. (In other words, the items in the scale are valid measures of a single concept.) The differences in maturity between junior high school students and the college age students used in the development of the scale probably account for the lack of differentiation between Items One and Two. Since Heinicke and Bales did not report scalability, it is difficult to account for the necessity of eliminating item Three. The final scale, also used to test Hypothesis 3, ranged in value from 0 to 3 and contained items 1, 4, and 5; its reproducibility was 0.94 and its scalability was 0.63.

RESULTS

The group is the unit of analysis. The group as opposed to the individual level of analysis is selected because the composition of a work group exerts a more powerful force on behavior than do individual differences within that work group. Each group is treated as an independent sample; that is, the fact that groups have different teachers is not taken into account. In the analysis of the data to test the first two propositions, namely the relationship between the treatment and the selection of task rules, data are collected for groups only. The analysis of the data relevant to the last proposition, that type of training affects cohesiveness of the group, is based on aggregated individual data. The procedures by which the data are aggregated are discussed in relationship to the particular analysis.

Prior to combining the samples of groups of boys and girls, the analysis of the effect of gender is carried out. When differences exist, results are reported separately.

Effect of Type of Training: Hypothesis One

When groups have worked together throughout their training, cooperative structuring of task rules is greater than when groups have not been trained together.

The theoretical framework suggests the importance of trust in the initiation of cooperative interaction. That is, members of groups will approach a task differently if they have had previous experience in working together. In this study, the indicator of trust is whether or not the members have been in the same group during both phases of the study (established groups) or have been in different training groups during both phases of the experiment (ad hoc groups).

The first step of the analysis is to examine whether differences in the responses of the male groups and the female group for each rule can be attributed to chance. A very simple way of doing this is by comparing the responses of the male groups with the female groups. The data were dichotomized because the responses in many of the options were small and the sample size is small. Since there is no substantive basis for combining rule options, responses were dichotomized into the "most cooperative" response versus "all others." The chi-square statistic was used to determine the significance of the relationship between the variables of sex and choice of cooperative rules. None of the chi-squares for the three kinds of groups and the three types of rules began to approach significance.

Table 1 shows the results of the analysis of differences between treatments. For each of the 2 x 2 contingency tables with one degree of freedom, a chi-square value of 3.8 is needed for significance at the 5 per cent level, and a chi-square value of 2.7 is needed for significance at the 10 per cent level in the resulting 2 x 2 contingency. For both the territorial

TABLE 1

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Frequency of Groups Selecting Most Cooperative Rule
Option for Each Type of Rule and for Each Type of Training

Type of Training	Type of Rule					
	Sharing		Territory		Strategy	
	Cooper- ative	All Others	Cooper- ative	All Others	Cooper- ative	All Others
Ad Hoc (N=33)	12	21	25	8	9	24
Established (N=37)	13	24	23	14	5	32

rule and the strategy rule, a greater proportion of the ad hoc groups selected the cooperative rules than did the established groups. The differences is thus not in the predicted direction. No relationship is found between the sharing rule and the type of treatment. When these data were examined using the chi-square statistic, none of the relationships were found to be significant. The data do not confirm the prediction.

Effects of Training on Task Structure: Hypothesis Two

When groups have cooperation training, cooperative structuring of task rules is greater than when groups have not had cooperation training.

Since there are no significant differences between the two types of training, the data are combined for the analysis of the second prediction. Again, the measures of rules are collapsed to "most cooperative" rules and "all others." The results of this analysis are found in Table 2. Twenty percent more of the treated groups chose the most cooperative of the sharing rules than did the nontreated groups. Using the chi-square statistic as a measure of the strength of the relationship

TABLE 2

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Frequency and Percentage of Groups Selecting Most
Cooperative Option of Sharing, Territory, and Strategy
Rules for Trained and Untrained Groups

Rule (df = 1)	Condition	Rule Options	
		Most Cooperative	All Others
Sharing $\chi^2 = 3.60$	Trained	26 (37.0)	45 (63.0)
	Untrained	5 (17.0)	24 (83.0)
Territory $\chi^2 = 3.80$	Trained	49 (69.0)	22 (31.0)
	Untrained	14 (48.0)	15 (52.0)
Strategy $\chi^2 = 2.60$	Trained	14 (20.0)	57 (80.0)
	Untrained	2 (7.0)	27 (93.0)

indicates that the probability of this strong a relationship would occur by chance 5 to 10 percent of the time. A similar trend is found for the choice of territorial rules: treated groups selected the free territory in 21 percent more of the groups. The results of the chi-square test show that $\chi^2 = 3.8$, which with d.f.=1 is significant at the .05 level. A much weaker, but similar trend is found in the data for the strategy rule. The treated groups were 13 percent more likely to select the highly interdependent strategy rule than were the nontreated groups. Although this relationship is not statistically significant, it would become significant assuming a larger sample size and similar trend. For all three of the rules the relationship is in the predicted direction. The treated groups were more likely to select the equal sharing rule, the free territory

rule, and the group plans everything rule than were the nontreated groups. The relationship is the strongest for the territory rule, followed by the sharing rule and the strategy rule. Although none of the relationships are overwhelming, the weight of the evidence confirms the prediction.

Another procedure for examining the way the groups structured the task is by looking at the combination of rules that each group chose. There are approximately 80 different possible combinations of rules that the groups could have selected. In fact, the groups did select 38 different combinations. These combinations were collapsed into five categories. This category system was developed independently by two members of the research staff. There was surprisingly little disagreement on the classifications, and the existing disagreements were jointly settled. The values of the resulting scale range from one to five, with the most cooperative set of rules given a value of five. The mean value of the rule sets for the established groups is 3.14, for the ad hoc groups 3.17, and for the control groups 2.4. This suggests that treated groups were more likely than nontreated groups to structure the task more cooperatively. No significance testing was carried out for this analysis.

Group Cohesion and Type of Training: Hypothesis Three

When groups have worked together throughout their training, cohesiveness is greater than when groups have not been trained together.

If feelings of trust have developed among the members of the groups that received their training together, these feelings will be reflected in the way the members interact with one another and in their perceptions of cohesiveness. Two indicators of the groups' cohesiveness were measured: a behavioral measure and a perceptual measure. Each indicator will be considered separately. The relationship between the measures is also presented.

Behavioral measure of group cohesion. Measures of behavioral cohesiveness are determined by counting the number of socio-emotional

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acts in each category. The contribution of each activity category is calculated into a percentage of the total acts for each group. Each activity category is summed across a condition, and then divided by the number of groups in a condition. This procedure is followed in order to weight all groups equally. In Table 3, the resulting mean percentages for behavioral cohesiveness are

TABLE 3

Mean Percent of Behavioral Cohesive Acts for Male and Female Groups and for Groups Combined, by Condition

Sex	Condition		
	Control	Ad Hoc Groups	Established Groups
Male Groups	26.3 (N=11)	18.5 (N=13)	23.4 (N=18)
Female Groups	18.7 (N=13)	27.9 (N=14)	24.3 (N=18)
Groups Combined	22.5 (N=24)	24.1 (N=27)	23.8 (N=36)

arranged in the table so that differences between the boys' groups and the girls' groups for each condition can be examined. The mean percentage of group cohesive acts for the male groups is shown in Row 1; for the female groups in Row 2; and for the comparison by condition in Row 3 of Table 3. Data are missing for 13 of the groups due to mechanical problems with the video recording equipment. Five of the missing groups are from the control condition, six from the ad hoc groups condition, and two from the established groups condition. The first thing to

note in Table 3 is the strong reversal between the control condition and the ad hoc condition. Male groups in the control condition exhibit far more cohesive behavior than do the female groups, while the exact opposite is true in the ad hoc groups condition. Very little difference is found between the male and the female groups in the established groups condition. Keeping in mind that the small sample size in these conditions suggests that the means may not be stable, the finding is contradictory to earlier findings of no sex differences on the three types of rules. When all of the groups in a condition are combined, a small difference is found between the nontreated groups and the two treatment conditions. And a differences of less than 0.3 percent is found between the two treatment conditions, with the ad hoc condition exhibiting more group cohesive behavior. These data do not confirm the third prediction.

Another way of looking at the data is to consider whether cohesive behavior is related to the ways in which the group structured the task. For each sharing rule, a mean percentage of cohesive acts is calculated by condition. The results of this analysis are found in Table 4. In general, the greater the amount of interdependence in the structuring of the rules, the higher the mean percentage of group cohesion. The only reversal is found for the "limited sharing" rule in the ad hoc condition, which is slightly higher in cohesiveness than is the "unlimited sharing" rule. These findings suggest an interaction between behavioral cohesion and choice of rules. In other words, while training affects choice of rules, it may only partially explain differences in cohesiveness between groups. This finding was not predicted.

TABLE 4

Mean Percent of Behavioral Cohesive Acts
Under Sharing Rule, by Condition

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Sharing Rule	Condition		
	Control	Ad Hoc Groups	Established Groups
Equal Sharing	31.4 (N=3)	33.7 (N=10)	32.5 (N=12)
Unlimited Sharing	23.3 (N=9)	16.8 (N=7)	25.5 (N=12)
Limited Sharing	23.0 (N=3)	17.1 (N=2)	20.3 (N=3)
Lending	17.9 (N=10)	16.6 (N=5)	15.6 (N=8)
Personal Food Rule	--	7.2 (N=2)	--

Perceptual measure of group cohesion. Individuals' perception of their groups cohesiveness is measured by a three-question Guttman scale which the participants answered after completing the simulation activity. Prior to the hypothesis testing, data were analyzed to determine whether the perceptions of the group were valid measures of the feeling tone of the group. The Hartley test was applied, with the results indicating that the samples were homogeneous (Walker and Lev, 1953). One-way analysis of variance was applied to each condition. The Γ tests for all three analyses are significant with a $p < .01$, indicating that there is a high degree of congruence between the members' perceptions in each group.

The second indicator of cohesiveness is based on the perceptions of the group's members. If training together increases the cohesiveness of a group, a higher level of perceived cohesiveness should be found in the established groups as compared

to the ad hoc groups. A summary of these means is found in Table 5. The mean level of perceptual cohesiveness is slightly

TABLE 5

Mean Perceived Cohesiveness for Each Group
by Sex of Group and for Each Condition
(Low=1, High=3)

Sex of Group	Condition		
	Control	Ad Hoc	Established
Male	2.8	2.1	2.5
Female	2.3	2.5	2.6
Combined	2.58	2.375	2.55

higher (2.55) in the established groups condition than in the ad hoc groups condition (2.375). In addition, the variance of 0.4 for the established groups is lower than the variance of .63 in the ad hoc groups, indicating that the groups in the former condition were more homogeneous in their perceptions of what went on in the group. While predictions were not made for the control condition, it is interesting that the mean cohesiveness is slightly higher than that of the established condition (2.58); the variance of this measure is intermediate. These data suggest that training does not produce cohesiveness.

When means are calculated for the male and female groups in each condition, the findings are comparable to similar measures using the behavioral data. The male groups in the control condition perceived higher cohesiveness in their groups than did the female groups, while the findings are reversed for males

and females in the ad hoc groups condition. The means for the established groups condition differ little by sex of the group.

It is interesting that the indicators of cohesiveness are unrelated. The product-moment correlation coefficient between behavioral and perceptual cohesion is .06. However, separate correlations were calculated for each condition, with somewhat surprising results. A weak relationship is found between these measures in the control condition ($r=0.12$); however, a much stronger relationship is found in the other two conditions ($r=0.40$ in the established groups condition and $r=0.49$ in the ad hoc groups condition). This suggests that the perceptions of the groups in the control condition did not reflect the group process as well as did those of the groups in the two experimental conditions.

Evaluation of Cooperative Skills Training Minicourse

Three criteria were used by the authors in the selection of the activities which constituted the cooperative curriculum: intrinsic interest to students; minimal teacher supervision while being completed; and potential for students to learn principles of cooperative group work inductively. The researchers were interested in determining how well the curriculum met these criteria when utilized under actual classroom conditions on a larger scale than that attempted by the pilot testing.

This was accomplished by asking the teachers, at the completion of each activity, to evaluate it on the basis of the criteria. Realizing the time constraints put upon teachers by obligations other than the cooperative curriculum, and assuming that the teachers might be put off by an overly involved evaluation questionnaire, the researchers decided to limit the evaluation form primarily to questions with multiple responses which could be checked off by the teachers. Teachers were, however, given the opportunity to respond to open-ended questions concerning the activity. As expected the bulk of the teacher evaluation data came from the multiple-choice questions and can provide only a thumbnail sketch of teacher estimates of the effectiveness of each activity. These can be examined for each of the three criteria.

Interest. All teachers reported their students to be interested to some degree in all of the activities. Pupils demonstrated the greatest interest in the pantomime and broken squares activity followed by lesser interest in the NASA and survival activities. This variance in interest may be due to the fact that the former two exercises entail physical activity and may have been a departure from regular school routine while the latter activities fit more closely the child's expectations for a social studies class. This should not suggest, however, that the students were uninterested in the latter activities -- no teachers reported that their students were "not interested" in any activity. Since all activities met the criteria of interest, it was concluded that the curriculum, as a whole, was intrinsically interesting to the students.

Minimal teacher supervision. In order to determine the quantity of teacher supervision required by an activity, the question "How closely did your pupils follow the guidelines of this activity?" was asked for each activity. Aside from the pantomime activity, which all teachers reported required little supervision, there was little agreement among the teachers on the degree of supervision required. This is understandable in light of the fact that all of the activities, aside from the pantomime, entail rather complicated directions to the students, which must be understood to insure completion of the activity. It suggests, for future work, that either the directions be simplified for the activities, or new simpler activities be introduced to replace them. Since there was general consensus among the teachers that none of the activities required a great deal of pupil supervision, the former suggestion would appear to be more tenable. Given this consensus, it can be concluded that the curriculum met the second criterion, but not to the extent expected.

Effectiveness in teaching group work skills. In this section of the evaluation, teachers were asked to make judgments, based on their observations of pupils at work, as to whether the students were in fact picking up skills of working together.

Pantomime, broken squares and the NASA activity were noted by all teachers to be effective in this regard. It was only with the survival game that there was disagreement among the teachers, with three of the eight teachers perceiving it to have no effect whatsoever and only one teacher perceiving it to be extremely effective. It is interesting to note that the three teachers who saw no effect were all teachers of classes with established groups -- four-person groups which had experienced all activities together -- and that it was in these classes that students chose to work individually because "they were tired of working together."

DISCUSSION

Children exposed to the cooperation minicourse selected the most cooperative rules more frequently to structure the simulation activity than did comparable groups not exposed to the training. This was more noticeable in the territory rules and the sharing rules than in the strategy rules. Since the curriculum activities did not stress group planning, it is not surprising that the results for the strategy rule were the weakest.

The predictions that individuals working together during both phases of the study as compared to individuals who rotated among ad hoc groups would (1) select the most cooperative rules (Hypothesis 2) and (2) have the most cohesive groups were not supported (Hypothesis 3). There is almost no difference between the two treatment conditions for any of the three types of rules. But although the established groups perceived more cohesiveness than did the ad hoc groups, the perceptions of cohesion by those in the control condition were equal to those of the established groups. Members of both treatment groups did behave more cohesively than did members of control groups.

This lack of findings can be interpreted as the result of several different forces working together. First, it is possible that the manipulation was not strong enough. That is, since the

children had been together for almost six months prior to their participation in the cooperation minicourse, enough rapport might have developed between all of the members of the class so that rotating between groups was not different from staying in the same group. In other words, the groups were established groups whether or not they rotated in membership. Second, some of the curriculum activities were differentially effective. Three of the teachers who taught only established groups reported that the children worked on the survival activity individually since they "were tired of working together." Third, it is likely that the curriculum did not provide sufficient skills in working out interpersonal problems which occurred among some of the established groups. Finally, the theoretical ideas forming the framework of this study may be at fault. Whether any one or a combination of these reasons is responsible for lack of support for these two predictions as to the differential effectiveness of established groups will have to await further investigation.

The third prediction concerned the importance of trust among members of a group prior to initiating cooperative interaction. It was assumed that groups who have experiences in working together would have more opportunity to work through differences, and would become sufficiently trustful of one another to cooperatively structure an activity. Analysis of the behavioral data of group cohesiveness provides several insights into the process by which cooperative interaction is maintained. Regardless of condition, the cohesive behavior of the group is strongly related to the degree of cooperativeness in the rules selected. This finding underlies the powerful effects that group structure exerts on behavior. For teachers it indicates the importance of knowledgeably setting up learning activities. Data from other studies have hinted that school tasks may be responsible for the increasing competitiveness of children as they go through school. The results of this study provide strong evidence of this fact.

The data show how accurate children are in reading the social cues in their environment. The low correlation between

the perceptual and behavioral measures of cohesion in the control condition suggests that these children may have been reacting to the experience of being in a group activity, perhaps for the first time. In other words, the first experience had a Hawthorne effect, with the children responding positively to the experience on the questionnaire regardless of their experience in the group. The children in the two treatment conditions may have been responding more closely to the experience they had just completed as, evidenced by the high correlations between behavioral and perceptual measures of cohesiveness.

In general, the findings from the study support earlier experimental research on cooperation. At the same time, new insights are provided and new questions are raised. First, the results indicate that training is a necessary condition for cooperation to be initiated. Second, task rules are responsible for the maintenance of cooperative interaction. Finally, we have learned that cooperation will be initiated without external rewards provided that the tasks themselves are intrinsically interesting. This last point is extremely important in the consideration of the curriculum for use in the schools, since extrinsic rewards for task completion are associated with decreased intrinsic motivation of students to perform a task in the future. Cooperation has been conceptually treated in this study as a unidimensional concept, while it has been empirically treated as multidimensional. More work needs to be directed toward further understanding of this concept. For example, the first step might be in determining just what the children learn from the treatment.

This curriculum, composed of interesting classroom activities having significant effects, has been shown to be usable. Inclusion of process skills necessary for working on consensus tasks would make a stronger treatment. While there is no evidence for keeping the children together during the treatment, if process skills are included then it may become more important.

The next step in the research process would be strengthening of the curriculum by introducing process skills for use in group discussions. Assuming that findings from this step show increased cohesiveness of treated groups, we are ready for classroom application.

The next step toward application would be the institution of this cooperation curriculum at the beginning of the school year. In this way students will perceive it to be a part of the ongoing activities in the classroom. Under such conditions, the curriculum should become even more effective in training children to work together on tasks where cooperation has optimal benefits.

The utility of cooperative group work in racially integrated and mixed sex groups has been supported by others (see Johnson and Johnson, 1974; Cohen, Katz, and Lohman, 1974). How applicable this curriculum would be in such settings requires further investigation.

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Appendix I

Description of Cooperation Minicourse

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The curriculum in cooperation consisted of four activities which were judged, by the authors, to meet several criteria: (1) they were intrinsically interesting to seventh grade students; (2) a major part of the activity could be completed in a small-group setting, with little direct teacher supervision; and (3) they were activities from which students would be able to inductively learn principles of cooperative group work. A pilot-testing of the activities with seventh graders indicated that the activities were meeting these criteria.

The first of the four activities to be presented to the students was an adaptation of the NASA exercise, "Lost on the Moon" (Pfeiffer and Jones, 1970). In this exercise students were initially required to individually rank order a list of items as to their usefulness on the moon. After working individually, this ranking was done in four-person groups. Then, the accuracy of the individual and group rankings was determined by comparing them with a list of correct rankings. Since in almost all cases groups were more effective than individuals in this activity, the teacher-led discussions which followed the NASA exercise were structured to elicit the reasons for this relative effectiveness. This activity was done in two one-hour blocks over a period of two days.

The second activity was divided into two parts, and was completed in one class period. The four students of a group were first each given a packet of puzzle pieces and told that the puzzle contained the directions for the main part of the activity. When this puzzle (a large piece of poster board) was completed, the students began "Broken Squares" (Pfeiffer & Jones, 1970). Here students were required to construct five squares from puzzle-pieces they were given. No talking was allowed in this activity and students were not allowed to communicate the need for a puzzle piece or to take a piece from another person's pieces. An individual, however, was allowed to give pieces. The puzzle pieces were distributed in such a manner that successful completion of the activity depended upon each group member's giving away at least one puzzle piece. The follow-up discussion for this activity focused on group work skills and contrasted the skills needed in this activity with the different type of skills (e.g. listening skills) required by the NASA exercise.

The third activity centered on pantomime and was used to reinforce the idea that, in group work, each member may contribute unique skills to the completion of a task. Groups were asked to decide upon a message to be delivered to the rest of their class in pantomime, to practice delivering this message, and to deliver it. In this activity members of other groups decoded the pantomimed messages.

A survival simulation provided the focus for the final two days of the curriculum. In the first part of this exercise students were told that they would be placed on an island and would be allowed to carry a limited number of survival items with them. In this activity students were given the option of attempting survival alone, carrying five survival items, or functioning as a group with ten survival items. They were told that, in deciding upon these items, they should write down situations they might encounter. In the second part of the exercise these survival situations were collected by the teacher, and ten of them were chosen to represent survival situations to be faced by all of the groups or individuals. These were then read aloud and students determined whether, indeed, they had brought items which would allow them to survive.

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Although a comparison was made between the number of survivals for individuals and groups, the main emphasis in the discussion which followed this activity was upon group work skills. Groups which had chosen to work together discussed the difficulties encountered in the process of choosing survival items, while pupils who had elected to attempt survival alone were asked to cite reasons for this choice. Interestingly, these reasons usually centered on perceived difficulties in cooperating as a group.

In addition to these small-group activities a large thousand-piece jigsaw puzzle, accompanied by a poster which read "Puzzles are a way for large groups of people to work together," was given to each class participating in the curriculum. These puzzles were a supplementary activity meant to be utilized to prevent groups who had finished their activities from disturbing groups still at work. It is interesting to note that many teachers reported that this supplementary activity met the criteria mentioned above quite well and, as such, enhanced the learning of cooperative behavior in their pupils.

APPENDIX II

THREE PATTERNS OF RULE PATTERNS USED IN SIMULATED ACTIVITY

FOOD **BEST COPY AVAILABLE**

HOW YOU HUNT

TERRITORY

Equal Sharing: All members combine their daily food and all seals they catch. Members share all food equally.

Unlimited Sharing Rule: Members keep own food, but can share it with other members whenever they desire.

Lending Rule: Members may lend food to other members, but this food must be paid back as soon as the person catches a seal.

Personal Food Rule: Each person takes care of his own food. No sharing or lending is allowed.

Limited Sharing Rule: Members may share food with others but may give two pieces of meat, at the most, to each other person.

Group Plans Everything: The group begins by choosing an overall hunting strategy for the 20 day hunt. At any point, they can change the strategy if they desire. The group also decides where each person will hunt each day.

Group Advises: Each person decides on his own hunting strategy for the 20 day hunt and for each day. Members of the group may make suggestions to other members each day.

Personal Hunting Rule: Each person decides on his own hunting strategy for the 20 day hunt and for each day. Members of the group may not make any suggestions to each other.

Group Plans Part of Hunt: The group, as a group, decides on a hunting strategy for the whole 20 day hunt, but does not decide where each person will hunt each day. This is done by each person.

Permanent Territory: Before the hunt the hunters divide the ice floe into 4 territories. Each hunter owns one of these territories and only he may hunt in that territory. Hunters may not hunt in other hunters' territories.

Free Territory: Members may hunt anywhere they care to hunt.

Temporary Territory: Owner Permission: When a person opens a breathing hole and catches a seal, he owns the hole around that hole for the next day of the hunt. Other hunters must ask his permission to hunt in these holes. If he wishes, the hunter may give permission.

Temporary Territory: No Permission: When a person opens a hole and catches a seal he owns the breathing holes that form a circle around that hole for the next day of the hunt. Other hunters may not ask permission to hunt in these holes and the owner may not give this permission.

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HOW YOUR HUNT

SHARE YOUR HUNT

Lending Rule: Members may lend food to other members, but that food must be paid back as soon as the person catches a seal.

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FOOD

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HOW YOU HUNT

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WHERE YOU HUNT BEST COPY AVAILABLE

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APPENDIX III
METHODOLOGICAL ANALYSES

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Two analyses were completed which consider the effects of the experimental design on the results and on the quality of the measures themselves.

Effect of Order of Rules on Their Selection

Previously, it was stated that each participant was given a copy of the three rules and their options. The order in which the options for each rule appeared on these sheets was random. Three different patterns were assumed; each group randomly received either Rule Set 1, 2, or 3. In order to determine whether the order of presentation of the rules affected their selection, the frequency with which groups using Rule Set 1, 2, or 3 chose each rule was calculated. The results of this analysis are found in Table 6 (see Appendix II for the three patterns of rules).

TABLE 6

Frequency and Percentage of Groups Choosing Most
Cooperative Rule Option for Each Type
of Rule and for Each Rule Set

Rule Set	Sharing		Territory		Strategy	
	Most Coopera- tive	All Others	Most Coopera- tive	All Others	Most Coopera- tive	All Others
1 (N=35)	11 (11.4)	24 (25.0)	23 (23.9)	12 (12.5)	7 (7.2)	28 (29.2)
2 (N=34)	9 (9.4)	25 (26.0)	19 (19.8)	15 (15.6)	8 (8.3)	26 (27.1)
3 (N=27)	10 (9.6)	17 (17.7)	19 (19.8)	8 (8.3)	2 (2.0)	25 (26.0)
	$\chi^2=.783$		$\chi^2=1.476$		$\chi^2=2.88$	

number of missing observation = 4

III-2

Of the three sets of rules, number three appears to be the only one having a relationship with subsequent choices of rule options. Groups given this rule set are seven percent less likely to choose non-cooperative sharing and territory rules and six percent less likely to choose the most interdependent planning strategy. A chi-square test was utilized to determine the strength of these relationships. In order to be significant at the .05 level, X^2 with 2 degrees of freedom must be greater or equal to 5.99; at the .10 level, it must be equal or greater than 4.64. Since none of the X^2 approaches these figures, we can conclude that the order of presentation of the rules did not affect the results obtained in the prior analyses.

Effect of Behavior Over Time

Earlier, the number of videotapes of groups due to a combination of the malfunctioning of the video-recorder and human error was detailed. In addition to losing sound and/or pictures on thirteen tapes, one or two turns of several of the other tapes were in too poor condition to be coded. There are two possible ways of dealing with this problem: (1) make length of all tapes comparable by using the same turns on each tape; or (2) use all of the available data, given that the measured behavior does not change during the course of the activity. If behavior is relatively stable during the game, the latter measure is desirable. The following analysis was carried out for this purpose.

This analysis assumes the rate that a specific behavior is emitted will be randomly distributed during the course of the game. Further, the distribution of the groups will be in the form of the Chi-Square Distribution. Some groups will have very even distribution, others will have a skewed distribution, with more groups taking the former than the latter distribution. Twenty-four groups with complete data, eight from each condition, were randomly selected. Cohesive behavioral data was coded by quarters of the activity (five turns) and a Goodness of Fit test was calculated. The resulting chi-square value for each

group, the measure of evenness of spread of the behavior during the activity, was tallied by the quartile in which the X^2 value fell. Evidence that behavior does not change over the course of time is indicated by an even distribution of groups according to the X^2 quartiles. The results of this analysis are presented in Table 7. The twenty-four groups are almost evenly divided

TABLE 7

Distribution of Chi-Square Values Using Goodness of Fit Test to Determine Stability of Behavioral Measure of Group Cohesiveness Across Quarters of Sal Hunting Activity

Quartiles	Chi-Square Values When $df = 3$	Condition			Total
		Control	Ad Hoc	Established	
.75 - 1.0	0 - 1.21	1	1	3	5
.50 - .74	1.22 - 2.4	2	2	3	
.25 - .49	2.41 - 4.16	3	2	1	6
0 - .25	4.1 - 6 +	2	3	1	6

between the four quartiles of the X^2 distribution. These findings indicate that the rate of cohesive behavior is not related to the duration of the activity. Practically, this suggests that with standardization of the data so that quiet groups are comparable to the more talkative groups, the use of incomplete data on some of the groups will not substantially bias the results.