EFFECTS OF ABILITY LEVEL COMPOSITIONS IN COOPERATIVE LEARNING SETTINGS

by

Wesley Lee Bird

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APPROVED:

Jim C. Fortune, Co-Chairman

Elizabeth H. Koball, Co-Chairman

Karl T. Hereford

Michael B. Quanty

Stavroula Kostaki-Gailey

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Blacksburg, Virginia

ABSTRACT

The use of cooperative learning as an instructional procedure for delivering instruction has become popular among many educators. Research in cooperative learning has provided positive indicators for improvement in academic achievement and attitudes towards self, peers, and school. Little research has been performed on the type of students that compose these groups. The purpose of this study was to investigate the effects of homogeneous and heterogeneous ability created groups on individual student performance. Through the use of two problem solving activities, students were exposed to cooperative learning experiences followed by individual performance assessments.

The two cooperative exercises provided varying results. No significant interaction effects were found in either case. The first exercise showed a significant main effect for ability level. Students in high ability groups overall scored higher than both middle and low ability groups, ($F=6.78$, $p<.01$). The second exercise produced significant main effects for cooperative type, ability level, and teacher. Homogeneous groups performed on the average at a higher level than heterogeneous groups ($F=6.88$, $p<.01$). Both high and middle grouped students scored higher than low ability students ($F=13.85$, $p<.01$). Teacher differences were present for this exercise ($F=4.67$, $p<.01$).

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Chapter 1

Introduction

Classroom grouping practices have been a major interest of educators for many years (Gurnee, 1937; Taylor & Fauct, 1952). Students have been grouped between classes and within classes according to ability, sex, age, or other variables.

Grouping for cooperative learning is a major topic in educational circles today (Slavin, Sharan, Kagan, Lazarowitz, Webb, & Schmuck, 1985). Cooperative learning is not a stranger to education, but in recent years has resurfaced in a new package and has been presented by many to be a valuable tool in delivering instruction to students. Earlier work by Dewey (1938) emphasized the need for schools to encourage cooperative processes to help students function in a democratic society. Research has shown that academic achievement and attitudes toward self, peers, and school have improved through the use of cooperative learning strategies (Johnson, Johnson, Johnson, & Anderson, 1976; Johnson, & Johnson, 1978; Johnson, 1980; Johnson, Maruyama, Johnson, Nelson, & Skon, 1981; Johnson, Johnson, & Stanne, (1986); Slavin, 1980; Slavin, 1982; Slavin & Karwert, 1984; Slavin, Sharan, Kagan, et. al., 1985).

Although the logistics of applying cooperative learning may vary from one setting to another, several basic themes exist in working with cooperative groups. These include:

1. Well-defined group goals elicit cooperation.

2. The groups need to be of a manageable size. Most educators working with cooperative groups usually use three to five students per group.
3. Cooperative activities focus on heightened student engagement.
4. Students model social skills that promote a beneficial learning environment.

Cooperative learning differs from traditional learning environments in three basic areas:

1. Two or more students study/work together as opposed to working individually.
2. Teacher and student relationships differ from the traditional lecturer/listener method of delivering instruction. Teachers perform more as facilitators rather than providing direct instruction and solutions to questions. Students are more active rather than passive learners.
3. None of the participants are experts on the information being studied (O'Donnel, Dansereau, & Rocklin, 1985).

Advocates of cooperative learning indicate that when students are placed in cooperative groups that communicate freely and stay on task, students can achieve more academically than they can as individuals. Most students of different achievement levels seem to profit from the use of cooperative learning instruction (Dickson and Vereen, 1983;

Slavin and Karwert, 1984). Cohen (1986) found that when children work in structured groups, such as those used in cooperative learning, certain kinds of critical learning and social learning skills are enhanced. It was shown that such structured settings promoted conceptual learning, problem solving, and increased oral communication.

Cooperative learning models used by Slavin and Johnson and Johnson primarily use heterogeneous ability grouping. Ability in these cases is usually relative to the class under consideration. Research using this arrangement shows that the cooperative grouping effects on learning were consistent across ability levels, suggesting that both high and low ability students profited from cooperative learning methods (Johnson and Johnson, & Stanne, 1986).

The increased use of cooperative learning strategies within the classroom has changed curricula and instructional models within many school systems. Some schools are using cooperative learning as the dominant instructional tool throughout the entire school. The recent National Council of Teachers of Mathematics, Curriculum and Evaluation Standards for School Mathematics (1989) stresses the need for students to work together in a cooperative manner. Seminars that stress cooperative learning have become very popular, and are well attended nationwide. Other prominent groups, such as the Secretary's Commission on Achieving Necessary Skills (SCANS), identified in their report, What Work Requires Of

Schools (1991), that working as a team and teaching others as competencies that are central to job performance. We see the thread of cooperative learning running through our educational system and in the work environment.

Although many research studies support the use of cooperative learning, other researchers question its depth of effectiveness and the published research results. Allan (1991) contends that much of the research on grouping is often misinterpreted to the disservice of the student. Research on aptitude-treatment interactions has shown that within classes different instructional methods have variable effectiveness with groups of students. Several studies have concluded that high and low ability students participated in and benefited from peer tutoring in small group settings, but middle ability students did not benefit from this treatment (Peterson, Janicki, & Swing; 1981). It is questionable that students with less ability will model the behavior of students with greater ability in heterogeneous groupings. Research on peer modeling has shown that students typically model the behavior of other children with similar abilities who are coping well in school. "Children of low and average ability do not model themselves on high ability learners" (Schrunk, 1987). It appears that "watching someone of similar ability succeed at a task raises the observers' feelings of efficiency and motivates them to try the task" (Feldhusen, 1989). Hooper and Hannafin (1988) suggest that

cooperative learning activities may be most beneficial for students that usually seek teacher assistance during work, and least necessary for competent learners that seek limited assistance.

Since researchers disagree on the contrasting results achieved between students of different ability levels, the best composition of ability levels in forming cooperative groups remains inconclusive. It is valuable to the classroom teacher to determine under what conditions cooperative groups do achieve highly successful instructional experiences.

The following questions require additional consideration:

Are there any effects on individual student achievement by assigning different achievement levels within the cooperative groups? Do students in similar levels of achievement gain as much from homogeneous grouping as from heterogeneous grouping? Do low ability students benefit from the exposure to those in higher achievement levels or could exposure to peers provide similar results? What is the role of the average student in a cooperative setting and what benefits are gained? What is the influence of the teacher in establishing successful cooperative groups?

Purpose

Research in cooperative learning has provided considerable evidence that cognitive and affective benefits result from cooperative group activities. Most of the research on this topic compares cooperative learning groupings to individual or competitive groupings. Limited research has been performed on group composition and the impact that this composition has on individual learning. Factors that affect the group's potential to reach maximum achievement must be considered when formulating cooperative groups. Factors such as the ability levels of the students composing the groups may be instrumental in developing successful cooperative group instruction.

The purpose of this study is to investigate the effects of homogeneous and heterogeneous cooperative groups created by ability levels assignments on individual student performance when using problem solving skills and strategies. Through the use of homogeneous and heterogeneous cooperative groups, student performance will be monitored to determine any deviations that may occur.

As cooperative learning continues to gain popularity as an instructional tool, it is imperative to implement cooperative learning experiences that successfully meet the needs of all ability levels. Since mathematics has many instructional activities that lend themselves to cooperative

learning experiences, math content material will be used to provide the materials and exercises in this study.

Hypotheses

The three hypotheses formulated below provide a basis for the questions addressed earlier. The hypotheses are:

1. Ability levels will behave differently among cooperative types. It is expected that interactions will occur and that upon observation of simple effects ability levels will differ among the homogeneous and heterogeneous cooperative groups.

2. High ability groups will perform better in homogeneous cooperative groups; middle and low ability groups will perform better in heterogeneous cooperative groups. Cooperative groups composed of three high ability grouped students would more likely produce top results especially in problem solving activities. It is hoped that through heterogeneous grouping that the middle and low ability students can gain more through a greater diversity of ability level ranges providing a broader scope of possible solutions.

3. Individual teachers should have no effect on cooperative group performance. It is hoped that if teachers carefully follow the defined cooperative model that students will have similar experiences across classes.

Methodology

In considering ability level composition, subjects in this study will be assigned to one of four types of

cooperative groups. The groups that will be created will be labeled as **homogeneous/high**, **homogeneous/middle**, **homogeneous/low**, and **heterogeneous**. Before the assignment, students will be classified based upon percentile positions as established by the student scores on the math problem solving section of the Comprehensive Test of Basic Skills. Instructional materials used will be suitable for the average learner and will consist of mathematical process problems. Process problems are problems that cannot be solved by simply adding, subtracting, multiplying, and dividing. They require students to use critical thinking skills and use of problem solving strategies in order to develop appropriate processes and solutions.

By using combinations of groups with different ability level compositions, it is expected that the data will provide additional information on cooperative learning and it's effects upon individuals who participate in such experiences. If optimal combinations can be found, educators can create cooperative learning experiences that work best for different student ability levels and provide effective and successful learning opportunities.

Chapter 2

Review of Related Literature

Research on the effects of group experiences as an instructional method in the classroom is not new. Numerous investigations (Gurnee, 1937; Klugma, 1944; Permulter & de Montmoller, 1952; Taylor & Faust, 1952) have considered group effectiveness in comparison to individual work. In general, they found that groups working on problem solving endeavors provided more correct solutions to problems than did individuals. In these studies, group results were compared to individual work purely on the basis of solutions obtained in each procedure. Not covered in these studies is the effect of the group work on the individuals who compose the group. In other words, does the experience in group work transfer to provide successful individual experiences?

Hudgins (1960) performed research on the effects of group experiences on individuals through problem solving exercises. Hudgins explored the hypothesis that problem solving experiences in a group improve individual learning more than individual experiences do. Using 128 fifth-grade students over a twelve day period, he found that groups of students solved more problems than comparable students working on individual assignments. However, Hudgins also found that there were no significant improvement in the students' ability to solve problems as a result of the group

experience. Cohen (1986) found that when status conditions such as academic or peer status were allowed to dominate group activity certain effects were observed. Children who had high peer and academic status did much more talking and working together than those with less peer and academic status. Thus he concluded the operation of status can impair the learning of low status students in unstructured group settings.

Hudgins, like many before him in the study of group work, considered subjects who worked in a group, but not as a group or structured unit. When considering recent work in group experiences as it relates to cooperative learning, one finds a more structured experience where children are taught the social skills needed to function in a group. As such, they work toward a group goal with rewards based upon group success.

Cooperative learning as outlined in the Association for Supervision and Curriculum Development Cooperative Learning Facilitator's Manual (Vasquez, Slavin, D'Arcangelo, & Kiernan, 1990) is based on three elements:

1. Positive interdependence-the success of the group depends on the success of each member.
2. Individual accountability-each student is responsible for learning the material.
3. Social skills-the interpersonal and communication skills that are necessary for

effective group interaction are emphasized. When referring to group work or cooperative learning, it is to be understood that at least these three elements are present.

Johnson and Johnson have developed, over the past ten years, a systematic procedure of comparing the effects of cooperative, competitive, and individualistic learning environments. Of twenty-six studies that were conducted by the Johnsons and associates, twenty-one supported a conclusion of higher achievement, two studies had mixed results, and three found no difference among conditions. A meta-analysis (Johnson, Maruyama, Johnson, Nelson, & Skon, 1981) of the one hundred twenty-two studies that had been conducted between 1924 and 1981 yielded two hundred eighty-six findings. Three methods of meta-analysis were used: voting method, effect size method, and z-score method. These findings indicated that cooperative learning experiences promoted higher achievement than did competitive and individual learning experiences. These results held for all age levels and for other variables such as concept attainment, verbal and spatial problem solving, and predicting. Study lengths ran from 1 day to 9 months with instructional sessions from 15 to 90 minutes.

Salend and Sonnenschein (1989) conducted research through the use of direct observation on cooperative learning techniques using three classes of emotionally disturbed

adolescents. Dependent variables included on-task behavior, cooperative behaviors, and academic performance. Data collected through these observations indicated that when the cooperative learning was in effect, the subjects worked on more items and completed the items with a greater degree of accuracy. This improvement of on-task behavior and academic performance was consistent with the research on the increase in instructional activities (Johnson, & Johnson, 1978) and superior academic achievement under cooperative learning conditions (Slavin, 1982; Sharan, 1980; & Johnson et. al., 1976).

Slavin has performed extensive research in cooperative learning models. His work has centered around specific models such as TGT (Teams-Games-Tournaments), STAD (Student Teams-Achievement Division), Jigsaw II, and TAI (Team Assisted Individualization). Research on these models has provided additional support of the effectiveness of cooperative learning. Seven noted studies (Slavin, Sharan, Kagan, et. al. 1985) were conducted to evaluate the TAI cooperative learning model. Studies ran from 8 to 16 weeks. The TAI model consists of nine components that include: team formation of heterogeneous achievers, placement tests, established materials (computational exercises), team study method, team scores and recognition, teaching groups, homework, facts tests, and group-paced units. Results showed that in five of the six studies which assessed student

achievement, achievement in TAI classes was significantly higher than in the control group that used traditional methods of group-paced instruction.

A study conducted by Kagan, Zahn, and Widaman (1986) concluded that cooperative methods appear to improve classroom climate over that of traditional whole-class format. This study reported a slightly higher value on social relations attitudes of children in cooperative settings than found of children in traditional classrooms, a difference that was statistically significant.

The research literature provides substantial evidence to support the use of cooperative learning as a viable instructional tool. Although its effectiveness has been shown, cooperative learning research results have shown that this procedure may be better suited for certain types of students. Evidence exists that both black (DeVoe, 1977; Richmond & Weiner, 1973) and Mexican-American (Kagan, 1977, 1984) students are more cooperative than Anglo-American students. Studies on cooperative learning and classroom climate (Kagan, Zahn, & Widaman, 1986) produced results showing that female students responded more openly in a cooperative environment than in traditional settings.

Another cooperative learning model known as Jigsaw (Aronson, Blaney, Stephen, Sikes, & Snapp, 1978) requires students to share or teach lessons to small groups. Although prior research had shown success with this model, studies

conducted by Moskowitz, Malvin, Schaeffer, and Schaps (1983) found little improvement in the self attitudes while working with fifth and sixth grade students over a school year. Failure may have resulted from a conflict in the model implementation. Teachers using this model found it difficult to play the role of facilitator rather than using traditional instructional practices.

Most of the research addresses the cognitive and affective benefits that can be obtained through cooperative learning experiences. Little research has been done on the effectiveness of various group compositions and its effects on individual achievement. Most studies to date have been based on heterogeneous grouping with ability and gender used as the primary selection criteria. One study (Bennett, & Cass, 1989) considered the effects of group composition on group interactive processes and pupil understanding. Nine groups of middle school (11 and 12 years old) children were used in the sample. Three types of groups were considered in this study: homogeneous (3 high, 3 average, or 3 low in each group), heterogeneous (3 groups of high, average, low) and mixed (2 low, 1 high or 2 high, 1 low in each group). Results reported from this study indicated that heterogeneous groups performed poorly, whereas the mixed groups performed successfully in completing the designated task. In groups with mixed high and low ability students, low ability students seemed to accept the opinions of higher

ability students regardless of the correctness of the response. The homogeneous high ability group was the top performing group of all nine groups in the study. The study also supported the previous research that homogeneous groups of low ability may not have the necessary skills and knowledge base effectively to function as a group. He found similar results in homogeneous average groups with a low frequency of suggestions and incorrect responses in post hoc interview sessions. Results also provided additional support that high achievers were successful in performance irrespective of the type of cooperative group in which they worked. High achievers provided twice the number of responses as other groups with approximately 75% of the responses being correct. This contradicts the opinions of some professionals that high achievers may be adversely affected by working with lower achievement levels.

As sited in other studies, on-task behavior was high for all groups. This factor continues to play a prominent characteristic in most studies on cooperative learning.

The findings by Bennett and Cass are important with respect to the role that group composition can play as a factor in the effectiveness of the group process. Their research provides a foundation for additional studies in the membership composition of cooperative groups. Additional research on the effectiveness of cooperative groups is imperative in developing sound instructional tools. With the

formation of cooperative groups based upon ability level compositions, it is predicted that best fit associations will emerge to allow maximum individual achievement.

Chapter 3

Research Methodology

The use of cooperative learning has become an important alternative instructional strategy to traditional whole class and individual instructional systems. Of 26 studies by Johnson and Johnson (Slavin, et. al., 1985) that included achievement data, 21 indicated that cooperative learning promoted higher achievement than competitive and individual instructional procedures. Research documents positive results in numerous applications. Most cooperative learning that takes place in the classroom is performed in heterogeneous settings and research has been primarily focused on this arrangement. The purpose of this study was to investigate the effects of homogeneous and heterogeneous cooperative situations created by ability criteria on student performance when learning problem solving skills and strategies. Performance of students of similar ability was compared within the different cooperative group formations. Any deviations of performances among similar ability students but in different group setting were examined.

The sample was taken from the Christina School District located in New Castle County, Delaware. The district is located in the northwest portion of Delaware and includes schools located in the city of Newark and its suburbs and west Wilmington.

The district is presently under court ordered desegregation and distributes students across the system through extensive busing. The schools participating were located in the city of Wilmington, Delaware and house grades four, five and six.

Fifth grade students from seven classrooms in two schools were used in the study. Students in these classes were enrolled in self contained classes and provided the traditional curriculum given to other students in the district.

Students in the district were from a variety of socio-economic and ethnic backgrounds. The forced busing provided a balanced mixture of these groups across district schools. Classes selected were those that exhibited heterogeneous grouping based upon prior academic achievement.

Each class was supervised by a teacher who had received training in the cooperative model under consideration. Teachers were provided leave time during the regular day to receive instruction in cooperative learning and provided an overview of the direction of the study. The training was cooperative in nature providing actual simulations and taped models that exhibited desired outcomes and student behaviors. Teachers receiving the training were first provided exercises to understand the team building process. They were instructed that this is a process that may take several sessions to begin to feel that the groups are working

cooperatively. By having teachers work in cooperative groups, they were better able to feel some of the same experiences that their students would encounter. The expected behavior skills (Appendix E) and cooperative model were carefully introduced and discussed. Training on ways to successfully teach and monitor the cooperative skills was provided. The assessment tool (Appendix B) to be used by the observer was reviewed. Teachers were also given process problems to work in cooperative groups and given the opportunity to discuss outcomes and strategies used. A training film illustrating a model cooperative classroom was shown and discussed.

Students were assigned to cooperative groups through a stratification process. Stratifications were based upon the problem solving normed percentile rank from the Comprehensive Tests of Basic Skills published by Macmillian/Mcgraw-Hill Company copyright 1990 given to students during October, 1992. The norm group basis was a national sample.

The percentile ranks range from 1 through 99. Three divisions within the percentile ranks were made to provide group classifications. The division scales used were 67%-99%, 34%-66%, and 1%-33%. Students in the first division (67%-99%) were considered at the highest or above average level. Students in the second division (34%-66%) were considered at an average level in the norm ranking. The last

division (1%-33%) were considered well below average in the normed scores.

Students within each stratum were randomly assigned to an appropriate cooperative group. High ability scorers were randomly assigned to either heterogeneous or homogeneous groups until all available positions were filled. The same procedure was followed in assigning average and low ability levels to heterogeneous and homogeneous groups. Each classroom had one **homogeneous/high** group, one **homogeneous/middle** group, one **homogeneous/low** group, and three **heterogeneous** groups. Each homogeneous/high group was composed of three students randomly assigned from the top one-third normed referenced percentile rank (67%-99%) for problem solving. Each homogeneous/middle group was composed of three students in the middle one-third of the percentile ranking (34%-66%). Each homogeneous/low group was composed of three students who fell in the bottom one-third percentile ranking (1%-33%). Each heterogeneous group consisted of one high-ability, one middle-ability student, and one low-ability student. Table 3.1 shows the percentage of students in each class that were in each of the three ability levels.

Table 3.1

Individual Class Percentages For Norm Rankings

Norm Ranking	Teacher 1	2	3	4	5	6	7	Total Sample %
99-67%	37	32	39	28	46	23	30	34
66-34%	25	39	32	28	23	50	30	33
33-0%	37	29	28	42	31	27	39	33

Two distinct cooperative exercises for the purpose of data collection, each one month apart, were performed by the students. Each exercise was performed by different combinations of student groupings. Students were rotated in a systematic fashion to form a cooperative arrangement different from the first experience. Students in homogeneous groups in the first exercise were reassigned to a heterogeneous cooperative group for the second exercise. Similarly, heterogeneous group students in the first exercise were placed into homogeneous cooperative groups for the second exercise. Figure 3.1 shows group arrangements during the two cooperative experiences. As the figure illustrates, each classroom had three hetereogeneous cooperative groups and three homogeneous groups. Classroom homogeneous groupings consisted of one high, one average, and one low ability level. Each group contained three students.

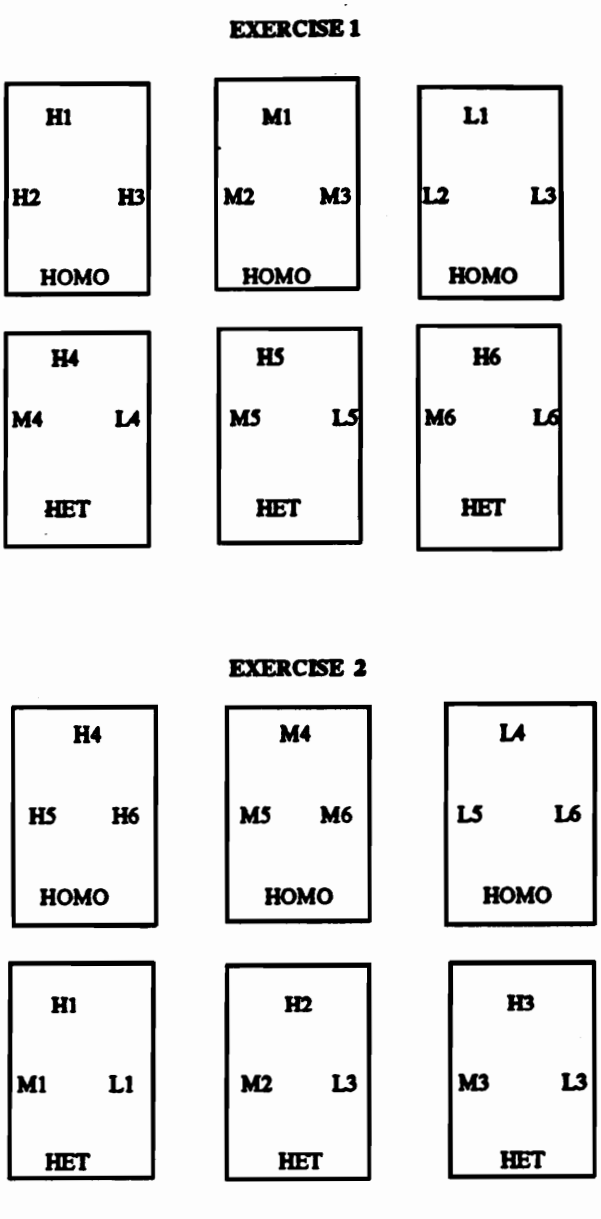

Chart Showing Session Grouping Assignments For Classrooms

Figure 3.1

Preparation For The Experiment

Teachers supervising the cooperative groups received five hours of training and supervision in cooperative learning procedures during a one day workshop. Two follow-up informal sessions concerning the progress of the group work were held with each teacher prior to and during data collection to monitor program progress and to deter possible problems. The guidelines used followed the basic training program as established in the training guide Cooperation in the Classroom (Johnson, Johnson, & Holubec, 1988) developed through the Illinois Research Institute, Inc. The training addressed the following topics:

1. Learning structures and elements of cooperative learning.
2. Planning and implementing cooperative lessons.
3. Teaching social skills.
4. The teacher's role in the cooperative classroom.

The model used in this study was patterned from the approach developed by David and Roger Johnson as outlined in their books, Circles of Learning (Johnson, Johnson, Holubec, & Roy, 1984) and Cooperation in the Classroom (Johnson, Johnson, & Holubec, 1988). This model was composed of five basic elements and was the focus for student development and participation. These elements are as follows:

1. Positive interdependence.

Members of the group must perceive that they are in this work together. Positive interdependence is to be achieved through the use of mutual goals, division of labor, sharing of common resources and information, assigning students to carry out specific roles, and by rewarding the group based upon group performance.

2. Face-to-face interaction.
   Interaction procedures and verbal interchange will be promoted through positive interdependence.
3. Individual accountability.
   Each group member is responsible for learning the material. Each student will be evaluated to degree of learning transferred.
4. Interpersonal and small group skills.
   Students will be taught social skills necessary to promote collaboration among members.
5. Processing.
   Students will be given the opportunity to evaluate group effectiveness and develop strategies for improving working relationships.

Students received initial cooperative learning instruction during three week training periods before each of the two cooperative exercises. Trial sessions of two per

week over the three week period were conducted to acquaint students with cooperative learning procedures and to allow time for the group to function as a unit. Such skills as encouraging others, listening, speaking in quiet voices, keeping on task, and total group effort were cooperative skills that were monitored and evaluated. Teachers were instructed to define and carefully monitor the skills as they were introduced to the students. The beginning of each cooperative session was begun with a review of the skills that would be observed during the cooperative session. Table 3.2 summarizes some of the skills addressed and ways to determine if the skill was being utilized. Teachers were provided with a skills evaluation sheet (Appendix A) to record group skills and debrief students at the end of each session. At the conclusion of each training, students were encouraged and advised on appropriate actions to take to increase cooperative effectiveness.

A second cooperative learning assessment tool (Appendix B) was used to evaluate team effectiveness in meeting cooperative learning goals and standards. The assessment consisted of eight yes or no observations that targeted major components of the cooperative learning model and behaviors. The statements focused upon the necessary skills to make a group focus on the cooperative process. All skills in the assessment were essential in establishing a successful cooperative group. The assessment was used by a curriculum

supervisor/observer, knowledgeable in cooperative learning but not teaching the class, to evaluate overall performance and advise groups on areas for improvement. The observer was instructed to visit each class during the trial and exercise sessions. During the observation the observer was to make no contact or conversation with the groups being assessed. Rotating throughout the classroom, the observer monitored group activities and recorded what behaviors were taking place within the cooperative groups. At the conclusion of each observation, the observer reported to the teacher a status report on group progress towards reaching cooperative effectiveness. Until satisfactory cooperative team status had been obtained by all groups as determined by the assessment, data collection did not begin.

Table 3.2 *

Partial Listing of Observed Social Skills

On-Task Behavior	
Looks Like	Sounds Like
Heads together	Every one is heard
All members together	People are sharing ideas
All eyes looking at materials	Questions are being asked
Everyone is busy	Talk is about the topic
Eyes on the speaker	Talk remains within the group
Good Listening	
Looks Like	Sounds Like
Heads together	One voice at a time
Eyes on the speaker	No extra sounds
One mouth moving at a time	Asking questions
Nodding	Quiet voices
Taking turns	No interruptions
Waiting	waiting
Discussing and Agreeing	
Looks Like	Sounds Like
Eye to Eye Contact	Sharing opinions
People talking in turns	One at a Time Speaking
All members are contributing	Compromising
	"Will you explain..."
	"Let's try it another way..."

* Developed from material by Tarpley, Beverly. (1992)

Teachers were directed to follow the training model as closely as possible. Daily instruction on social skills relevant to their classes and groups was emphasized, monitoring of social skills and group feedback on areas of improvement was performed, and the teacher acting as a facilitator rather than a lecturer were major target areas. To control for any differences that might occur in the study from the variation of teaching styles, the data was blocked by teacher to filter out any effects from teacher/class differences. The primary goal was reaching compatible cooperative groups that perform in like fashion using cooperative behaviors. Through observations it was determined if groups had reached the desired cooperative status and were working independent of teacher direction. The observer monitored the cooperative experiences for several classroom periods providing teachers with the necessary feedback in order to create the desired cooperative groups. If a particular skill was not observed the observer continued working with the particular teacher and groups, until the cooperative skills were mastered.

Experimental Phase

Students received exposure to two types of process problems: making an organized list and looking for a pattern. (Examples of these types of problems are found in Appendix C.) Teachers provided an introduction to the topic before cooperative learning groups began to work on possible

solutions. Following three week trial periods where practice problems were provided, students were exposed to two separate cooperative experiences each focused on one type of process problem. Each cooperative experience was one classroom period (approximately one hour) in duration. The teacher served only as a facilitator and monitor during the cooperative exercises. Written instructions composed of guided questions and prompted procedures were used by the cooperative groups to provide a framework for mastering the necessary strategies and cognitive processes needed to correctly reach a desired solution. During the cooperative exercise, students were instructed to rotate within the group to describe and debrief each member on the procedures used in reaching a solution. Following the day of the cooperative experience, students were exposed individually to the same type of problem as encountered in the cooperative group setting. To assess individual accountability, students were asked to provide the processes and strategies without the assistance of other cooperative members. Students were given one classroom session (approximately one hour) to individually solve a process problem. Students were asked to provide detailed information on selecting and developing the strategy used in reaching their solution. No assistance from teachers or other peers was allowed during the assessment of the individual student.

Both cooperative experiences were similar in format with the differences being the type of problem given and students in the same ability stratum rotated between heterogeneous and homogeneous groupings (Table 3.3). No two students were assigned to the same group type or together in the two exercises.

Table 3.3

Rotation Procedure Used During Cooperative Experiences

Group	First Cooperative Exposure			Second Cooperative Exposure		
1	H1	H2	H3	H4	H5	H6
2	M1	M2	M3	M4	M5	M6
3	L1	L2	L3	L4	L5	L6
4	H4	M4	L4	H1	M1	L1
5	H5	M5	L5	H2	M2	L2
6	H6	M6	L6	H3	M3	L3

H = High M = Middle L = Low

A primary focus was to compare individual performance of students of like ability levels in both homogeneous and heterogeneous settings. Students in homogeneous cooperative groups were compared against their like achievement counterparts in heterogeneous groups. Of interest in the study was the performance level obtained within each homogeneous group and the impact of the heterogeneous group on the specified ability levels.

Scoring

Student papers were scored using an analytic scoring scale. The scale was composed of two criteria: (1) developing an appropriate strategy and (2) reaching a correct solution. For each criteria a 0, 1, or 2 points was assigned. Table 3.4 provides detail of the scoring procedure. This model was adapted from How To Evaluate Progress In Problem Solving, National Council of Teachers of Mathematics, 1987.

Table 3.4

Analytic Scoring Scale

Developing an Appropriate Strategy	Point Values	Description
	0	Inappropriate strategy used
	1	Partially correct strategy used
	2	An appropriate strategy used
Reaching a Correct Solution	0	No answer or wrong answer based upon inappropriate strategy
	1	Incorrect solution but due to computational or copying error
	2	Correct solution is provided

Papers were scored by an independent team composed of three teachers of mathematics. Keeping the analytical scale simple allowed greater rater reliability when scoring each problem. This scoring procedure has become very prevalent in the nationwide trend towards performance based assessments and the building of rubric scoring scales. Consistent scoring of papers is obtained when prior team consensus for standard papers is obtained. Training was provided for the

team using models that depict possible outcomes that may be encountered during the scoring session. Trial papers were evaluated by the team members to assure that each member had a common understanding of the scoring procedure and that like scoring would occur. Each team member scored each paper individually without knowledge of the paper's owner. Once individual scoring was complete, team raters met to discuss any differences and try to come to a consensus for an official score. If a consensus could not be met, the average of the individual scores was used as the official score for that paper. The total student score was the sum of points for developing an appropriate strategy and reaching a correct solution. At the end of the scoring session, raters had reached a consensus on all student responses and did not need to utilize the averaging of scores.

Data Analysis

Data analysis was handled through a randomized block factorial design. Two independent factors used were cooperative learning group type (homogeneous vs. heterogeneous) and ability level (high, middle, and low) and a third factor of teacher/class assignment was used as a blocking factor. The three variables manipulated concurrently provided information on any significant main and interaction effects that were present. The independent variable was the student process score based upon the analytic scoring scale and determined by the scoring team.

A 2(cooperative type) x 3(ability level) x 7(teacher) analysis of variance (Table 3.5) was used for each cooperative group exercise to provide tests of significance. Significant main effects were further examined with the post hoc multiple comparison procedure, Tukey-HSD. Significant interactions were considered through a closer analysis of simple effects.

Table 3.5

Analysis Design

Source	df
(A) group type	1
(B) ability level	2
(C) teacher/class	6
A X B	2
A X C	6
B X C	12
A X B X C	12
Residual	84
--------	--------
Total	125

Chapter 4

Results

The performance score data from the 126 students in each of the two cooperative learning exercises was used to compute the two analyses of variance, post hoc comparisons, and descriptive statistics reported below. Possible scores on the two exercises ran from a minimum of 0 to a maximum of 4 points. Both exercises produced means very close to the middle of the scoring range. Table 4.1 provides descriptive details of the two cooperative exercises.

Table 4.1

Descriptive Summary of Scores of Two Cooperative Exercises

	Mean	Std. Dev.	Number
Exercise 1	2.16	1.21	126
Exercise 2	2.06	1.14	126

A 2(cooperative type) x 3(ability level) x 7(teacher) analysis of variance was performed upon each set of data. Scores from the two exercises produced varying results.

First Cooperative Experience

In the first exercise analysis (Table 4.2), significant main effects was found for ability level, ($F=6.78$, $p<.01$). No significant interactions or other main effects were found.

Post hoc examinations on ability levels using Tukey-HSD procedures indicated that the high and middle ability groups were both significantly different from the low ability group ($p<.05$). High and middle ability means were greater than the low ability group mean. Table 4.3 shows ability level group means for the first cooperative exercise.

Second Cooperative Experience

The second exercise analysis (Table 4.4) produced significant main effects for cooperative types ($F=6.88$, $p<.01$), ability levels ($F=13.85$, $p<.01$), and teachers ($F=4.67$, $p<.01$). No significant interactions were found. With significant main effects between the two cooperative types, examination of these means (Table 4.5) shows homogeneous groups with a higher mean than the heterogeneous group mean. Post hoc examinations using Tukey-HSD procedures were performed on the group means for ability levels and teachers. Post hoc analysis results indicated that the ability level groups high and middle were both significantly different from the low ability group ($p<.05$). As in the first exercise high and middle ability level means were greater than low ability group means. Comparison of teacher group means showed that each of the two teachers with the highest group means was significantly different from the teacher with the lowest mean score ($p<.05$). Tables 4.3 and tables 4.6 show group means for ability levels and teachers for the second cooperative exercise.

Table 4.2

Analysis of Variance for Exercise 1

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif of F
TYPE	1.556	1	1.556	1.174	.282
LEVEL	17.968	2	8.984	6.778	.002 *
TEACHER	15.937	6	2.656	2.004	.075
TYPE X LEVEL	1.968	2	.984	.743	.479
TYPE X TEACHER	4.444	6	.741	.559	.762
LEVEL X TEACHER	13.587	12	1.132	.854	.595
TYPE X LEVEL X TEACHER	16.032	12	1.336	1.008	.449
EXPLAINED	71.492	41	1.744	1.316	.145
RESIDUAL	111.333	84	1.325		
TOTAL	182.825	125	1.463		

* Significance at .01 level.

Table 4.4

Analysis of Variance for Exercise 2

Source of Variation	Sum of Squares	DF	Mean Square	F	Signif of F
TYPE	5.786	1	5.786	6.877	.010 *
LEVEL	23.302	2	11.651	13.849	.000 *
TEACHER	23.556	6	3.926	4.667	.000 *
TYPE X LEVEL	4.762	2	2.381	2.830	.065
TYPE X TEACHER	10.381	6	1.730	2.057	.067
LEVEL X TEACHER	14.921	12	1.243	1.478	.149
TYPE X LEVEL X TEACHER	9.238	12	.770	.915	.536
EXPLAINED	91.944	41	2.243	2.666	.000
RESIDUAL	70.667	84	.841		
TOTAL	162.611	125	1.301		

* Significant at the .01 level.

Table 4.3

Group Means for Ability Levels in Exercises

	High	Middle	Low
Exercise 1	2.67	2.05	1.76
Exercise 2	2.55	2.12	1.50

Table 4.5

Group Means for Cooperative Type in Exercises

	Homogeneous	Heterogeneous
Exercise 1	2.27	2.05
Exercise 2	2.27	1.84

Table 4.6

Group Means for Teachers in Exercises

	Teach 1	Teach 2	Teach 3	Teach 4	Teach 5	Teach 6	Teach 7
Exer 1	2.83	1.72	2.22	2.22	1.72	2.06	2.33
Exer 2	2.61	2.17	1.72	1.33	2.22	1.78	2.56

Teacher Questionnaire

A short questionnaire (Appendix D) was administered to the participating teachers at the conclusion of the two exercises. The purpose of the questionnaire was to receive teachers' reactions to the cooperative experience, explore any similar instructional experiences, class conditions, and years of experience. Individual responses are summarized in table 4.7.

Four of the seven teachers reported prior use of various forms of instructional group work in their classes but not to the extent as outlined in the cooperative model. All teachers reported that this was a beneficial instructional strategy and produced positive results in student attitudes towards classwork and an increase in student participation. Each agreed that over time the cooperative groups improved in their relationships in working together and producing desired outcomes. Five of the seven teachers felt that the ability levels of their classes were generally lower when compared to classes of previous school years. Teacher experience ran from 4 years to 19 years with an average of 10 years of experience for the seven participating teachers.

Table 4.7

Summary Of Responses From Teacher Questionnaire

TEACHER	Prior Experience	Reactions	Model Improve	Benefit	Improve on Time	Class Comparison	Years Experience
1	None	Helpful to those following oral direction and low skills.	Have more group changes.	Yes	Yes	Better	19
2	None	Will continue to use it.	More detailed instructions.	Yes	Yes	Similar	4
3	Yes, limited grouping.	Very positive. Would try limited grouping.	Change ways of grouping.	Yes	Yes	Lower	13
4	None	Very good instructional procedure.	Different groupings.	Yes	Yes	Less willing to complete tasks.	6
5	Yes, limited grouping	It works! Positive results.	No changes.	Yes	Yes	Similar	8
6	Yes, limited grouping	Positive results. Took longer to master skills than expected.	Use it more frequently.	Yes	Yes	Lower	10
7	Yes, limited grouping	Beneficial.	More topics of curriculum being presently studied.	Yes	Yes	Lower, behavior problems.	10

Chapter 5

Teacher Observation Report

An extensive effort was made during the treatment periods to assure that the cooperative model was followed and that groups were indeed working in a cooperative manner. It was imperative that groups reach targeted standards of exhibiting appropriate social skills (i.e. listening, encouragement, persistence, etc.), team sharing of information and materials, and remained on task during the cooperative sessions.

During the initial training periods, teachers taught and reinforced the expected cooperative behaviors (Appendix E) that each group was to exhibit. Before cooperative sessions the teacher reviewed cooperative behaviors that would be observed. Teachers acted as facilitators during the sessions moving around the room encouraging group participation and debriefed each group on skill areas needing additional attention.

A key component of monitoring the training periods and the two cooperative exercises, was the use of an outside observer to monitor each classroom and record progress of each cooperative group. The observer assessed group work and made recommendations for improvement. The observer made at least four visits to each classroom and provided evaluations of each cooperative group. Where cooperative behaviors were

not observed, the teacher and involved groups were provided feedback on ways to better improve the cooperative group process. Most groups were in need of this debriefing process before cooperative groups status was obtained. The observer continued monitoring each cooperative group until all criteria on the cooperative assessment tool (Appendix B) was met. The use of an outside observer was a valuable instrument in making sure that the work being performed within each group was truly cooperative in nature. A report from the observer follows on the next page. Her reactions and observations strengthens the reliability of the treatment and the results obtained from the individual assessments.

Observation Report

22 January 1993

TO: Wesley Bird, Supervisor, Christina School District

FROM: Maryann S. Whann, Educational Consultant

RE: Report on Cooperative Learning Project

This report relates to the Cooperative Learning Project which was initiated and directed by Wesley Bird, Supervisor for the Christina School District. The Cooperative Learning Project came about in order to introduce students and teachers to the effectiveness of cooperative learning in the classroom. I was asked to be an independent observer of the Cooperative Learning Project in order to assess its effectiveness in helping students to learn better and teachers to be more effective helping students to learn in the classroom. Classrooms using this alternative learning technique pursued the same standard curriculum as classrooms using more traditional techniques.

I observed the Cooperative Learning Project in the Stubbs and Drew-Pyle Intermediate Schools during the weeks of 14 December 1992 and 11 January 1993. Six fifth-grade classrooms at the Stubbs School were involved. The Drew-Pyle School had one fifth-grade classroom taking part in the project. Only instructional techniques were altered during the Cooperative Learning Project. The standard curriculum pursued by the classes remained the same.

My background in education includes teaching experience at preschool through twelfth grade levels, as well as adult education. I have been involved in the educational field in Delaware as a teacher, district chairperson and consultant. I have a Master of Instruction degree and additional credits from the University of Delaware and the State of Delaware. I also have had intensive inservice training through the Bank Street College of New York on cooperative learning techniques and teaching methods for at-risk students. I have a particular interest in cooperative learning and cooperative teaching. I have used these methods of instruction and have seen the benefits of students at every age working cooperatively in educational settings in a variety of subject areas. As a result, my experience qualifies me to evaluate this project.

The particular model that was used in this project to evaluate the effectiveness of cooperative learning comprised of groups of three students each, working on both practice and final problems in mathematics. Teachers were retrained in the procedures and techniques of cooperative learning. They taught the cooperative learning process to their students before and during my observations.

While observing the groups, it was evident that the teachers were effective in instructing students to work cooperatively in groups. Classroom transitions to small groups went smoothly and proper learning strategies were

employed within groups as they worked on the problems. Because the teachers gave clear directions for working on the problems and used effective review strategies, students were able to transfer problem-solving skills to a large-group setting. This provided an effective transition to direct instruction of the whole group.

During my initial observations, I observed the students following the parameters of the model. As in the model, students worked in assigned teams and maintained tolerable noise levels. The students made sure that each group participant had access to the needed materials. Students were involved and on task during the cooperative learning sessions. They explained answers to each other and checked that everyone understood the assigned material. They asked teammates for help before approaching the teacher for assistance. They were instructed to use praise and encouragement in order for each teammate to feel successful and a part of the group; I noted, however, that they did not all do this at first. This weakness in following the model was called to the attention of each teacher. During my second observation, I saw the teachers reviewing all elements of the cooperative learning model and, in particular, stressing the need for the students to focus on redressing the weakness in the area of positive reinforcement. By 18 December 1992, all groups in every classroom had reached each objective of the model, including encouraging each other in

small groups. In January 1993, newly formed small groups continued to apply the cooperative learning techniques and met the criteria for cooperative group status.

During the course of my observations, I noted particular areas of strength. There was a smooth transition from the regular classroom setting to small cooperative groups. Students worked effectively and cooperated to keep each other on task. Students' roles were clearly labeled in each group, and the roles were rotated. By the end of the process, every student experienced each role. Teachers had groups use checkoff forms to track use of social skills or they put charts on the board so that students had a visible picture of their accomplishments in meeting each objective of the cooperative learning process. All teachers used thorough review techniques at the conclusion of each cooperative learning session.

In conclusion, the goals of the project were achieved according to the model. Students demonstrated the use of problem-solving skills necessary to higher academic achievement. Students exhibited effective social skills in working together which are necessary in any environment. Student attitudes and comments reflected a sense of positive feelings about themselves and about their peers. The atmosphere in each classroom in the study was more upbeat than in the classrooms not using cooperative learning techniques. I noted that students were highly motivated and

engrossed in solving the problems. There is no doubt that this cooperative learning project fostered growth in the students' abilities to work together and stay on task. Finally, and importantly, the project tapped into the potential of individual students allowing them to learn from, as well as with, each other.

Chapter 6

Discussion

The purpose of this study was to investigate the effects of homogeneous and heterogeneous cooperative groups through ability assignments on individual student performance. Prior research on cooperative learning by Johnson et. al.(1976) and Slavin et. al.(1985) using heterogeneous ability grouping indicated over-all positive results in student achievement, peer relationships, and general school attitudes. A number of studies (Nevin, Johnson, and Johnson, 1982; Armstrong, Johnson, and Balow, 1981) support the benefits in achievement gains of middle and low ability grouped students in heterogeneous cooperative settings. These studies also indicate that high ability students generally gain in academic and social skills from heterogeneous groupings and at least are not hurt by working with peers of different ability groupings. With most studies concerned with the use of heterogeneous ability grouping for all students, it was essential that other possible grouping arrangements be investigated to determine if positive gains in achievement can also be attained. Although a consistent pattern did not materialize when comparing the analyses of the two cooperative groups, important results from the study did emerge to add to the research on group formations in cooperative settings.

Conclusions

The first hypothesis proposed that simple effects of ability levels would change for different cooperative groups. Neither of the exercises produced significant interactions. By combining the absence of any interactions with the results of the second exercise showing the homogeneous group mean greater than the heterogeneous group mean, implications might be drawn to question the prevalent heterogeneous ability arrangements found in most research studies.

Although an absence of interaction effects was found in this study, further research may find that they are still possible and frequent. Teachers reported that over time students showed a greater refinement of social skills and other working relationships. By extending the time interval for training and reinforcement of cooperative skills, members in the cooperative groups may have had a greater influence upon other peers in their groups. It is also possible that the difficulty level of the problem may have had some influences upon performance outcomes. Results from post hoc procedures showed that both high and middle ability students performed better than low ability students. This somewhat parallels the results of Bennett and Cass (1989) that low ability students may not have the necessary skills to solve the problems. With the problems that were used targeted at the middle achievement level, the degree of success may have

been modified. Lower ability students may have had greater success with problems more suitable for their level and would have strengthened the peer relationships in both types of cooperative groups.

The second hypothesis suggested the success for high ability students in homogeneous groupings and better performances from middle and low ability students in heterogeneous groups. With no interactions taking place, we cannot confirm this hypothesis. Once again, extension of time and change of problem difficulty may provide additional data that may support this scenario.

An unexpected main effect result found in the second exercise was the difference between certain teacher/class groups. This was in contradiction to the third hypothesis on expecting to find no teacher/class differences. It is unlikely that as in the Moskowitz, et. al.(1983) study that teachers found the role changes too radical and could not properly implement the cooperative treatment procedures. All teachers in the study indicated a successful experience with cooperative learning and planned to continued use in their classrooms. The observer indicated that the teachers were effective in instructing the students to work in cooperative groups. She found a smooth transition from large-group instruction to the cooperative learning procedures.

There were several factors that may account for the indicated differences. First the differences that were found

may have been a result of instructional experience. When ranking positions for both exercises (Table 4.6), the two teachers with the least amount of teaching experience (6 years or less) ranked at the bottom while the two teachers with the highest ranks had more than ten years of experience. The teacher ranked number one for both exercises also had the greatest number of years of teaching experience-19 years. It is also interesting to note that the two bottom ranking teachers were the only male teachers in the group leading one to speculate whether the sex of the teacher influences group formation. A third factor to consider was the change in the type of process problem and cooperative group members from the first exercise. The average score for the second exercise was slightly lower than the first exercise. Changes in any of these factors could have affected class outcomes.

Teacher responses to this instructional procedure were very positive. Similar to the results of Salend and Sonnenschein (1989), teachers responded that students attempted more items (especially the lower ability students) and completed them with a greater degree of accuracy. They found this instructional strategy very beneficial and planned to continue using it when appropriate within their classrooms.

Replication Comparisons

When considering the two exercises as replications of a cooperative treatment particular factors require further comparisons. First, neither exercise produced any interaction effects. There were no differences in behavior in ability levels across cooperative types. Both exercises produced main effects for ability levels. Further examination also showed that in both cases the high and middle ability groups had higher mean scores than the low ability group. With significance at the .01 level, low ability students continued to be consistent in operating below achievement expectations. Theories of successful peer relationships of working with similar ability peers or with peers of higher ability levels did not seem to influence low achievers under the conditions of this study. As stated earlier, this may be explained by the nature and level of the problem that was given during the cooperative group sessions. The lack of any upward movement for the low ability groups is discouraging when searching for instructional methods that would improve instructional achievement for this particular level.

Differences in the two exercises came in the second exercises with the addition of two new main effects. Group type and teacher factor were significant at the .01 level.

The significance for the second exercise indicating the homogeneous group mean greater than the homogeneous group mean may or may not be an indicator of a prevalent grouping arrangement. The significance between teachers was also new in the second exercise. Post hoc examinations did not reveal a difference in all teachers but in one teacher at the top of the group mean scale and two teachers at the bottom of the scale. Although this does not indicate any great influence upon cooperative groups, teacher associations should be carefully monitored in future studies.

Two exercises with both similar and contrasting results do not establish a pattern but is the basis for additional replications and provides a foundation in considering group formation factors. Replications may indicate the consistency of high and middle ability levels to perform at a higher level than low ability level. It is also possible that one cooperative group type may prove to be consistently dominant over another. Additional factors that cause such dominance need greater examination.

Recommendations

Continued research in this area is needed. It has been shown that cooperative learning empowers students to become better problem solvers and develop essential social skills. A replication of this study would be of great value if some modifications were made. It would be advisable to have the cooperative groups remain intact during the entire study. This would allow a greater time period for improving the cooperative team and would allow continued work with the same team members.

Future studies should investigate the effects of problem difficulty upon group effectiveness. By changing the possible success factor, the transfer of learning for especially the lower ability student may improve.

Exercises of this nature model a new national trend towards evaluating students using performance based assessments. Working in cooperative groups provides a more authentic exercise reflective of real life situations. In the real world we must work many times in team formats in order to get the job accomplished. Assessment of cooperative group work has become much more common in instructional circles. The use of analytic scales and team scoring is new to many teachers. The individuals on the scoring team found the procedure fair and that more informative information is provided to the teacher and student than a simple letter

grade. Although not the norm in scoring tests of this nature, their ability to come to a consensus on all problems provided high reliability to the students' work.

Although results from this study did not provide conclusive findings for specific group formations in cooperative settings, they do provide an additional building block in developing a better cooperative learning model. One expression from a teacher sums up the need to continue to work with cooperative learning - "It works!"

APPENDIX A

SAMPLE COOPERATIVE LEARNING SKILLS CHECK OFF SHEET

STUDENT

SKILL	1	2	3
LISTENING			
ENCOURAGING OTHERS			
STAYING ON TASK			
SHARING IDEAS			
DISCUSSING AND AGREEING			

APPENDIX B

COOPERATIVE LEARNING ASSESSMENT

TEAM STUDY-TEACHER RESPONSES TEAM IDENTIFICATION:_____

Y N 1. Students work with their assigned team.

Y N 2. Students maintain a tolerable noise level.

Y N 3. During discussions, students maintain a high level of on-task behavior.

Y N 4. Students explain answers to each other.

Y N 5. Students check to make sure everyone understands the material.

Y N 6. Students ask teammates, before teacher, for help.

Y N 7. Students make encouraging comments to teammates.

Y N 8. Students make sure all members have access to needed materials.

APPENDIX C

COOPERATIVE EXPERIENCES

COOPERATIVE EXPERIENCE I

Use Or Look For A Pattern

A builder wishes to make a geometric design on a patio. The design was begun by using triangular tiles placed in rows. He placed one tile in the first row, two tiles in the second row, and three tiles in the third row. Each row fit directly under the other. If the builder used a total of 55 tiles, how many rows of tile are there?

COOPERATIVE EXPERIENCE II

Make An Organized List

At the school carnival, prizes can be won if one gets at least 70 points in a "break the balloon" contest. Each contestant gets three darts to break balloons. Each red balloon counts 30 points, each blue balloon counts 25 points, and each white balloon counts 15 points. How many different ways can someone win a prize?

Appendix D

Teacher Questionnaire

1. Was this your first time in using cooperative learning as a way of delivering instruction?

   If no, had you used it with this class before the initial training period? For how long?

2. What are your reactions to this procedure for delivering instruction?

3. How would you improve upon this cooperative learning model?

4. Do you feel that your students were able to benefit from this procedure as compared to a traditional lecture format?

5. Did students improve with the cooperative skills over time?

6. How does this class of students compare with classes that you have taught in the past?

7. For how many years have you taught?

Appendix E

Expected Behaviors

- Moving into groups quickly and quietly
- Staying with the group
- Talking in quiet voices
- Encouraging others
- Listening
- Exchanging ideas
- Summarizing at the end of the session
- Contributing ideas from each group member
- Sharing of materials
- Being persistent and not giving up
- Reaching agreements

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VITA

Wesley Lee Bird

Born March 22, 1950. Hinton, WV

Married July 17, 1982.

Academic Training

B.S. Concord College, Athens, WV, 1971

M.S. James Madison University, Harrisonburg, VA, 1974

Employment

1971-73 Lexington City Schools, Lexington, VA
Teacher of Mathematics.

1974-82 York County Public Schools, Yorktown, VA
Teacher/Department Chairman Mathematics.

1982-84 York County Public Schools, Yorktown, VA
Instructional Computer Specialist.

1984-87 York County Public Schools, Yorktown, VA
Systems Operation Manager.

1987-92 York County Public Schools, Yorktown, VA
Director of Technology and Computer Services.

1992-93 Christina School District, Newark, DE
Supervisor, Curriculum/Technology.

Other Professional Positions Held

1974-85 Thomas Nelson Community College
Hampton, VA
Adjunct Faculty, Mathematics

1981-86 Christopher Newport University
1991-92 Newport News, VA
Adjunct Faculty, Mathematics/Computer Science

Professional Societies

Association for Supervision and Curriculum Development

Phi Delta Kappa