Individual Accountability in Cooperative Learning Groups: Its Impact on Achievement and on Attitude with Grade Three Students

By

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A Thesis Submitted to the
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Abstract

The effects of cooperative learning with process oriented individual accountability, cooperative learning without individual accountability and traditional instruction were compared on pre-instructional achievement, post- instructional achievement, retention, and attitudes towards school and Mathematics. Three third grade classrooms were randomly assigned to the three conditions. Within each classroom the students were assigned to the high ability or low ability group. The results indicated that students in the two cooperative learning groups scored significantly better than the traditional group. In comparison to the traditional group, the post-test results indicated that the cooperative learning with individual accountability revealed a significant difference. The students of low ability experienced greater success in the cooperative learning with process oriented individual accountability than the students of low ability in the traditional group. The cooperative learning without individual accountability did not reveal a significant difference when compared to the traditional group. The results of the retention test were found to be insignificant. Cooperative learning with individual accountability had a significant effect on the achievement results, whereas, cooperative learning without individual accountability had a significant effect on attitudes towards Mathematics.

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Chapter 1

Nature and Significance of the Problem

In today's educational system educators are expected to teach students who reflect diverse learning needs, wide ranges of social skills, and a variety of performance levels. During the last four and half decades competitive and individualistic learning strategies have dominated in classrooms to such an extent that they are used from eighty to ninety-three percent of the time in American schools (Anderson, 1984; Goodlad, 1984; D. Johnson & R. Johnson, 1976).

In an observational study of actual classrooms Goodlad (1984) found that few educators used a variety of teaching strategies. The most common teaching method used involved a presentation of information by the teacher and the intake of that information by the students. Educators talked more than the students at a ratio of three to one. Chances were less than eight percent that students would be involved in discussions, simulations, role playing or demonstrations. Lorin Anderson (1984) found similar results in the observational study of one hundred fifty three classrooms in South Carolina. Educators rarely engaged students in situations where students could express their ideas or opinions.

Doyle (1983) found that sixty to seventy percent of the students school day was spent on individualistic tasks. Many classrooms were viewed as places of learning if students were quietly listening, reading, or writing without any interaction with their peers (Davidson, 1990). The instructional methods emphasized quiet individual learning with little interaction among peers.

Traditional instructional methods find their roots in competition and individual achievement where students compete for praise, grades, recognition, and rewards (Slavin, 1985). In today's educational system students with developmental delays, physical challenges, language delays, emotional instabilities and learning disabilities are at an even greater disadvantage when only traditional instructional methods are used. These students experience success less often when traditional instructional strategies are employed because they are unable to compete successfully for grades, recognition, and rewards due to their limitations (Ames, Ames, & Felker, 1977). Instructional strategies that promote only competition and individual achievement penalize these students (Slavin, 1985). In the past these teaching methods were considered acceptable. Today, however, these methods can not meet the students' needs (Slavin, 1991).

Due to the inadequacies of the traditional whole-class expository instruction and individual instruction systems, many educators are advocating the application of teaching strategies that allow for more interaction among students. According to Glasser (1986) students have a strong need to be accepted, to belong, and sometimes to influence others. By involving students in their own learning, educators can provide structured opportunities for students to interact with each other. Students' retention levels of the material being studied improve and students achieve better academic results when the educator carefully structures oral interaction within the groups to include explaining, elaborating, paraphrasing, summarizing as well as listening to discover a joint understanding of the material (Yager, Johnson & Johnson, 1985).

A variety of alternative instructional strategies have been developed that would enhance academic achievement and prosocial development. These techniques and strategies aim to solve the problems created by competitive classrooms and intergroup relations. Among these strategies cooperative learning has achieved prominence and is one that has been studied extensively (Johnson & Johnson, 1989). While there are many different types of cooperative learning strategies, they "all share an interest in finding an alternative to 'frontal teaching' -- the teacher instructing the whole class at once -- or to individual seatwork by students"(Newmann & Thompson, 1987, p.1).

Cooperative Learning, traditional instruction and individual accountability are complex educational terms that can be defined in many different ways. In order to provide a clear understanding of these educational terms in the current study the following definitions are presented.

Definition of Terms

Cooperative learning is an instructional strategy that provides a combination of cooperative, competitive, and individualistic goals. According to Johnson & Johnson (1991) cooperative learning is the instructional use of small groups so that students work together to maximize their own and one another's learning(p. 69). The teacher structures the classroom into small heterogeneous groups to work towards a common goal. Cooperative learning can be used at any grade level and in any subject area. It usually involves the completion of one worksheet or one assignment. The five key elements which are incorporated into each lesson are positive interdependence, face to face interaction, individual accountability, interpersonal and small group skills and group processing.

Individual accountability is defined as "the student is responsible for his/her own learning and the learning of each of the members in the group." The students have the understanding that they must use all the resources of the group before they go to the teacher for help. The educator provides feedback to the group members and to the group as to how each individual is progressing. Redundant efforts are avoided. The educator needs to put into place strategies that will ensure that every individual is responsible for learning the material. Examples of strategies are individual tests, randomly picking one paper to represent the entire group, and each member explaining what he/she has learned.

Traditional learning is defined as "the student is responsible for his/her own learning". The material is presented by the teacher and the students master the material individually. The teacher assists the individual students who are having difficulties while the other students work on their own. The students have the understanding that if you need help or clarification you always go to the teacher.

The definitions of the key educational terms provide the foundation on which the current study is developed.

The implementation of cooperative learning can address the problems of diverse classrooms and the basic human need for affiliation (Davidson, 1990). Johnson and Johnson(1989) state:

> "Today the research evidence is clear. Students achieve higher, learn more, use higher-level reasoning strategies more frequently, and retain what they learn longer, when they work together in cooperative learning groups than when they participate in competitive or individualistic learning situations. (p.2:19)

The success of cooperative learning depends on the expertise of the teacher (Strother, 1990). One can not just put students into groups and expect them to achieve better results. To be successful, there must be sufficient preparation of students for cooperative work and adequate staff development. An understanding of the difference between cooperative learning methods and traditional methods is essential for a smooth implementation of cooperative learning within the classroom.

The transition from the traditional methods to the cooperative learning methods involves changes in the educators' roles as well as the students' roles(Kagan, 1985). The teacher transforms from a transmitter of information to a facilitator of learning. According to Johnson, Johnson & Holubec(1987) the teacher's role in formal cooperative learning groups is both as an academic expert and as a classroom manager to promote effective group functioning. The educator teaches the academic concepts, principles, and strategies that the students are to apply and to master. She/He monitors each group by intervening to teach the social skills and to provide the required academic assistance. The student's role changes from a passive recipient of information to becoming tutors, experts, investigators, and presenters. Students become more active in their own learning. Students are taught to look to their peers for assistance, feedback, reinforcement and support. Students are expected to interact with each other, to share ideas and materials, to support and to encourage academic achievement. This change in roles takes time, for students and educators alike, to develop. It will take educators from two to three years to gain sufficient expertise that they can use cooperative learning routinely without considerable thought and planning (Johnson & Johnson, 1991).

In order to implement cooperative learning strategies successfully within the early years classroom an educator must be aware of the effects the diverse needs of the students will have on the group work. Galton & Willcocks (1983) found that students' behaviors in the classroom fit into different categories. The learning behaviors could be described as, the hard grinders who are always busy, the attention seekers who are the focus of the educators' individual interactions, the attention getters, who because of behavior elicit a statement from the teacher, the intermittent workers who work a small proportion of the time, and the easy riders who work as slowly as possible. This combination can be found in any early years classroom. Due to the combination of learning behaviors, working in groups does not come naturally for the early years students. Placing students in groups can result in power conflicts or personality conflicts which can disable a group to the point where no one learns (Johnson & Johnson, 1991).

When working in groups the diversity of the students' needs and the students' learning behaviors can produce an effect known as the "free rider effect" also, known as "social loafing" (Slavin, 1990; Kerr & Bruun, 1983). The problem is that less capable members of the group may develop an attitude that someone else in the group will do the work which creates a "leave it to the smart one" attitude while the more capable students expend less effort to avoid doing most of the work (Kerr, 1983). Another aspect of the problem is that the more capable group members may take over the important leadership roles in order to benefit themselves at the expense of the group (the rich-get richer effect). The more capable members learn a great deal since they tend to do the explaining which correlates highly with the amount learned, while the less capable students become the audience; watching but, not participating in the group's activities (Webb,1985).

Researchers agree that the "free rider effect" can have a negative effect on group productivity (Johnson & Johnson, 1989; Cohen, 1985). The outcome is lack of group cohesiveness which negatively effects students' achievement scores. Slavin (1990) states

> "If the learning of every group member is not critical to group success, or if group success is not rewarded, achievement is unlikely to be increased above the level characteristic of the traditional classrooms(p.10)."

The learning situation should reflect an understanding by the teacher that not all students will be actively involved in their learning. Some students will need more support than others. To assist all students of various academic and social levels to become involved in their own learning as well as the learning of their group members instructional strategies need to be put in place by the educator.

Within cooperative learning groups a solution to the "free rider effect" is found in the implementation of individual accountability strategies which have been defined as each student being responsible for his/her learning as well as the learning of each member in the group. Within traditional instructional methods the student is responsible only for his/her own learning. The educator who uses traditional instructional methods promotes individual accountability through timelines, rewards, praise, and test results.

Within cooperative learning methods Slavin (1991) suggests two ways to make students individually accountable. One way is to divide the work into sections, so that each student is responsible for a certain part. The other way is to use group extrinsic rewards linked with the individual students' improvement in academic achievement. These strategies emphasize the final product or the outcome. Another way of promoting individual accountability is through strategies that are placed into every lesson on a daily basis. An example of this type of strategy is randomly asking a member of the group to explain a certain part of the assignment or to give specific material to each person where all the materials are needed to complete the project. These strategies emphasize the process of learning rather than the final product.

Kagan(1985) did a comparison of several cooperative learning methods. In his analysis he grouped the different methods into cooperative learning methods that were product oriented or methods that were process oriented. The product oriented cooperative learning methods emphasize the learning outcome, achievement. These methods rely on extrinsic rewards to motivate students to master the material. The process oriented cooperative learning methods emphasize the learning process. These methods emphasize the inclusion of all members of the group.

By applying Kagan's (1985) categories, the following model for the implementation of individual accountability strategies has been developed by the investigator. The individual accountability strategies can be divided into the same two categories, namely, process orientation or product orientation. The goal of the process oriented strategies is to motivate students to become actively involved in their own learning as well as the learning of the other group members. Galton and Williamson (1992) have done extensive research with early years students in England. Their findings suggest that early years students benefit, socially and academically, when the teacher emphasizes the process of learning rather than the final product or outcome of learning. The emphasis is not only on what is learned, but how it is learned. Product oriented individual accountability strategies are aimed at increasing the student's knowledge base. The learning outcome is more important than the process of learning. The product is achievement.

Four ways of promoting process oriented individual accountability strategies are explained. The first way is to ask randomly a member of the group to explain the answer. The second way is to give specific materials to each member of the group. The materials can be specific manipulatives to move, or a specific color of pencil to use. The involvement of each member is expected to be similar. The third way involves each member being allowed to sign the work sheet if the group feels the member participated in completing each question of the worksheet. The fourth way involves each member of the group signing the work sheet, only if he/she can explain to his/her group members how to do each part.

The product oriented strategies can promote individual accountability if the student values the importance of evaluation. One way of promoting individual accountability is by rewarding each student on the basis of improvement from one test to the next. The group is rewarded on the basis of the improvement of all group members. The second way to take one paper, grade it, and every member of the group is assigned that grade. The third way is to combine the individual scores and reward on the basis of success. The fourth way is to give all members the lowest score of their group members. All of these methods are based on a reward system that is related to the achievement of individuals in the group and the total group is rewarded. The extensive research of Slavin (1991) and his colleagues supports the fact that a group goal linked with an extrinsic reward is successful in promoting student mastery of the material.

Product oriented strategies are linked with extrinsic rewards while process oriented strategies are linked with student participation. A controversy exists among researchers about the use of extrinsic rewards to promote individual accountability. Slavin (1991) has found through extensive research that using extrinsic rewards motivate students to master the material. Davidson (1990) suggests that recent studies in the areas of problem solving and reasoning tasks, reveal that rewards are not always necessary to increase student achievement. Johnson & Johnson (1990) suggest that positive goal interdependence has to be present to increase student achievement. Kohn (1991) advocates that by bribing students with extrinsic rewards the educator undermines their interest in learning and can reduce the quality of their work.

The current study investigates the area of Mathematics which is susceptible to the "free rider effect". Due to the nature of the subject the students of high ability can take over the group and complete the worksheets without the input of the students of low ability. As previously described individual accountability can provide a solution to the "free rider effect". When early years students are working in groups, Galton & Williamson (1992) recommend that the emphasis of instruction should be placed on the process of learning rather than the outcome. By placing the emphasis on the process of learning students can experiment with the new concepts to develop a clear understanding. Through the implementation of process oriented individual accountability strategies the goal is to change the students' focus from completing the worksheet as quickly as possible to the inclusion of each member within the group in the completion of the worksheet. The implementation of process oriented individual accountability strategies within the cooperative learning groups can assist students to include all members of the group.

Mathematics is, also, a subject that can be difficult for many students to the point that they experience math avoidance or math anxiety (Davidson, 1990). Within cooperative learning the group interaction provides students with a healthy atmosphere to take risks in order to learn the concepts and to master the problem solving strategies. Students learn by discussing, explaining and thinking with others (Johnson &Johnson, 1989).

Kohn (1991) supports the concept that the love of learning should be promoted by educators, not extrinsic rewards which can result in reduced student efforts. With the deletion of extrinsic rewards the focus is on the participation of all members of the group rather than the end outcome, the reward.

Kagan (1985) suggests that every element of cooperative learning should be analyzed to discover the impact of the element within the context of cooperative learning methods. The current study recognizes the need to investigate whether process oriented individual accountability strategies that promote inclusion of all members can produce positive student achievement gains with early years students. The assumption is that early years students are motivated to learn, therefore, extrinsic rewards are not needed. Through investigation of the element, individual accountability, an insight into the basic principles regarding cooperative learning can assist early years educators to deal with the diverse learning behaviors, wide spectrum of learning needs and the "free rider effect".

Statement of the Problem

The implementation of cooperative learning takes a great deal of dedication and training. The increase in achievement scores is an important part of the motivation to implement cooperative learning strategies. The literature supports the finding that if the members of the groups do not feel it is important to work together to attain the goal, the achievement results will be similar to the traditional achievement results(Slavin, 1990). When teaching early years students in groups the emphasis should be on the process of learning in order to allow these students to experiment with the new concepts (Galton & Williamson, 1992). There is little research about whether using process oriented individual accountability strategies with cooperative learning groups can positively effect student achievement scores. The current study examines three observations that have been developed through the investigator's anecdotal evidence. One, process oriented individual accountability strategies should be implemented with early years students to promote active learning which may result in higher student achievement than the traditional methods. Two, if students have an opportunity to concentrate on what is being learned rather than the outcome of learning students' attitudes will show improvement. Three, as suggested by Kohn(1991), extrinsic rewards are unnecessary at the early years level, due to their enthusiasm and their motivation to learn.

The major problems to be investigated are: What is the effect of process oriented individual accountability strategies without extrinsic rewards within cooperative learning groups on the achievement scores of early years students of high and low abilities? Does the element of individual accountability promote positive student attitudes towards school and towards mathematics? The general questions may be phrased as seven specific research questions:

1. Do grade three students in the cooperative learning groups perform better on multiplication achievement tests than grade three students in the traditional group?
2. Do process oriented individual accountability strategies promote higher student achievement in the cooperative learning group compared to the traditional group?
3. Is there a statistically significant difference between the multiplication achievement results of the students of high ability of the cooperative learning with individual accountability group when compared with the students of high ability in the traditional group.

4. Is there a statistically significant difference when the achievement results of the students of low ability of the cooperative learning group with process oriented strategies are compared to the results of the students of low ability in the traditional group?

5. Do the attitude scores towards school and towards mathematics on the Likert scale survey of the students of the cooperative learning groups reveal a positive increase when compared to the students of the traditional group ?

6. Do the attitude scores towards school and towards mathematics on the Likert scale survey of the students of the cooperative learning with individual accountability group reveal a positive increase when compared to the students of the cooperative learning group without individual accountability?

7. Do the attitude scores towards school and towards mathematics on the Likert scale survey of the students of the cooperative learning with individual accountability group reveal a positive increase when compared to the treament groups by ability groups?

Hypotheses

The current study has two purposes. The first purpose is to investigate the effectiveness of four specific process oriented individual accountability strategies without extrinsic rewards and the extent of success in promoting higher student achievement and positive student attitudes with students of high and low ability within early years classrooms. The second purpose is to identify the changes in attitude within the different treatment groups and between the high and low ability groups. A ten statement Likert scale survey which was developed by the investigator was used to establish whether or not the students' attitudes towards school and towards mathematics were effected during the treatment. The following hypotheses have been formulated.

1. Grade three students who are taught using cooperative learning strategies will achieve higher results on the multiplication unit test than grade three students who are taught using traditional strategies.
2. Grade three students who are taught using cooperative learning, with process oriented individual accountability strategies will achieve higher results on the multiplication post test than students who are taught using traditional strategies.
3. Grade three students who are taught using cooperative learning with process oriented individual accountability strategies will achieve higher results on the multiplication post test than grade three students who are taught using cooperative learning without process oriented individual accountability strategies.
4. Grade three students who are taught using cooperative learning strategies without individual accountability strategies will achieve

higher results on the multiplication post test than grade three students who are taught using traditional strategies.

5. Grade three students of high ability who are taught using cooperative learning with process oriented individual accountability strategies will achieve higher results on the multiplication post test than grade three students of high ability who are taught using traditional strategies.

6. Grade three students of high ability who are taught using cooperative learning strategies with process oriented individual accountability strategies will achieve higher results on a multiplication post test than students who are taught using cooperative learning strategies without individual accountability.

7. Grade three students of high ability who are taught using cooperative learning without individual accountability strategies will achieve higher results on the multiplication post test than students of high ability who are taught using traditional strategies.

8. Grade three students of low ability who are taught using cooperative learning with process oriented individual accountability strategies will achieve higher results on the multiplication post-test than grade three students of low ability who are taught using traditional strategies.

9. Grade three students of low ability who are taught using cooperative learning with process oriented individual accountability strategies will achieve higher results on the multiplication post test

than students of low ability who are taught using cooperative learning without individual accountability.

10. Grade three students of low ability who are taught using cooperative learning without individual accountability will achieve higher results on the multiplication post test than students of low ability who are taught using traditional strategies.

11. Grade three students who are taught using cooperative learning strategies with process oriented individual accountability strategies will retain the information on the multiplication retention test better than students who are taught using traditional methods.

Table 1

Analysis of the Results of the Hypothesis

Measures	Pre-test	Post-test	Retention Test
	Total	Total	Total
1+2 vs 3			
	Total High Low	Total High Low	
1 vs 3			
1 vs 2			
2 vs 3			

Group 1 - Cooperative Learning with Process Oriented Individual Accountability Strategies
Group 2 - Cooperative Learning without Individual Accountability
Group 3 - Traditional

12. The students in the cooperative learning groups will reveal a greater difference in their attitudes over the course of the study than the traditional group.

Table 2

Statistically Significant Statement on the Survey

Statements	1	2	3	4	5	6	7	8	9	10
Ind. Accountability										
Without Ind. Acct.										
Traditional										

X - $p < .05$

O - $p > .05$

13. Grade three students who are taught using cooperative learning with process oriented individual accountability strategies will have a better attitude toward school than grade three students in the traditional group.

14. Grade three students who are taught using cooperative learning with process oriented individual accountability strategies will have a

better attitude toward school than grade three students who are taught using cooperative learning without individual accountability.

15. Grade three students who are taught using cooperative learning with process oriented individual accountability strategies will have a better attitude toward mathematics than grade three students who are taught using traditional strategies.

16. Grade three students who are taught using cooperative learning with process oriented individual accountability strategies will have a better attitude toward mathematics than grade three students who are taught using cooperative learning without individual accountability.

Table 3
Results of the Analysis of Variance for the Survey

Treatment Groups	School	Mathematics
High Ability Groups		
Low Ability Groups		
1 vs 3		
1 vs 2		

Legend

1 - Cooperative Learning with Individual Accountability

2 - Cooperative Learning without Individual Accountability

3 - Traditional

Significance of the Study

Many educators agree that getting young children to work together in groups is not an easy task (Galton & Williamson, 1992). Many educators are concerned that the free rider effect will deter the learning of some students. Mathematics is a subject that is susceptible to the "free rider effect" due to the nature of the subject. Many students experience math avoidance or math anxiety, therefore, cooperative learning groups can provide an opportunity for these students to participate less often than the others in the group. As a possible solution to this problem, the educator could concentrate on the process of working in a group before concentrating on the final product. It is proposed that the use of process oriented individual accountability strategies that promote individual involvement and assist students to understand the importance of their involvement could result in better achievement outcomes. Most early years students are motivated to learn, therefore, extrinsic rewards are not needed to promote active learning and mastery of the material.

There is little research which advocates different approaches for young high and low ability students to enable them to become individually accountable within cooperative learning groups. This study investigates whether or not the implementation of process oriented individual accountability strategies can produce higher student achievement scores with early years students.

This study examines whether or not the implementation of cooperative learning strategies can produce higher academic achievement results than the traditional instructional method which are most frequently used with early years students.

This study attempts to provide four alternative strategies to extrinsic motivation in promoting student accountability. Specifically, this study examines whether or not the process oriented individual accountability strategies can provide a more suitable alternative to product oriented individual accountability strategies which are linked to extrinsic rewards in reducing the "free rider effect". Furthermore, the current study inquires whether such effects are evident for students of high ability as well as for students of low ability.

It is intended that the study will provide direct application of the results to the classroom through workable individual accountability strategies that reduce the "free rider effect" in the area of Mathematics. Hopefully, by using these process oriented individual accountability strategies the educator will be able to assess through observation whether or not the free rider effect has been reduced.

In the area of social development, this study examines the attitudes held by early years students towards school and towards mathematics. The study adds support to the notion that through working in groups students experience a wider support base. This support base provides the assistance and security necessary to enable all students to progress in their social development.

Chapter 2

Review of the Literature

The education system has been motivated to examine new teaching strategies to cope with the increased academic and social needs of all students due to the breakdown of the family unit, the change from industry to an information-management society, and the introduction of legislation that allows all children to attend their neighborhood school. One of the teaching strategies that has proven to be successful in meeting the diverse needs of students, both socially and academically, is cooperative learning.

In order to understand cooperative learning and to understand the relevancy of this study the extensive research has been organized in the following way. First, a theoretical base of cooperative learning is explained to provide an understanding of student interactions. Second, to comprehend the changes that are involved in implementing cooperative learning, the differences between cooperative learning and traditional methods of instruction are presented. Third, to understand the complexity of cooperative learning, different principles and methods of cooperative learning are described briefly. Fourth, related research that supports the use of the different methods of cooperative learning in the classroom is presented. Fifth, although the research clearly supports the effectiveness of cooperative learning the diverse student population creates challenges that need to be addressed. The various challenges and possible solutions are discussed. The final section of this chapter includes a summary and major conclusions.

The theoretical foundation of cooperative learning lies in the area of Social Psychology with specific reference to the theory of social interdependence. According to Deutsch's (1949a; 1962) theory of social interdependence there are two types of social interdependence which are referred to as cooperation and competition. Individualistic efforts involve the absence of interdependence. He identified the two types of social interdependence as a continuum of goal interdependence. One type of goal interdependence is promotive which is a situation where both individuals must achieve their goal to be successful. The second type of goal interdependence is contrient which is a situation where if one individual achieves the goal the others do not. The second continuum is made of two actions. The first action is called effective which improves the chances of reaching the goal. The second action is called bungling which decreases the person's chance of reaching the goal.

Deutsch (1962) combines the two continua to explain how these elements affect the three basic social psychological processes: substitutability, cathexis (the investment of psychological energy in objects and events outside oneself) and inducibility (openness to influence). Within a cooperative situation an individual will exert more energy in order to make up for the ineffectiveness of a group member. Whereas in a competitive situation the ineffectiveness of a competitor allows one to achieve the goal. Within a cooperative situation the effective actions are cathected positively and bungling actions are cathected negatively. Within competitive situations the opposite is true. Within cooperative situations participants will assist each other and work to prevent bungling action. Within competitive situations the individuals resist assisting the other person and willingly assist with any bungling action. This theory provides the basis for the future work on the social interdependence theory.

Deutsch's (1985) crude law of social relations states that the characteristic processes and effects elicited by a given type of social interdependence, also, tends to elicit that type of social interdependence. Cooperation promotes trust, openness, and mutual assistance. Competition promotes the obstruction of each other's success. It, also, promotes distrust and limited communication. Individualistic efforts promote isolation.

Social interdependence can be structured in three ways. Each way will affect the way individuals interact and the outcomes of those interactions. Cooperation exists when the situation is set up where individuals are positively interdependent. The interaction promotes each others' success which results in higher productivity and achievement, more positive relationships, and greater psychological health and well-being (Johnson and Johnson, 1989). Positive interdependence is set up through four goals. One goal is sharing a common fate. The second goal is striving for mutual benefit. The third goal is having a long-term perspective. The fourth goal is having a shared identity.

Competition exists when the situation is set up where individuals are negatively interdependent. Individuals work against each other which results in lower productivity and achievement, more negative relationships among individuals, and lower psychological health and well-being (Johnson & Johnson, 1989). Negative interdependence is set up through four goals. One goal is recognizing the negatively linked fate. The second goal is striving for differential benefit. The third goal is having a short term time perspective. The fourth goal is recognizing a relative identity.

Individualistic efforts exists when there is no interdependence. The results are similar to the negative interdependence. No interdependence is set up through five goals. The first goal is recognizing they have an individual fate. The second goal is striving for self benefit. The third goal is having a short-term time perspective. The fourth goal is recognizing their individual identity. The fifth goal is recognizing that their performance is self-caused.

Student-Student interaction can be divided into three types which are referred to as competition, individualism, and cooperation. A learning goal is a desired future state of demonstrating competence or mastery in the subject area being studied. The goal structure specifies the ways in which students will interact with the teacher and with each other during the instructional session. Competitive situations perpetuate a negative interdependence. Students perceive that they can obtain their goals if and only if the other students fail to obtain their goals (Deutsch, 1962; Johnson & Johnson, 1987). In individualistic learning situations students' goal achievements are independent. Students perceive that the achievement of their learning goals is unrelated to what other students do (Deutsch, 1962; Johnson & Johnson, 1987). In a cooperative learning situation there is a positive interdependence among students' goal attainments. Students perceive that they can reach their learning goals if and only if the other students in the learning group also reach their goals (Deutsch, 1962; Johnson & Johnson, 1987).

According to Johnson & Johnson, (1989) in the ideal classroom, all students should learn how to work collaboratively with others, compete for fun and enjoyment, and work autonomously on their own. Competitive and individualistic work should supplement cooperative learning when it is appropriate. Cooperative learning should be used sixty percent of the school day with individualistic and competitive activities making up the other forty percent of the day.

To implement cooperative learning strategies within a classroom the differences between cooperative learning and traditional teaching should be examined. The understanding of the differences in the two teaching strategies promotes the successful implementation of cooperative learning. In the traditional classroom the teacher is a transmitter of information while in the cooperative learning classroom the teacher is a facilitator of learning. In both situations the teacher determines the objectives of the lesson and how that material will be presented to the students. However, in the cooperative learning classroom the teacher organizes each lesson so that students feel responsible for their learning as well as the learning of the group members. The students' roles can be defined as progressing from a passive form of learning in the traditional group to a more active form of learning in cooperative learning. The differences between the two teaching strategies are presented in Table 4.

Table 4
What is the difference between Cooperative Learning and Traditional Learning Groups? (Johnson & Johnson, 1991)

Cooperative Learning	**Traditional Learning**
Positive interdependence	No interdependence
Individual Accountability	No individual accountability
Heterogeneous membership	Homogeneous membership
Shared leadership	One appointed leader
Responsible for each other	Responsible only for self
Task & maintenance emphasized	Only task emphasized
Group processing occurs	No group processing
Teacher observes & intervenes	Teacher ignores groups

Cooperative learning has been used and investigated in all subject areas from grades two to twelve. It can be used to supplement the teacher's instruction by providing time to practice new material or to discuss new information. It can, also, be used to provide a structure in order for students to learn new material on their own. Various researchers have developed alternative ways of dealing with the problems experienced in structuring a cooperative classroom (Kagan, 1985; Slavin, 1985). Nevertheless, all methods share the same fundamental feature of small (2-4) heterogeneous groups working toward a common goal. Group members represent a cross-section of characteristics which include academic ability, social skills ability, gender, ethnicity, students interests and race. Recognition and rewards are based on the performance of all team members.

Summary of the Decisions Necessary for Change

In developing each lesson an educator makes a choice whether or not students of varying abilities work together to accomplish a goal, whether or not students of varying abilities compete against each other to accomplish a goal or whether or not students work independently to accomplish a goal. Through the use of cooperative learning strategies all the resources of the class are used to assist all students to find success. In order to implement cooperative learning effectively the teacher should have a clear understanding of the differences between cooperative learning and traditional groups. The implementation process requires the educator to outline the necessary changes.

Various forms of cooperative learning have been developed by different researchers to address the diverse needs of the students. Different models can vary in their philosophy of education, the roles they prescribe for educators, the task structures they employ, and the methods they use to evaluate students. To understand the complexity of cooperative learning the different forms are presented in the next section.

Principles and Methods of Cooperative Learning

The cooperative learning methods can be divided into two categories which are the conceptual approach and the direct approach. An example of the conceptual approach is the Learning Together model which was developed by Johnson & Johnson (1984). It involves training educators in the general principles and procedures as to the nature of cooperative learning and how it can be used. The educators are taught how to change any existing lesson into a cooperative learning lesson. Each lesson involves an academic objective as well as a social skill objective.

A direct approach involves giving the educator a curriculum package or specific strategies for use in very specific ways. Examples of the direct approach are the Students Team Achievement Divisions which were developed by Slavin (1985) and his team at John Hopkins University, Coop, Coop which was developed by Spencer

Kagan(1985), Jigsaw which was developed by Aronson (1978), and Group Investigation Method which was developed by Shlomo Sharan (1976). One by one each of these cooperative learning models is described as to the specific approaches and strategies that are used.

1. Student Team Learning

Slavin (1985) and a team of researchers from John Hopkins University developed the Student Team Learning cooperative learning approach. Four principal methods of STL have been researched extensively: Student Teams-Achievement Divisions (STAD), Teams-Games-Tournament (TGT), Team Assisted Individualization (TAI) for mathematics 3-6, and Cooperative Integrated Reading and Composition (CIRC) for reading and writing instruction grades 3-5. The latter two are actual curricula specifically designed for those grade levels. STAD is most appropriately used with subjects or material that involve one correct answer: mathematics, language usage and mechanics, geography, map skills and science facts and concepts.

There are five components of Student Teams-Achievement Divisions. One, the lesson is presented to the whole class by the teacher. Two, the heterogeneous teams of four or five students work together to learn the material. Three, the students take individual quizzes. Four, the individual improvement scores are tallied for team points. Five, once a week teams are recognized through a reward system. Individuals who score well or who have shown the most improvement are, also, recognized.

The three key elements to this approach are team rewards, individual accountability, and equal opportunities. Team rewards refer to certificates or rewards that are awarded to a team when they achieve a certain criteria. The rewards are in abundance and every team has the ability to attain them. Individual accountability means the success of the team depends on the success of the individuals. Each member of the team has a responsibility to learn the material themselves and to assist other members of their team through explaining the concepts and making sure everyone understands it. Equal opportunities for success means that each member of the team must try to do better than past performances on individual quizzes. The goal of the team is to learn something, not just to do something. As a team the students strive to achieve better than their past performances. Since the team success rests with the sum of the individuals' learning, each member of the team takes responsibility for ensuring that each one of them understands the materials that they will be tested on individually.

In Teams-Games-Tournament (TGT) which is also designed by the Johns Hopkins University, the quiz is replaced with weekly tournaments. At three person tables students with similar past performances compete against each other . Low achievers compete with low achievers. High achievers compete with high achievers.

Average achievers compete with average achievers. A team reward is given. Even though the team members compete at different tables, the points scored by the individual are put toward the team score. Individual accountability is accomplished in the same manner as in STAD.

Team Assisted Individualization uses four member mixed ability groups. Instead of the team working on the same materials, they work at their own pace, assisting fellow team members where they can. Cooperative Integrated Reading and Composition (CIRC) is like TAI in the fact it is a curriculum. The sequence of CIRC involves, teacher instruction, team practice, team pre-assessments, and quizzes. Students take the quiz when their teammates determine they are ready.

2. Jigsaw

The Jigsaw Model was developed by Elliot Aronson and his colleagues (1978). Students are assigned to six member teams. The material is divided into different sections. Each student of the group is given a different section to learn. The student's job is to master the assigned material. The students who have the same material to learn form expert groups. In the expert group the students master the material and decide how they will teach the material to the other members of their group. The students return to their original group to teach their section to the other members of their team. Students take individual quizzes which like STAD are based on the comparison of past performance in order to tally team points. Jigsaw is most effective in areas such as social studies where the material is textbook oriented.

3. Learning Together

The Learning Together model was developed by David Johnson and Roger Johnson at University of Minneapolis (Johnson & Johnson, 1984). Their method involves grouping students in heterogeneous groups of three to five students. The teacher presents the lesson by clearly explaining the task and the goal structure to the students. The students work in groups to complete the task. The teacher monitors the different groups by intervening where necessary to provide task assistance or to increase the students' interpersonal skills. The educator assists the students to evaluate their achievement and assists the students to discuss how well they worked together. Each lesson consists of an academic objective and a social skill objective. The five key elements of this method are positive interdependence, individual accountability, promotive face-to-face interaction, group processing, and social skills.

The most important element of this method is positive interdependence. Positive interdependence is the understanding that the students of each group are joined together so that for one of them to be successful all of them must be successful. There is mutual benefit, a common fate, and a shared identity. The group celebrates each other's successes and the group's successes. Each member is responsible for helping the others in his/her group.

Positive interdependence is structured by the educator in a variety of ways. Only the strategies that are used most often will be described briefly. The first step in structuring positive interdependence is to set up a mutual goal so that the members are responsible for their own learning as well as the learning of each other's. Positive goal interdependence is the most important part of any cooperative learning lesson. Positive reward interdependence exists when all group members receive the same reward for successfully completing the goal. Positive resource interdependence exists when each member of the group has only a part of the materials, information, or resources needed and the members' resources must be combined in order to attain the goal. Positive role interdependence exists when each member is assigned specific responsibilities, such as, reporter, recorder, encourager. Positive identity interdependence exists when the group have a name, flag, motto, or song. Environmental interdependence exists when the group members have a specific place where they meet. It is essential for the cooperative learning lesson to be successful that there is positive goal interdependence supplemented by at least four different positive interdependence strategies (Johnson & Johnson, 1987).

Individual accountability exists when the performance of each student is evaluated and the results are given back to the group and to the individual. This element ensures that each individual did his/her fair share of the task. The educator needs to devise ways to assess the effort that each individual group member is contributing to the group task. He/She provides feedback to the group members and to the group as to how each individual is progressing. Redundant efforts are avoided. The educator needs to put into place strategies that will ensure that every individual is responsible for the final outcome. Examples of strategies are individual tests, randomly picking one paper to represent the entire group, and each member explaining what he/she has learned.

Face to face promotive interaction among students requires an opportunity for students to promote each other's success by helping, supporting, encouraging and praising each other's efforts to learn. Every member is responsible for the final outcome. Interpersonal and small group skills involve getting to know each other, trusting one another, communicating effectively, accepting and supporting each other, and resolving conflicts constructively.

Group Processing involves reflecting on how the group works together to accomplish the goal. The members of the group discuss what actions were helpful and unhelpful. Decisions are made about what actions the group should continue or change. For example the members of the group may decide that all members are working together to get the task done, but more encouragement would increase the productivity of the group. Each member would agree to encourage each other while working.

Group Investigation Model

The Group Investigation Model was developed by Shlomo Sharan and Yael Sharan at the University of Tel-Aviv. Students work in small groups using cooperative inquiry, group discussion, and cooperative planning and projects (Sharan and Sharan, 1976). Students identify a topic and organize themselves into research groups. They divide the material into individual sections, develop a group report and present it to the entire class. Individual accountability is established through the division of labor.

5. **Structural Approach-- Co-op Co-op**

The Structural Approach was developed by Spencer Kagan (1985), Director, Resources for Teachers. According to Kagan (1990)

> "the structural approach to cooperative learning is based on the creation, analysis, and systematic application of structures, or content-free ways of organizing social interaction in the classroom"(p. 12).

These structures can be used over and over again within a variety of content areas. Here are examples of the structures used in the structural approach. Roundrobin is a technique where students take turns to share orally. Numbered heads involves each student having a number, the teacher asking a question, members consulting with each other, a number is called, those students who have the number raise their hands, and a member of a group is called upon to answer. Think-Pair-share involves a process where students have time to think by themselves, then he/she shares his/her ideas with a partner and finally the ideas are shared with the class. Kagan(1985) suggests a variety of techniques that a teacher can use to organize the social interaction among students to enhance teambuilding, classbuilding, communication building, mastery of material, and concept development..

Co-op Co-op which was developed by Kagan (1985) is a ten step structure in which students in teams produce a project that fosters the learning of other students in other teams. It is an extension of the group investigation model. The ten steps of Co-op Co-op begin with a student-centered class discussion. The students are placed in heterogeneous teams. At this point team building activities are done to promote increased cooperation and communication skills. The team chooses a topic where each member of the team is responsible for one aspect. Mini topic selection involves each student of the group becoming an expert in that one aspect. Each student individually prepares to teach their group. All students present their part to their group. The whole team prepares a presentation that will be made to the class. The teams present their material. Evaluation is composed of the individual presentations to the team members, the team presentation to the class , and each individual's paper on his or her mini-topic. The teacher is the evaluator.

Summary of the Need for a Variety of Methods

The different models of cooperative learning address the different needs of the educators. Some educators prefer an approach that has precise implementation procedures such as the direct approaches; STAD, TGT, Jigsaw, Coop Coop. Other educators prefer an approach that allows for more freedom in implementation, such as David Johnson & Roger Johnson's Learning Together Method (1984). As the teachers experiment with cooperative learning in their classrooms, the needs of the various students in their classroom motivate the teacher to search for alternate methods that will remedy the challenges. This search leads them to other forms of cooperative learning.

Related research is presented to provide an understanding of the different elements that have been investigated. These findings assist educators to implement strategies that will improve student achievement beyond the traditional method.

Related Research

All of the cooperative learning methods have been developed to meet the increasing academic and social needs of the students. In order to enhance student achievement, the most successful approaches have incorporated two key elements which are group goals and individual accountability (Slavin, 1990). A group goal means that the group members assist each other to attain the goal and work together to receive the stated reward, grade, or any other sign of recognition. Individual accountability means that in order for the group to be successful all the members of the group must learn the concept being taught. Group goals and individual accountability motivate students to give explanations and to take one another's learning seriously. Groups are rewarded based on the individual learning of all group members.

Slavin (1991) suggests two ways which have been found to be effective in assisting students to be individually accountable. One way is to reward groups based on scores of individual tests that are weighted for improvement based on capability. These scores are tallied for team points. The second way is to give each member a specific task for which he/she could be held accountable.

Forty one out of sixty seven (sixty one percent) experimental/control comparisons of at least four weeks' duration have found significantly positive effects. Twenty-five (thirty seven per cent) found no differences. In one study the control group outperformed the experimental group (Slavin, 1991). Achievement effects of cooperative learning have been found to be about the same degree at all grade levels (2-12), in all major subjects, and in urban, rural, and suburban schools. Effects are equally positive for high, average and low achievers (Slavin, 1991). Cooperative learning methods, also, have a positive effect on self-esteem, intergroup relations, acceptance of academically handicapped students, attitudes toward school, and ability to work cooperatively (Johnson & Johnson, 1989).

In studies evaluating Student Team Achievement Divisions, (STAD), Team Game Tournament, (TGT), Team Assisted Individualization (TAI), and Cooperative Integrated Reading and Composition, (CIRC) the results have been consistently positive. Thirty seven out of forty four studies (84%) found significantly positive achievement effects. In contrast, only 4 out of 23 studies (17%) that were lacking group goals and individual accountability found positive effects on student achievement.

Slavin & Karweit (1984) evaluated STAD over an entire school year in the inner city Philadelphia ninth grade mathematics classes. On a standardized mathematics test student performance increased significantly more than in either a mastery learning group or a control group using the same materials.

The largest effects of Student Team Learning methods have been found in studies of TAI. Five of six studies found substantially greater learning of mathematics computation in TAI than in control classes. A year after the students who were in TAI had substantial experimental control differences (Slavin and Karweit, 1985). In mathematics concepts and applications, one of three students (Slavin et al. 1984) found significantly greater gains in TAI than control methods, while two found no significant differences (Slavin and Karweit, 1985). Cooperative learning strategies do positively effect the student achievement in the area of Mathematics.

Many studies have tried to identify which of the elements of cooperative learning are the most effective in promoting student achievement. Through investigation of the various elements an insight into the basic principles regarding cooperative learning can assist educators to implement the strategies effectively (Kagan,1985).

Is it group membership or is it positive interdependence that promotes higher achievement? Hwong et. al (1989) conducted a study that examined whether higher productivity was due to membership in the group or due to positive interdependence. The study involved forty-three college students who were enrolled in an elementary music education class. The group was divided into a cooperative group and an individualistic group. One group worked together to complete assignments and to learn the material. A paper was randomly chosen from each group and the whole group received the grade. Therefore, the performance of one member of the group determined the grade for the group. The second achievement test was structured so that each member of the group was given an individual score based on his/her performance. The results supported the positive interdependence hypothesis. Students achieved better than the individualistic group on the first written test. However, there was no difference on the final test. The researcher concluded that simply being a member of a cooperative group did not promote higher achievement. There must be clear positive interdependence structured among members' outcomes for the increased effort required for higher achievement.

Is it the discussion within the group that promotes higher achievement or is it the positive interdependence that promotes higher student achievement? Lew, Mesch, Johnson & Johnson, (1986a; 1986b) have studied whether positive interdependence is necessary to increase achievement or whether group discussion within an individualistic situation will produce the same results. In their studies they compared (a)the opportunity to interact with classmates under an individualistic goal and reward structure, (b)cooperative work within positive goal interdependence, (c)cooperative work within positive goal and reward interdependence, and (d)cooperative work within positive goal and reward interdependence with an added reward for engaging in cooperative skills. The researchers found that students achieved higher when positive goal interdependence was present than when they worked individualistically but had the opportunity to interact with classmates. It was concluded that a combination of goal and reward interdependence produced even higher results than goal interdependence alone.

Is it the number of students in the group that promotes higher achievement or is it positive interdependence? Hagman and Hayes (1986) found that students were less productive when working in groups of 2,3, or 4 within an individualistic structure than students who worked under a cooperative structure. The conclusion was that without positive interdependence there was no advantage to having individuals interact with each other while they work.

Is it of value to discuss the strengths or weaknesses of the way the group interacts? Does group processing impact on student achievement? Yager, Johnson & Johnson (1985) did a study with eighty four grade three students. The problem was to find out whether group processing had an effect on achievement. They divided the students into three groups: a) cooperative learning with group processing, b) cooperative learning without group processing, and c)individualistic learning. The results indicated that students involved in the cooperative learning group with group processing performed better on daily achievement, post-instructional achievement, and retention measures than the other two conditions. The cooperative learning groups outperformed the individualistic group.

A follow-up study was conducted by Johnson, Johnson, Stanne, and Garbaldi (1989) with forty nine high ability Black American Seniors who were entering college. The goal was to investigate the roles of the teacher and the student within the process of improving group effectiveness. The study compared cooperative learning with no processing, cooperative learning with teacher processing, cooperative learning with teacher and student processing, and individualistic learning. The combination of teacher and student processing produced better results on the problem solving assignment. Whereas all cooperative learning groups achieved better results on the problem solving assignment than the individualistic condition.

In order for cooperative learning strategies to have a positive effect on student achievement, Johnson & Johnson (1989) found that three specific variables should be present. First, there must be clearly perceived positive interdependence which exists when students perceive that for one to be successful all members of the group must attain the learning goal. Second, there should be face-to-face interaction which involves students actively encouraging and assisting each other to learn the material. Third, the students need to use relevant personal skills and process the strengths and weaknesses of the group often by making goals for improvement.

In a study which was conducted in London, England with early years students , Galton and Williamson, (1992) agreed with Johnson & Johnson (1989) that there were three important steps in assisting early years students to work effectively in groups. First the students must understand the value of working in groups. Second, the group skills needed should be broken down into small steps. Third, the process of working in the group should be emphasized before the learning outcome. Through emphasizing the process the students become actively involved in the activity which result in better achievement.

Due to the diversity of learning behaviors and the diversity of learning needs students in the early years classroom students need to be taught how to work effectively in a group (Galton & Williamson, 1992). In the Learning Together model (Johnson & Johnson, 1984) the educator explains to the students the rationale for the decision to work in groups. Also, the educator has an understanding of how difficult it can be to work in groups and expresses this understanding to the students. The social skills needed to work in a group are taught.

Mathematics

Mathematics is a subject that can be difficult for many students to the point that they experience math avoidance or math anxiety (Davidson, 1990). Through cooperative learning the small groups can provide a social support system. The group interaction provides students with a healthy atmosphere to take risks in order to learn the concepts and to master the problem solving strategies. Students learn by discussing, explaining and thinking with others. Mathematics provides opportunities for creative thinking, for discussions, and for mastery of basic facts and procedures.

Davidson (1990) reviewed more than seventy studies in mathematics comparing student achievement in cooperative learning versus whole-class traditional instruction. In forty percent of these studies the cooperative learning group significantly outperformed the control group. In only two studies did the control group perform better and both of these studies had design irregularities. The effects of cooperative learning combined with mathematics have been consistently positive, especially, when individual accountability and team recognition have been implemented. There was no effect if the teacher did not have prior training in cooperative learning techniques since the element of positive interdependence was usually ignored.

Implementing Cooperative Learning

To review briefly the general definition of cooperative learning is described as the systematic instructional sequence where students learn various roles and skills that will facilitate the learning. Students are introduced to a new role or skill, practice is provided, and feedback is given by the teacher and the group members as to how well they performed the role or skill.

Implementing cooperative learning involves a great deal more than placing children in heterogeneous groups and giving them tasks to do (Johnson & Johnson, 1989). It involves the combination of a knowledgeable educator, informed parents, and informed students. Each one of these components provide a unique part of the equation for success. In order to implement cooperative learning successfully the teacher must be trained. Furthermore, the staff must be allowed to adopt cooperative learning methods willingly and be given adequate training (Strother, 1990). Most educators use a very narrow range of practices (Sirotnik 1983, Medley, 1977). They expand that repertoire only when they are provided substantial and carefully designed training. In order to manage a cooperative learning classroom effectively, to integrate strategies into their teaching repertoire, and to make good use of curriculum materials, educators must have a sophisticated understanding of the underlying theory. If educators do not have a clear understanding of where, when and how to implement cooperative learning methods, the misuse can undermine the effectiveness (Slavin, 1991). The amount of training needed varies with the different dimensions of cooperative learning. Staff training is a crucial factor in the relationship between cooperative learning and the improvement in student academic achievement (Johnson, Johnson, 1989, Slavin, 1990)

Another important aspect of implementing cooperative learning is to inform parents about the changes their children will be experiencing. Parents tend to think of education in terms of how they were taught. Therefore, some parents worry that high achievers will become "little educators" when working in heterogeneous groups. Such a concern is unfounded because, unlike peer tutoring, cooperative learning involves learning material that is new to all the students. Parents, also, worry that high achievers will be held back by the others in his/her group. When cooperative learning is implemented by trained educators the learning groups are carefully set up to benefit the high-ability students as well as the other members.

To support the conclusion that students of high ability benefit from cooperative learning, Robert Stevens (1987) did a study in two suburban elementary schools. The schools had been using cooperative learning for years in all academic subject areas. Special education students were integrated and there was no between class ability groups. He found that the highest achieving students benefit from cooperative learning in comparison to the control groups. Consistently, the mastery and retention of assigned material by high-ability students was found to be higher in cooperative learning situation as compared to individualistic or competitive learning situations.

Another concern of parents is that the high achieving students' grades will be lower due to group marks. In cooperative learning most evaluation or grades are based on individual performance. According to research, effects are positive for high, average, and low achievers. All three groups benefit from working in a cooperative learning situation (Slavin, 1991).

Parents need to be given opportunities to become informed about the positive gains that can be made through the utilization of these methods. In order to implement cooperative learning strategies effectively parents need to be part of the process. Questions such as: "Should not the teacher be doing the teaching? How can my child learn from the other children?" can be addressed through workshops where parents experience the cooperative learning strategies by actively participating in heterogeneous groups. Parents need information, too. Information sessions and workshops have been found to be very effective in addressing parental concerns (Ellis, 1990).

A weakness of cooperative learning that both educators and parents, alike, are concerned about is the motivation of the students in the individual groups to do their fair share of the assignment. When working in groups the diversity of the students' needs and the students' learning behaviors can produce an effect known as the "free rider effect" also, known as "social loafing" (Slavin, 1990; Kerr & Bruun, 1983). As mentioned, the "free rider effect" involves members of the group developing an attitude that someone else in the group will do the work. Members of the group participate to varying degrees causing a lack of group cohesiveness.

In order to solve the problem created by the "free rider" effect researchers have examined different elements. The element of individual accountability is one element that has a positive effect on eliminating the problem. Johnson & Johnson(1990) advocate the use of positive interdependence, face to face interaction and interpersonal skills. Slavin (1991) advocates group goals and individual accountability. Sharan (1976) and his colleagues advocate the students having more autonomy to make choices and having a role in deciding what they do as a solution. In many of the cooperative learning methods individual accountability is linked with evaluation (Slavin, 1990, Aronson, 1978).

To review, the two types of individual accountability strategies as outlined by the investigator, are namely, process oriented and product oriented. The goal of the process oriented strategies is to motivate students to become actively involved in their own learning as well as the learning of the other group members. The emphasis is not only on what is learned, but how it is learned. Product oriented individual accountability strategies are aimed at increasing the student's knowledge base. The learning outcome is more important than the process of learning. The product is achievement.

One way to motivate students to become individually accountable is to provide extrinsic rewards. A controversy exists among cooperative learning researchers as to the use of extrinsic rewards. Within the methods developed by Slavin (1991) the use of extrinsic rewards consists of certificates that are given to students who attain the pre-established standard of excellence. Shlomo Sharan and his colleagues (1988) evaluate group projects through examining the contribution of each member. Kohn (1991) disagrees with the use of extrinsic rewards in the use of cooperative learning because it undermines intrinsic interest. He argues that by bribing students to work together through extrinsic rewards decreases student motivation. Johnson & Johnson (1990) recommend that positive goal interdependence has to be present in order to make achievement gains. Davidson (1990) suggests rewards are not always necessary to increase student achievement in problem solving and reasoning tasks. Galton & Williamson (1992) suggest that with early years students it is important to concentrate on the process of working together, first, and then to concentrate on the outcome.

The two polar positions in this controversy are Kohn (1991) and Slavin(1991). According to Slavin (1991) in order to increase student achievement the only cooperative learning methods that work are those that involve group rewards based on the individual achievement of each group member. Kohn's position is the love of learning should be promoted, therefore, extrinsic rewards should never be used. Graves (1991) suggests that the educator should be aware of both positions and make choices as to whether or not to use extrinsic rewards. Kohn (1991) suggests that there should be alternate ways to promote individual accountability without the use of extrinsic rewards. Applying the investigator's anecdotal evidence, the current study examines whether or not process oriented individual accountability strategies can assist students to become more involved in their learning which results in a reduction of the "free rider effect".

Summary of the Literature Related to the Current Study

The need for educational strategies that promote social development as well as academic development is becoming more and more apparent. With the breakdown of the family unit and the introduction of legislation that all students have a right to attend their neighbourhood school, education has had to rise to the challenge of meeting the diverse needs of our students' learning needs and learning behaviors. In every student interaction the decision must be made regarding whether it will be cooperative or competitive.

Cooperative learning has been researched extensively. The research clearly points out that if cooperative learning is implemented by a trained professional it is more effective than the traditional methods. Cooperative learning methods have proven themselves to promote a learning environment that will lead to a better quality of life. People must learn to work together, to work alone and to work competitively (Johnson & Johnson, 1989). Students develop into caring and committed individuals who possess the skills to cope with this ever changing society in a positive manner (Sapon-Shevin & Schniedewind, 1990).

Successful implementation of cooperative learning in the classroom requires a knowledgeable educator, informed parents , and informed students. Parents are an important part of a child's education. When an educator implements a new strategy like cooperative learning parents have some concerns. If an educator shows a good understanding of the elements of cooperative learning and how they effect student outcomes, parents' worries are reduced.

Through a knowledgeable educator and supportive parents the students are motivated to learn the new material. When this combination is not present the success of cooperative learning is at risk.

Conclusion

The literature strongly supports the implementation of cooperative learning methods to promote academic growth, as well as, social growth. All students benefit from the introduction of cooperative learning groups. The diverse learning needs and learning behaviours are addressed by this teaching strategy. However, implementing cooperative learning strategies in the area of Mathematics can be a complex process at the early years level. The area of Mathematics is a curriculum area that needs additional strategies put in place to reduce the "free rider effect". The nature of the subject leads to judgements by students as to whether they are competent mathematics students or incompetent mathematics students which effects the amount of effort the students put forth. The students' attitudes towards mathematics are effected by the limited success experienced. The element of individual accountability is viewed by many researchers as the solution to the "free rider effect" which is defined as a lack of group cohesiveness (Slavin, 1991; Davidson, 1990). When the educator places the instructional focus on the process of working in a group and the process of learning the material, rather than the final outcome, the students can experiment with the new concepts in a supportive group allowing for understanding (Galton & Williamson, 1992). By being involved in their learning and being part of a supportive group, the students' attitudes towards mathematics may improve. Kohn (1991) argues that there must be an alternative to extrinsic rewards that will heighten the students' intrinsic motivation to learn the material.

The literature is limited in the area of assessing the strength of individual accountability strategies to promote the process of learning. Alternative strategies other than extrinsic rewards and product oriented individual accountability strategies which are related to the outcome of learning to meet the diverse needs of early years educators are needed. The current study investigates whether or not the implementation of four process oriented individual accountability strategies with early years students in the area of mathematics will result in higher student achievement than the traditional methods. By emphasizing the process of learning through the use of process oriented individual accountability strategies do early years students' attitudes towards school and towards mathematics improve?

Chapter 3

Design and Procedure of the Study

Design

This study was a pre-test, post-test, post-test control group factorial design. The factorial design involved one grade level (grade three) divided into high and low achievers interacting with three treatment conditions. The three treatment conditions were cooperative learning with individual accountability, cooperative learning without individual accountability and traditional instruction.

Seventy six children who were enrolled in three grade three classes in a Winnipeg elementary school were the subjects of this study. The current study was conducted for a period of four weeks. The multiplication pre-test and the attitude survey were administered the first day of the study. The multiplication post-test was administered the twentieth day of the study. The multiplication retention test took place three weeks after the end of the study.

Subjects

The following process was used to develop the three grade three classlists. In May, 1993, all the grade two students were grouped into the three categories: high, average, and low abilities.

The classroom groups were stratified by sex and ability. Beginning with the high ability students, then the average ability students, and ending with the low ability students, the grade two educators randomly placed each student into one of the three grade three classes.

The three grade three classrooms were used for the study. Each one of the classrooms was randomly assigned to a treatment condition.

Variables

The four independent variables were cooperative learning, individual accountability, traditional instruction, and academic ability. The following sections present a brief review of each of these instructional strategies.

Cooperative learning is an instructional strategy that provides a combination of cooperative, competitive, and individualistic goals. According to Johnson & Johnson (1991) cooperative learning is the instructional use of small groups so that students work together to maximize their own and one another's learning(p. 69). The teacher structures the classroom into small heterogeneous groups to work towards a common goal. It can be used at any grade level and in any subject area. It usually involves the completion of one worksheet or one assignment. It involves the incorporation of five key elements which are positive interdependence, face to face interaction , individual accountability, interpersonal and small group skills and group processing.

Individual accountability is defined as "the student is responsible for his/her own learning and the learning of each of the members in the group."

Process Oriented Individual Accountability Strategies

The goal of the process oriented strategies is to motivate students to become actively involved in their own learning as well as the learning of the other group members. The emphasis is not only on what is learned, but how it is learned. Four ways of promoting process oriented individual accountability strategies are implemented in this study. The first way is to ask randomly a member of the group to explain the answer to a question. The second way is to give specific materials to each member of the group. The materials can be specific manipulatives to move, or a specific color of pencil to use. The involvement of each member is expected to be the same. The third way involves each member being allowed to sign the paper only if the group feels the member participated. Since cooperative learning involves the completion of one worksheet in each group each student is motivated to sign the sheet to show completion and involvement in the group. The fourth way involves each member of the group signing the paper only if he/she can explain how to do the question to the group. Two of the process oriented individual accountability strategies are placed in every lesson by the teacher to ensure that each student of the group is individually accountable.

The teacher's observational skills are essential to assisting each student to become individually accountable. The teacher monitors each group by asking questions and by observing the groups for student involvement. A student's name being left out on a worksheet indicates a problem which can be quickly corrected by the teacher's involvement. A teacher's observational skills can, also, identify situations where members of the group are allowed to sign, but the students are not participating. By reinforcing the rules about whether or not a member can sign, the situation can be solved. Another solution is to use two process oriented individual accountability strategies. Using the strategy of randomly asking students to explain how the group is working or to explain how the group attained an answer can be used in combination with the signing strategy. These strategies provide the additional support needed for some students to become active learners.

Traditional learning was defined as "the student is responsible for his/her own learning". The material is presented by the teacher and the students master the material individually. The teacher assists the individual students who are having difficulties while the other students work on their own. The students have the understanding that if you need help or clarification you always go to the teacher.

Academic Ability involved each student being assigned to either a high ability or low ability group depending on his/her results on the pre-test. Where the results were similar and a decision had to be made as to whether or not the students would be assigned to the high ability or low ability group, the student's previous scores in the area of mathematics were considered in order to make an accurate placement.

Student Achievement was defined as the students' results on the three multiplication achievement tests. The three achievement tests, a pre-test, a post-test and a retention test were administered.

Instruments

The content of the multiplication unit was required by the Manitoba Department of Education and Training Grade Three Mathematics Curriculum. The unit which was developed by the investigator involved eighteen lessons that presented the grade three multiplication concepts, computations, and problem solving strategies. (See Appendix A for the Multiplication Unit.) Each test which was developed by the investigator using the Manitoba Training and Education Mathematics Grade three Curriculum Guide was composed of questions that tested the students' mastery of the multiplication concepts, computations and problem solving skills. (See Appendices B, C, D for the three achievement tests.)

At the beginning of the multiplication unit each student was given a pre-test. At the end of the unit each group was given a final achievement test. At the end of the three weeks the students were given a retention test. In all treatment groups the tests were done individually.

At the beginning and at the end of the multiplication unit each student completed a ten statement Likert scale survey. Five statements related to his/her attitude towards mathematics and five statements related to his/her attitude towards school (See Appendix E).

Learning Together

The Learning Together Cooperative learning Model was selected for this study for a variety of reasons. One, the flexibility of this method allowed for its use with any curricula area. Two, this method incorporated the teaching of social skills as well as academic skills. Three, the teachers had a clear understanding of this model due to their involvement in school professional development activities. Four, process oriented individual accountability strategies were incorporated easily to assist the students to learn the importance of their involvement in learning.

A brief review of the The Learning Together model which was developed by David Johnson and Roger Johnson of the University of Minneapolis (Johnson & Johnson, 1984) will be presented in relation to the current study. The students were placed in heterogeneous groups of four. Each lesson consisted of an academic objective and a social skill objective. The teacher presented the lesson by clearly explaining the task and the goal structure to the students. The students worked in groups to complete the task. The teacher monitored the different groups by intervening where necessary to provide task assistance or to increase the students' interpersonal skills. The educator assisted the students to evaluate their achievement by allowing them time to discuss how well they worked together.

The key elements of this method were positive interdependence, individual accountability, promotive face-to-face interaction, group processing, and social skills. Each element is presented using only those strategies that were essential to the current study.

The most important element of this method is positive interdependence. To briefly review positive interdependence, it is the understanding that the students of each group are joined together so that for one of them to be successful all of them must be successful. The positive goal interdependence was supplemented by the following strategies. Positive resource interdependence is defined as each member of the group has only a part of the materials, information, or resources needed and the members' resources must be combined in order to attain the goal. In this case, the students were given a number of manipulatives that were to be used to complete one worksheet per group. Positive role interdependence is defined as each member is assigned specific responsibilities, such as, reporter, recorder, encourager. Each member of the group was responsible for a specific role. A recorder completed the worksheet with the answers provided by the group. The checker made sure that all group member agreed with the answers written down. The time keeper watched the clock to ensure that the assignment was done on time. The noise monitor reminded the students to talk softly. The manipulator moved the different pieces to make the different arrays. Positive task interdependence is defined as each member has a specific task that must be completed before the next member can complete their task. Students had to follow a specific order to complete the worksheets. Environmental interdependence is defined as the group members have a specific place where they meet. It is essential for the cooperative learning lesson to be successful that there is positive goal interdependence supplemented by at least four different positive interdependence strategies(Johnson & Johnson, 1987).

Individual accountability was defined as the student is responsible for his/her own learning and the learning of each of the members in the group. The four process oriented individual accountability strategies were implemented. One strategy was randomly asking one member of the group to explain the answer. The second strategy was the use of specific resources where the students used a specific colour or type of manipulative. The third strategy was the use of signing the paper if one participated. The fourth strategy was the use of signing the paper if one could explain the answer to the group or to the teacher. Two of these strategies were implemented into each lesson.

Face to face promotive interaction among students requires an opportunity for students to promote each other's success by helping, supporting, encouraging and praising each other's efforts to learn. Every member is responsible for the final outcome.

Interpersonal and social skills involved the appropriate use of social skills to achieve mutual goals. In order to work in groups students must learn the necessary social skills. By getting to know the member in the group and learning to trust each other the members of the group began to resolve conflicts effectively. The students learned to communicate accurately and clearly. Interpersonal and small group skills that were taught during this four week period were encouraging each other, using quiet voices, and disagreeing in an agreeable way.

Group Processing involved reflecting on how the group worked together to accomplish the goal. The members of the group discuss what actions were helpful and unhelpful. At the end of each lesson the group gave feedback by filling in a form or reacting orally as to how the group worked together during the lesson. A goal was made at the end of each lesson as to what area would be worked on during the next lesson.

Three Essential Components of Cooperative Learning

As identified by the literature, the three components needed for successful implementation of cooperative learning are a knowledgeable educator, informed parents, and informed students. The combination of all three contribute to a successful student experience. The following sections present a brief review of each of the components and how it was addressed by the current study.

Educators

All three grade three teachers had the proper cooperative learning training in the "Learning Together Model". The investigator met with the three grade three educators for one afternoon. Each teacher was given a teacher's guide, the student workbooks, and a box of manipulatives and activities for the multiplication unit. Each lesson was reviewed for content. The activities were explained and demonstrated in relation to the three treatment conditions.

Parents

For the current study parents were viewed as an important component to the success of cooperative learning. The parents of the grade three students were introduced to the details of the study during a presentation at "Meet the Teacher" night. In order to provide a clear understanding of the differences between cooperative learning and traditional instruction parents were invited to an informational workshop. In October a workshop was presented by the investigator and the school team leaders at the school. As mentioned, understanding the difference between cooperative learning and traditional instruction was the beginning of successful implementation of cooperative learning. The elements of cooperative learning were presented and explained in comparison to the traditional teaching method. The parents and teachers were placed in groups. They worked through various activities using first, the traditional methods, then the cooperative learning methods. A discussion period was held at the end of the session where concerns were addressed.

Students

Math avoidance and Math anxiety are problems that are experienced by some grade three students. Since grade three is the beginning of the introduction of the mathematics textbook, mathematics can be viewed by some students as a difficult subject. Through the use of cooperative learning groups this anxiety can be reduced. The unit taught in the current study was new material. One of the highly motivating units in grade three mathematics is multiplication. In grade one and in grade two the students deal mainly with addition and subtraction, therefore, multiplication in grade three is a new and exciting concept. Most students were eager to learn about multiplication in all three treatment groups.

Procedure

The content of the multiplication unit was required by the Manitoba Department of Education and Training Grade Three

Mathematics Curriculum. The unit which was developed by the investigator involved eighteen lessons that presented the grade three multiplication concepts, computations, and problem solving strategies.

1. The investigator met with the grade three parents to discuss the study and to receive written permission from each parent for the child's scores to be used. A month later, the investigator and the team leaders presented a parent workshop that explained the differences between cooperative learning and traditional instruction. A question and answer period was held at the end of the session to deal with any parental comments or concerns.

2. The three grade three teachers met with the investigator for one afternoon. During this time the investigator explained the three treatment conditions and how they differed. Each lesson was explained as to how it would be taught in the three different conditions. A timetable was given to each teacher that outlined what lesson would be covered and at what point they would rotate from group to group. The rotation of teachers was implemented to eliminate the quality of teaching as a reason for the difference in achievement results. During this meeting the students in the cooperative learning groups were placed in heterogeneous groups of four by their teachers. These heterogeneous groups were stratified for ability and sex. The teachers were informed by the investigator that the students remained in the same treatment condition

throughout the study and the students in each of the three conditions would meet at the same time during the day in their own classrooms.

3. Students in each condition were together for one hour from 10:30 to 11:30 each day for eighteen instructional days. Each teacher taught her class first, then progressed to teach the other classes. Each teacher taught one group for six lessons, rotated to the second group for the next six lessons, and ended by teaching the third group for the last six lessons.

4. On the first day of the study the investigator with the teacher administered the attitude survey to each group. The mathematics ability pre-test was administered by the classroom teacher. Using the results of the pre-test the students were assigned to an ability group. Each teacher provided the investigator with a rank ordered class list of all students from high to low ability as determined by their previous mathematical results. This rank ordered list was used to place only the students in the middle range where they had similar scores on the pre-test and a midpoint between the two ability groups had to be found.

5. The teachers followed the teacher's guide as outlined by the investigator who monitored the study through unscheduled visits two times a week. Each teacher administered the post-test and the attitude survey to their own classroom.

6. Three weeks after the end of the instructional unit the retention test was administered by the teachers.

Treatment Conditions

Cooperative Learning with Individual Accountability

The following instructional process was used to teach the cooperative learning with individual accountability condition. When the teacher asked a question, the students were directed to turn to their group members and to discuss the answer. The teacher asked one member of the group to share the group answer. The teacher posed several questions using this format. The teacher's mandate was to ensure that most of the students were involved in answering the questions. The groups were given an assignment.

The teacher assigned a different role for each person. Examples of the different behaviors that were associated with the different roles are presented. A recorder completed the worksheet with the answers provided by the group. The checker made sure that all group member agreed with the answers written down. The time keeper watched the clock to ensure that the assignment was done on time. The noise monitor reminded the students to talk softly. The manipulator moved the different pieces to make the different arrays. The teacher monitored the class by observing the different groups and assisting with collaboration skills.

Academically the teacher helped a group only if all the group members had the same question or concern. The following four strategies were used exclusively with this group to promote individual accountability. The first way was to ask randomly a member of the group to explain the answer to a question. The second way was to give specific materials to each member of the group. The materials could be specific manipulatives to move, or a specific color of pencil to use. The involvement of each member was expected to be the same. The third way involved each member being allowed to sign the paper only if the group felt the member participated. The fourth way was each member of the group could sign the paper only if he/she could explain how to do the question to the group. Two of these strategies were implemented into every lesson.

Cooperative Learning without Individual Accountability

The cooperative learning without individual accountability was taught in a similar way to the cooperative learning with individual accountability group with one exception. This group was not exposed to the four process oriented individual accountability strategies. The differences between the two cooperative learning groups are compared and contrasted to provide a clear understanding as to the behaviors associated with the presence or absence of the process oriented individual accountability strategies.

In cooperative learning with individual accountability any member of the group could be asked to explain the answer to a question, while in the cooperative learning without individual accountability the reporter of the group was responsible for answering and explaining the answers. In the cooperative learning with individual accountability group the students were given specific manipulatives that could be moved only by the person assigned to that color or shape. In the cooperative learning without individual accountability group the students divided the manipulatives among the members of the group by themselves. In the cooperative learning with individual accountability group the students were given different colors of markers or pencil crayons to use that revealed the participation of each member of the group. While in the cooperative learning without individual accountability group the students used the same color. Two signing strategies were used with the cooperative learning with individual accountability group. One, the students had to be able to explain the answer to a question in order to sign the assignment sheet. Two, the students were allowed to sign the assignment if their group felt they had participated in the completion of the assignment. The cooperative learning without individual accountability did not use the signing strategies.

Traditional Group

The students' desks were in groups of four. The traditional instruction involved the teacher presenting the new material from the front of the room. Most students watched the teacher and listened to the new material being presented. The teacher did several examples on the board. The student raised their hands to answer the questions. The students, one at a time answered the question or, one at a time came to the board to show how the question was done. All students did the same assignment individually at their desks. The students who were having difficulty raised their hands and the teacher called them to the desk or the teacher came to their desk to help them with the question.

Procedures of the Statistical Analysis of Data

General descriptive statistics were run for each treatment condition. The data was analyzed using the StatView Student - The Solution of Data Analysis and Presentation Graphics computer program. The accepted standard was .05 or better for all the statistical analysis.

Each test, pre-test, post-test, and retention test, was compared among the three treatment groups and within the high and low ability groups using the same procedure for each test as outlined below.

1. An analysis of variance (ANOVA) was conducted between the cooperative learning groups and the traditional group.
2. An ANOVA was conducted between cooperative learning with individual accountability group and traditional group, between cooperative learning with individual accountability group and cooperative learning without individual accountability group and finally between cooperative learning without individual accountability group and traditional group.

3. An ANOVA was conducted using the results of the students of high ability between cooperative learning with individual accountability group and traditional group, between cooperative learning with individual accountability group and cooperative learning without individual accountability group and between cooperative learning without individual accountability group and traditional group.

4. An ANOVA was conducted using the results of the students of low ability between cooperative learning with individual accountability group and traditional group, between cooperative learning with individual accountability group and cooperative learning without individual accountability group and between cooperative learning without individual accountability group and traditional group.

Procedure for the Statistical Analysis of the Survey

The survey used the Likert Scale Scoring System. The ten statement survey was made up of five positive statements and five negative statements. The results were weighted so that a favorable response resulted in a higher score than an unfavorable one. Reverse values were used for negative statements. The higher the score the more positive the attitude was toward the statement.(See Table 11) Faces were used to illustrate the different attitudes of strongly agree, agree, undecided, disagree, strongly disagree. Children put an "X" on the face that illustrated how they felt about the statement (See

Appendix E for the Student Survey). The results of the surveys were analyzed using the following process.

1. The results from the surveys were compared using paired t-tests within the treatment groups. Each statement of the first survey was compared with each statement of the final survey within the treatment group. The results were analyzed together to establish a probability factor. The accepted standard was .05 or better.

2. An Analysis of Variance (ANOVA) was administered between the cooperative learning groups and the traditional group on the difference between each statement. Each statement was analyzed to establish a difference among the treatment groups' results.

3. An ANOVA was administered among the treatment groups on each statement. Each statement was analyzed to establish a difference among the treatment groups' results.

4. An ANOVA was conducted among the treatment groups by ability groups. Each statement was analyzed to establish a difference among the treatment groups. The accepted standard was .05 or better.

5. An ANOVA was conducted on the five statements that related to school among treatment groups. Each statement was analyzed to establish a difference between the ability groups.

6. An ANOVA was conducted on the five statements that related to school among treatment groups by ability groups. Each statement was analyzed to establish a difference between the ability groups.

7. An ANOVA was conducted on the five statements that related to mathematics among treatment groups. Each statement was analyzed to establish a difference between the ability groups.

8. An ANOVA was conducted on the five statements that related to mathematic among treatment groups by ability groups. Each statement was analyzed to establish a difference between the ability groups. The accepted standard was .05 or better.

Chapter 4
Analysis of Data

The first purpose of this study was to determine whether or not process oriented individual accountability strategies within the cooperative learning group had a positive effect on early years students' achievement as a total group and within ability groups. The second purpose of this study was to determine whether or not process oriented individual accountability strategies promoted better attitudes with early years students towards school and towards mathematics.

Subjects

Students who for reasons of absence from school had not written the pre-test and/or the subsequent post-test and students who did not have parental consent to use their scores were dropped from the study. The scores of seventy one grade three students were included in the analysis. Twenty six students comprised the cooperative learning with individual accountability condition. Twenty three students remained in the cooperative learning without individual accountability condition and twenty two students were in the traditional condition.

Statistical Analysis of the Achievement Tests

General descriptive statistics were run for each treatment condition. The data was analyzed using the StatView Student - The

Solution of Data Analysis and Presentation Graphics computer program. In this section only the results that were found to be significant and the results that were directly related to the outcome of the current study were presented. The achievement results that were found to be insignificant can be found in Appendix H.

To review briefly, the process used to analyze the achievement data was to compare the pre-tests, the post-tests, and the retention test using analysis of variance (ANOVA) among the three treatment groups and within the high and low ability groups using the same procedure for each test. The statistical analysis involved assessing the initial differences of the treatment groups through conducting an ANOVA on the pre-test by treatment and by ability. The post-test was compared by treatment groups and by ability using ANOVA. The retention test was analyzed using the same process.

Results of the Pre-test

In order to establish whether or not statistically significant differences exist among treatment conditions the multiplication pre-test was treated statistically by using ANOVA. No significant difference was found between the traditional group and the cooperative learning groups, $F(1, 69) = .041$, $p > .05$. (See Appendix F for Pre-test ANOVA results. See Table 5 for Multiplication Pre-test Results of ANOVA for Achievement Measures and Mathematics Pre-test Achievement Means and Standard Deviations by treatment group). The ANOVA conducted among the three treatment conditions, revealed no statistically significant differences, $F(2, 68) = 2.104$, $p > .05$. The ANOVA indicated a significant difference between the cooperative learning with individual accountability group and the cooperative learning without individual accountability group, $F(1, 47) = 4.139$, $p < .05$. The ANOVA conducted between the cooperative learning with individual accountability group and the traditional group revealed no significant difference, $F(1, 46) = 1.44$, $p > .05$. The ANOVA between the cooperative learning without individual accountability group and the traditional group revealed no significant results, $F(1,43)= .666$, $p > .05$.

The cooperative learning with individual accountability group had the lowest mean score of 6.077 with a standard deviation of 3.149. The cooperative learning without individual accountability group had the highest mean of 8.13 with a standard deviation of 3.912. The traditional group had a mean of 7.227 with a standard deviation of 3.491.

Table 5

Results of ANOVA of the Multiplication Pre-test by Treatment Groups

Measures	DF	F	P
Treatment Groups			
Cooperative vs Trad.	1,69	.041	.8404
Overall	2,68	2.104	.1299
Ind vs. Without	1,47	4.139	.0476*
Ind vs Trad.	1,46	1.44	.2363
Without vs. Trad.	1,43	.666	.4191

Means and Standard Deviations of the Pre-test Achievement Test

Treatment Group	N	M	SD
Individual Accountability	26	6.077	3.149
Without Ind. Accountability	23	8.13	3.912
Traditional	22	7.227	3.491

*P<.05

Results of the Pre-test for Students of High Ability

A significant difference was found among the three treatment conditions when the scores of the students of high ability were analyzed, $F(2, 32) = 3.889$, $p < .05$. (See Appendix F for Pre-test ANOVA results. See Table 6 for Multiplication Pre-test Results of ANOVA for Achievement Measures by Ability and Mathematics Pre-test Achievement Means and Standard Deviations by treatment group). Similarly, the ANOVA revealed a statistically significant difference when students of high ability in the cooperative learning with individual accountability group and the cooperative learning without individual accountability group were compared, $F(1,22) = 8.009$, $p < .05$. The ANOVA conducted between the cooperative learning with individual accountability group and the traditional group revealed no significant difference, $F(1,22) = 1.315$, $p > .05$. Also, the ANOVA between the cooperative learning without individual accountability group and the traditional group revealed no statistically significant difference, $F(1,22)= 1.315$, $p > .05$.

The students of high ability in the cooperative learning with individual accountability group attained the lowest mean score of 8.615 with a standard deviation of 2.256. The students of high ability in the cooperative learning without individual accountability group attained the highest mean of 11.417 with a standard deviation of 2.392. The mean of the students of high ability in the traditional group had a mean of 9.727 with a standard deviation of 2.494.

Table 6
Results of the ANOVA of the Multiplication Pre-test Results by Treatment Group and high ability

Measures	DF	F	p
Ability Groups			
Overall-High vs Low	1,69	93.942	.001
Treatment vs ability	2,65	.537	.5873
High	2,32	3.889	.0308*
Ind vs Without	1,22	8.009	.0097*
Ind. vs Traditional	1,22	1.315	.2639
Without vs Trad.	1,20	2.277	.1400

Means and Standard Deviations of the Pre-test Achievement Test for the Overall Group and the High Ability

Treatment Group	N	M	SD
Individual Accountability	26	6.077	3.149
High Group	13	8.615	2.256
Without Ind. Accountability	23	8.13	3.912
High Group	11	11.364	2.501
Traditional	22	7.227	3.491
High Group	11	9.727	2.494

*$p < .05$

Results of the Pre-test for Students of Low Ability

Between the students of low ability in the cooperative learning with individual accountability group and the cooperative learning without individual accountability group the ANOVA was found to be statistically significant, $F(1,23) = 5.219, p < .05$. (See Appendix F for ANOVA of Pre-test Results, See Table 7 for the results of the ANOVA of the Multiplication Pre-test Results by ability) The ANOVA between the students of low ability in the cooperative learning with individual accountability group and the traditional group revealed no statistically significant difference. $F(1,22) = 2.457$, $p > .05$. No significant difference was found between the cooperative learning without individual accountability group and the traditional group, $F(1,20) = .133, p > .05$.

The mean of the students of low ability in the cooperative learning with individual accountability group was 3.538 with a standard deviation of 1.266. In the cooperative learning without individual accountability group the mean of the students of low ability was 5.167 with a standard deviation of 2.209. The mean of the students of low ability in the traditional group was 4.727 with a standard deviation of 2.37.

Table 7
Results of the ANOVA of the Multiplication Pre-test Results by Treatment Group and low ability

Measures Groups	DF	F	P
Low	2,33	2.277	.1185
Ind vs Without	1,23	5.219	.0319*
Ind. vs Traditional	1,22	2.457	.1313
Without vs Trad.	1,20	.133	.7188

Means and Standard Deviations of the Pre-test Achievement Test for the Overall Groups and by Ability

Treatment Group	N	M	SD
Individual Accountability	26	6.077	3.149
High Group	13	8.615	2.256
Low Group	13	3.538	1.266
Without Ind. Accountability	23	8.13	3.912
High Group	11	11.364	2.501
Low Group	12	5.167	2.209
Traditional	22	7.227	3.491
High Group	11	9.727	2.494
Low Group	11	4.727	2.37

* $p < .05$

Achievement Results for the Multiplication Post-test

Using the Kuder and Richardson's Formula 20, the post-test had a reliability of .89. The ANOVA conducted on the post-test achievement test between the cooperative learning groups and the traditional group indicated a statistically significant difference, $F(1,69) = 4.056$, $p < .05$. (See the Appendix G for the ANOVA Post-test Results. See Table 8 for the post-test Results for achievement and ability and the Means and Standard Deviations). The ANOVA conducted on the post-test means of the three treatment groups indicated there was no significant treatment effect, $F(2,66) = 2.647$, $p > .05$. A statistically significant difference between cooperative learning with individual accountability group and the traditional group was found $F(1,46) = 4.57$, $P < .05$. The ANOVA comparing the cooperative learning with individual accountability group and the cooperative learning without individual accountability group revealed no statistically significant difference, $F(1,47) = 2.071$, $p > .05$. The ANOVA between the cooperative learning without individual accountability group and the traditional group revealed no statistically significant difference, $F(1,54) = 1.103$, $p > .05$.

The mean of the cooperative learning with individual accountability group was 21.692 with a standard deviation of 3.222. The mean of the cooperative learning without individual accountability group was 20.328 with a standard deviation of 3.311.

The mean of the traditional group was 18.864 with a standard deviation of 5.874.

Table 8
Results of the ANOVA of the Multiplication Post-test Results by Treatment Group

Measures	DF	F	P	Direction
Ability Groups				
Coop. vs Trad.	1,69	5.046	.0479	Coop>Trad
Overall	2,66	2.647	.0782	Ind > Trad.
Ind vs Without	1,47	2.071	.1568	
Ind. vs Traditional	1,46	4.457	.0402	Ind > Trad
Without vs Trad.	1,43	1.103	.2995	

Means and Standard Deviations of the Post-test Achievement Test by Treatment Group

Treatment Group	N	M	SD
Individual Accountability	26	21.692	3.222
Without Ind. Accountability	23	20.348	3.311
Traditional	22	18.864	5.874

Post-test Results of Students of High Ability

The comparisons of the students of high ability and the treatment conditions revealed there was no statistically significant difference, $F(2,32) = .732$, $p > .05$. When the treatment groups were compared by total groups and by abilities, no significant differences were found. Therefore, these results were not presented. (See the Appendix G for the ANOVA Post-test Results. See Table G -1 for the post-test Results of the ANOVA for achievement and ability and the Means and Standard Deviations).

Post-test Results for Students of Low Ability

The ANOVA betwen the students of low ability and the treatment conditions indicated no significant difference, $F(2,33) = 2.714$, $p > .05$. (See the Appendix G for the ANOVA Post-test Results. See Table 10 for the post-test Results of the ANOVA for achievement and ability and the Means and Standard Deviations) Comparing the results of the students of low ability in the traditional group with the students of low ability in the cooperative learning with individual accountability group the ANOVA revealed a statistically significant difference, $F(1,22) = 4.231$, $p = .05$. The ANOVA conducted with the students of low ability between the cooperative learning with individual accountability group and the cooperative learning without individual accountability group revealed no statistically significant difference, $F(1,23) = 1.606$, $p > .05$. The ANOVA conducted with students of low ability between the cooperative learning without individual accountability group and the traditional group revealed no statistically significant difference, $F(1,21) = 1.581$, $p > .05$.

The mean of the students of low ability in the cooperative learning with individual accountability group was 20.462 with a standard deviation of 3.821. The mean of the students of low ability in the cooperative learning without individual accountability group was 18.667 with a standard deviation of 3.2 The mean of the students of low ability in the traditional group was 15.909 with a standard deviation of 6.833.

Table 9
Results of the ANOVA of the Multiplication Post-test Results by Treatment Group and Low ability

Measures	DF	F	P	Direction
Ability Groups				
Ind vs Without	1,23	1.606	.21	N.S.
Ind. vs Traditional	1,22	4.231	.05	Ind > Trad
Without vs Trad.	1,21	1.581	.22	N.S.

Means and Standard Deviations of the Post-test Achievement Test for the Overall Group and by Ability

Treatment Group	N	M	SD
Individual Accountability	26	21.692	3.222
High Group	13	22.923	1.935
Low Group	13	20.462	3.821
Without Ind. Accountability	23	20.348	3.311
High Group	11	22.182	2.400
Low Group	12	18.667	3.2
Traditional	22	18.864	5.874
High Group	11	21.818	2.562
Low Group	11	15.909	6.833

Retention Test Results

All the statistical analysis that were conducted on the retention test were found to reveal no statistically significant differences. (See Appendix H for the Retention ANOVA results. See Table 10 for the Means and Standard Deviations of the three Achievement Tests.)

Discussion of the Retention Test

One of the conditions of the retention test was that the teachers were not to teach or discuss multiplication during the three week period. The teacher of the traditional group taught an hour lesson the day before the retention test. The hour lesson involved the review of several concepts on the retention test. As a results in specifically two sections of the test that had been reviewed the day before there was a marked difference between the cooperative learning groups and the traditional group. In order to validate that the lesson could account for the differences in scores the investigator did a comparison between the scores on each section to determine if the concepts reviewed by the teacher could account for the difference. The traditional group did better than the cooperative learning groups in two areas. One, the section dealing with recognizing an array and writing the different ways of describing it, and the other area was in the computation questions on the test. The differences in the two tests supported the claim that the hour lesson could account for the differences in the mean scores.

Another issue that effected the study was the fact that part of the time between the post test and the retention test was a two week holiday. The investigator interviewed each treatment group in regards to whether or not the students had spent time working on multiplication during the holidays. In the traditional group fourteen of the twenty two students claimed they had worked with their parents to improve their multiplication skills. For the holidays some of these students received computers with mathematic programs, multiplication workbooks, or parent made booklets. In the other two cooperative learning groups, two of the students in each class had worked with their parent. The one hour lesson and the parental input prevented these results from representing the traditional group's retention of the material accurately. Due to the invalidation of the results, from this point on, the retention test for the traditional group will not be included in the analysis.

Table 10
Means and Standard Deviations for the Achievement test by Treatment Group

Treatment	N	X	SD
Group 1			
Pre-test	26	6.077	3.149
Post-test	26	21.692	3.222
Retention	26	20.423	3.722
Group 2			
Pre-test	23	8.13	3.912
Post-test	23	20.328	3.31
Retention	23	19.87	4.414
Group 3			
Pre-test	22	7.227	3.491
Post-test	22	18.864	5.874
Retention	22	20.429	5.418

Legend

N - number of subjects in the group
X - mean of the group
SD = standard deviation
Group 1 - Cooperative learning with individual accountability
Group 2 - Cooperative learning without individual accountability
Group 3 - Traditional

Summary of the Achievement Results

In analyzing the initial differences of the pre-test, there was no significant difference between the two cooperative learning groups and the traditional group. However, the cooperative learning without individual accountability group performed significantly better than the cooperative learning with individual accountability group when the total group and ability groups were compared using ANOVA.

The ANOVA that was conducted on post-test revealed a statistically significant difference when the two cooperative learning groups were compared to the traditional group. The cooperative learning with individual accountability group performed significantly better than the traditional group. The students of low ability in the cooperative learning with individual accountability group performed significantly better than the students of low ability in the traditional group. The cooperative learning without individual accountability group, however, did not perform statistically better than the traditional group. The ANOVA conducted with the students of high ability and the treatment groups revealed no statistically significant differences. (See Table 11 for Mean scores of all treatment conditions)

The retention test results of the traditional group were invalidated due to the teacher teaching the hour lesson and the parents assisting the students over the holidays to learn their math facts. (See Appendix H.) The retention test revealed that the students of both cooperative learning groups retained the material learned to the same extent.

Statistical Analysis of the Surveys

The purpose of the survey was to determine whether or not there were changes in the students' attitudes towards mathematics and towards school. The grade three students were given the same ten item Likert - scale survey at the beginning of the study and again at the conclusion of the study.

The ten item Likert-scale survey was made up of five statements dealing with the students' attitudes toward mathematics and five statements dealing with the students' attitudes toward school. Half of the statements were phrased positively while the other half of the statements were phrased negatively . (See Table 12 for Likert Five Point Rating Scale)

Table 11

Likert Five Point Rating Scale

Responses	Positive	Negative
Strongly agree	4	0
Agree	3	1
Undecided	2	2
Disagree	1	3
Strongly Disagree	0	4

In order for the student survey to be used in the study, two criteria had to be met. One, the student completed both of the surveys. Two, the student showed an understanding of the statements by answering the related statements in opposite directions. There were two sets of matched statements. Statement #1, students in my class help me when I need it was matched with statement #9 my teacher is the only one is my class who can help me with my work. Statement #2, math is easy was matched to statement #10, math is hard to understand.

Sixty seven grade three students' surveys met this criteria. There were twenty three students in the cooperative learning with individual accountability, twenty three students in the cooperative learning without individual accountability and twenty one students in the traditional group.

In order to continue to focus on the relevant results to the current study, this section will present only the findings that were found to be significant. The results that were not significant can be found in Appendix P.

Results of the T-tests

The means scores between the two surveys were compared to examine whether a change in attitude could be identified. Using paired t-tests each statement was examined within the three treatment conditions to investigate whether a significant difference occurred during the treatment. Each of the cooperative learning groups revealed two statements that were found to show a statistically significant difference. In the traditional group one of the statements revealed a statistically significant difference.

Cooperative Learning with Individual Accountability

When each statement was compared in the cooperative learning group with individual accountability group statement #1 and statement #5 were found to be statistically significant. Statement #1, students in my class help me when I need it, revealed a statistically significant difference, $T = 1.154$, $p < .05$. Statement #5, It is okay to make mistakes at school, revealed a statistically significant difference, $T = -2.44$, $p < .05$. (See Appendix I).

TABLE 12

Paired t-test Pre -treatment survey and Post-treatment survey for the Cooperative Learning with Individual Accountability by statement

Statement No.	Mean X-Y	Paired t-value	Prob.(one-tail)
1.	.739	1.154	.017*
2.	-.391	-1.123	.137
3.	0	0	
4.	-.174	-1	.123
5.	-.609	-2.44	.0116*
6.	.043	.096	.462
7.	.174	.536	.2967
8.	-.391	-.941	.1785
9.	-.652	-1.488	.856
10.	.087	.183	.428

*$p < .05$

Statement #1 - Many students in my class help me when I need it.

This statement was included in the survey to reveal whether or not students felt supported by their fellow classmates. This statement was used to compare students' perception as to whom in the classroom they could go to for help. This is a positive statement. This statement was one of the five statements that indicated how the students felt about school. This statement met the accepted standard of .05 or better.

The mean on the pre-survey for the cooperative learning with individual accountability group was 3.348 with a standard deviation of 1.152 while the mean of the post-survey decreased to 2.609 with a standard deviation of 1.406. (See Table 13 for Means and Standard Deviations)

In the cooperative learning with individual accountability group the mean score for the students of high ability was 3.091 with a standard deviation of 1.136 which decreased to a mean of 2.727 with a standard deviation of 1.191. The mean score on the pre-survey for the students of low ability was 3.583 with a standard deviation of 1.165 which decreased to a mean score of 2.5 with a standard deviation of 1.624.

Frequency Distribution- Group A -Out of the twenty three respondents twenty agreed with the statement and three disagreed. At the end of the study, fourteen agreed with the statement, four were undecided and five students disagreed.

Table 13

Statement #1- Many students in my class help me when I need it.

Overall Mean Scores and Standard Deviation for surveys and the

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	3.348	1.152	2.609	1.406

SD = standard deviation

M = mean score

Overall Mean Scores and Standard Deviation for Surveys for the Cooperative Learning With Individual Accountability Group By Ability

Treatment Groups	High		Low	
Group A				
Pre	3.091	1.136	3.583	1.165
Post	2.727	1.191	2.5	1.624

Frequency Distribution

Statement #1- Many students in my class help me when I need it.

Categories	SA	A	U	D	SD
Group A					
Pre	15	5	0	2	1
Post	8	6	4	2	3

Legend

Group A - Cooperative Learning with Individual Accountability

Categories: SA - strongly agree A- agree U - undecided D - disagree SD-strongly disagree

Statement #5 - It is okay to make mistakes at school.

This statement was used to find out whether the students' attitude toward school was one of seeing school as a safe place to try new things and to make mistakes. This is a positive statement. This statement was one of the five statements that indicated how the students felt about school. This statement met the accepted standard of .05 or better.

The mean on the pre-survey for the cooperative learning with individual accountability group was 3.391 with a standard deviation of 1.196 while the mean of the post-survey increased to 4.0 with a standard deviation of 0. The mean score for the students of high ability was 3.455 with a standard deviation of .647 which increased to a mean of 4.0 with a standard deviation of 0. The mean score on the pre-survey for the students of low ability was 3.333 with a standard deviation of 1.231 which increased to a mean score of 4.0 with a standard deviation of 0. (See Table 14 for Means, Standard Deviations and Frequency Distribution)

Frequency Distribution

Group A -Out of the twenty three respondents, twenty agreed with the statement, one was undecided, and two disagreed. At the end of the study of the twenty three, twenty three strongly agreed with the statement, zero were undecided and zero students disagreed.

Table 14

Statement #5 - It is okay to make mistakes at school.

Overall Mean Scores and Standard Deviation for surveys and the Cooperative Learning With Individual Accountability Group

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	3.391	1.196	4	0

Legend

SD = standard deviation

M = mean score

Overall Mean Scores and Standard Deviation for Surveys by Cooperative Learning With Individual Accountability Group and Ability Groups

Treatment Groups	High		Low	
	M	SD	M	SD
Group A				
Pre	3.455	.647	3.333	1.231
Post	4	0	4	0

Frequency Distribution

Statement #5- It is okay to make mistakes at school

Categories	SA	A	U	D	SD
Group A					
Pre	16	4	1	0	2
Post	23	0	0	0	0

Legend

Group A - Cooperative Learning with Individual Accountability

Categories: SA - strongly agree A- agree U - undecided D - disagree SD-strongly disagree

Cooperative Learning Without Individual Accountability

Within the cooperative learning without individual accountability group statement #8 and statement #9 were found to be statistically significant. Statement #8, Without Math, school would be more fun, revealed a statistically significant difference, T=-2.591, $p < .05$. Statement #9, My teacher is the only one in my class who can help me with my work, was found to be statistically significant, T=-3.07, $p<.05$. (See Table 15 for Paired t-test Pre -treatment survey and Post-treatment survey for the Cooperative Learning without Individual Accountability by statement.) However, it is important to indicated that this group had a perfect mean score of 4 on statement #4, It is important to know how to do Math. (See Appendix J for the t-test results.)

TABLE 15

Paired t-test Pre -treatment survey and Post-treatment survey for the Cooperative Learning without Individual Accountability by statement*

Statement No.	Mean X-Y	Paired t-value	Prob.(one-tail)
1.	.304	1.046	.153
2.	-.391	-1.438	.082
3.	-.13	-.68	.241
4.	-.217	-1.553	.067
5.	-.348	-1.558	.061
6.	.043	.146	.442
7.	.043	.13	.449
8.	-.957	-2.591	.008*
9.	-.87	-3.07	.003*
10.	-.174	-.5	.311

*$p < .05$

Statement #8 Without Math, school would be more fun.

This statement was included to find out if the students disliked math. It was a negative statement. This statement met the accepted standard of .05 or better. This statement was one of the five statements that indicated how the students felt about mathematics.

The mean of the pre-survey for the cooperative learning without individual accountability group was 2.261 with a standard deviation of 1.815 while the mean of the post survey increased to 3.217 with a standard deviation of 1.445. (See Table 16 for the Means and the Standard Deviations by Treatment and ability.)

The mean score for the students of high ability was 3.182 with a standard deviation of 1.041 which decreased to the mean of 3.091 with a standard deviation 1.375. The mean score on the pre-survey for the students of low ability was 1.417 with a standard deviation of 1.782 which increased to 3.333 with a standard deviation of 1.557.

Frequency Distribution

Group B - Out of twenty three students, ten agreed with the statement and thirteen disagreed. At the end of the study, three students agreed , three were undecided and seventeen disagreed.

Table 16

Statement #8- Without Math, school would be more fun.

Overall Mean Scores and Standard Deviation for surveys

Cooperative Learning Without Individual Accountability Group

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group B	2.261	1.815	3.217	1.445

Legend

SD = standard deviation

M = mean score

Statement #8 Mean Scores and Standard Deviation for the Surveys by the Cooperative Learning Without Individual Accountability Group and Ability

Treatment Groups	M	SD	M	SD
	High		Low	
Group B				
Pre	3.182	1.401	1.417	1.782
Post	3.091	1.375	3.333	1.557

Frequency Distribution

Statement #8 Without Math, school would be more fun.

Categories	SA	A	U	D	SD
Group B					
Pre	7	3	0	3	10
Post	2	1	3	5	12

Legend

Group B - Cooperative Learning without Individual Accountability

Categories:

SA - strongly agree A- agree U - undecided D - disagree

SD-strongly disagree

Statement #9 - My teacher is the only person in my class who can help me with my work.

This statement was included to find out whether or not the students viewed their peers as tutors. It was a negative statement. This statement met the accepted standard of .05 or better. This statement was one of the five statements that indicated how the students felt about school.

The mean of the pre-survey for the cooperative learning without individual accountability group was 2.609 with a standard deviation of 1.275 while the mean of the post survey increased to 3.478 with a standard deviation of 1.275. (See Table 17 for the Means and Standard Deviation by Treatment and ability and Frequency Distribution.)

Means Scores by Ability

The mean score for the students of high ability was 3.636 with a standard deviation of .809 which increased to the mean of 4 with a standard deviation 0. The mean score on the pre-survey for the students of low ability was 1.667 with a standard deviation of 1.875 which increased to a mean of 3.00 with a standard deviation of 1.651.

Frequency Distribution

Group B - Out of twenty three students, six agreed with the statement, four were undecided and thirteen disagreed. At the end of the study, three students agreed and twenty disagreed.

Table 17
Statement #9
My teacher is the only one who can help me with my work.
Overall Mean Scores and Standard Deviation for surveys and the Cooperative Learning Without Individual Accountability Group

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group B	2.609	1.275	3.478	1.275

Legend
SD = standard deviation
M = mean score

Statement #9 Mean Scores and Standard Deviation for the Surveys by Cooperative Learning Without Individual Accountability Group and Ability

Treatment	M	SD	M	SD
Group B				
Pre	3.636	.809	1.667	1.875
Post	4	0	3	1.651

Frequency Distribution
Statement #9 My teacher is the only person in my class who can help me with my work.

Categories	SA	A	U	D	SD
Group B					
Pre	6	0	4	0	13
Post	2	1	0	1	19

Legend
Group A - Cooperative Learning with Individual Accountability
Categories:SA - strongly agree A- agree U - undecided D - disagree SD - strongly disagree

Traditional

Within the traditional group statement #7 was found to be statistically significant. Statement #7, mathematics is easy, revealed the following results, T= -1.896, $p < .05$. (See Table 18 for Paired t-test Pre -treatment survey and Post-treatment survey for the Traditional Group by statement. See Appendix K for the t-test results.)

Table 18

Paired t-test Pre -treatment survey and Post-treatment survey for the Traditional Group by statement

Statement No.	Mean X-Y	Paired t-value	Prob.(one-tail)
1.	-.95	-.295	.386
2.	.52	1.1	.142
3.	.238	1.045	.154
4.	-.143	-.9	.189
5.	-.143	-.548	.295
6.	.333	.674	.254
7.	-.762	-1.896	.036*
8.	-.048	-.1	.4606
9.	.524	1.29	.106
10.	0	0	

P < .05

Statement #7 - Math is easy.

Statement #7 Math is easy. This statement was included to find out whether or not students found math to be easy. It was a positive statement. This statement was one of the five statements that indicated how the students felt about mathematics. This statement met the .05 standard or better.

The mean of the pre survey for the traditional group was 2.429 with a standard deviation of 1.69 while the mean of the post survey increased to 3.19 with a standard deviation of 1.327. See Table 19 for the Means and Standard Deviation by Treatment Group and by ability and Frequency Distribution)

Mean Scores by Ability

In the traditional group the mean score of the pre survey for the students of high ability was 2.455 with a standard deviation of 1.635 which increased to 3.364 with a standard deviation of 1.206. The mean score for the students of low ability on the pre survey was 2.4 with a standard deviation of 1.838 which increased to the mean score of 3.00 with a standard deviation of 1.491.

Frequency Distribution

Group C- Out of twenty one students, ten agreed with the statement, five were undecided and six disagreed. After the study sixteen students agreed with the statement, one was undecided and four disagreed with the statement.

Table 19
Statement #7 Math is easy
Overall Mean Scores and Standard Deviation for surveys and the Traditional Group

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group C	2.429	1.69	3.19	1.327

Legend
SD = standard deviation
M = mean score

Statements #7 Overall Mean Scores and Standard Deviation for the Surveys by the Traditional Group and Ability

Treatment Groups		High		Low	
		M	SD	M	SD
Group C	Pre	2.455	1.635	2.4	1.838
	Post	3.264	1.206	3	1.491

Frequency Distribution
Statement #7 Math is easy.

Categories	SA	A	U	D	SD
Group C					
Pre	10	0	5	1	5
Post	14	2	1	3	1

Legend
Group C - Traditional
Categories:SA - strongly agree A- agree U - undecided D - disagree SD-strongly disagree

Analysis of Variance between the Cooperative Learning Groups and the Traditional Group

The analysis of variance that was conducted between the cooperative learning groups and the traditional group revealed there was a statistically significant difference in statement #1 and statement #5. Statement #1, many students in my class help me when I need it, revealed a statistically significant difference, $F(1,65)= 8.879$, $p < .01$. Statement #5, It is okay to make mistakes at school, revealed a statistically significant difference, $F(1,65) = 6.328$, $p < .05$.

When the three treatment groups were compared using analysis of variance statement #1, statement #2, and statement #5 were found to be statistically significant. Statement #1, many students in my class help me when I need it, revealed statistically significant difference, $F(2, 64) = 4.379$, $p < .05$. Statement #5, It is okay to make mistakes at school revealed statistically significant difference, $F(2, 64) = 3.298$, $p < .05$. Statement #2, math is doing the same thing over and over again, revealed a statistically significant difference at the beginning of the study, $F(2,64) = 5.489$, $p < .05$ and at the end of the study $F(2,64) = 3.543$, $p < .05$. (See Appendix M for the ANOVA between the Cooperative Learning groups and the Traditional groups. See Appendix L for ANOVA among Treatment Conditions. See Table 20 for the Analysis of Variance for the Pre and the Post Survey by Treatment Groups and between Cooperative Learning and Traditional).

Table 20

Results of the Analysis of Variance on the Surveys by the Treatment Groups and by the Cooperative Learning Groups and Traditional

Statement	Treatments		Cooperative vs. Traditional	
	Pre	Post	Pre	Post
1.	F= 2.121	F=4.379	F=1.765	F=8.879
	P= .1283	P=.0165*	P=.1886	P=.0041*
2.	F= 5.489	F=3.543	F=4.613	F=.009
	P=.0063	P= .0347*	P= .0355	P= .9262
3.	F= .763	F= 1.229	F= .396	F=.174
	P= .4704	P= .2995	P= .5311	P= .6782
4.	F= .087	F=1.04	F=.014	F=.128
	P= .9165	P=.3593	P=.9061	P= .722
5.	F= .135	F= 1.972	F= 4.867	F=6.328
	P= .8738	P= .0433*	P= .9945	P= .0144*
6.	F= 3.381	F= 1.972	F=5.141	F=2.371
	P= 0402	P= .9158	P= .0267	P= .1285
7.	F= 2.05	F= .088	F= 4.053	F= .179
	P= .1371	P= .9158	P= .0482	P= .6737
8.	F= 1.728	F= 1.51	F= 3.262	F= .289
	P= .1859	P= .2286	P= .0755	P= .593
9.	F= 1.933	F=2.442	F=2.505	F=1.654
	P= .1531	P= .095	P= .1183	P= .2029
10.	F= .333	F= .842	F=.17	F= .082
	P= .7182	P=.4356	P=.6815	P= .7753

DF = 1, 65

P < .05

Statement #1- Many students in my class help me when I need it.

The mean on the pre-survey for the cooperative learning with individual accountability group was 3.348 with a standard deviation of 1.152 while the mean of the post-survey decreased to 2.609 with a standard deviation of 1.406. The mean of the pre-survey for the cooperative learning without individual accountability group was 2.87 with a standard deviation of 1.343 while the mean of the post-survey decreased to 2.565 with a standard deviation of 1.343. The mean of the pre-survey for the traditional group was 3.471 with a standard deviation of 1.078 while the mean of the post-survey increased to 3.571 with a standard deviation of .978. (See Table 21 for Means and Standard Deviations.)

Mean Scores by Ability Groups

In the cooperative learning with individual accountability group the mean score for the students of high ability was 3.091 with a standard deviation of 1.136 which decreased to a mean of 2.727 with a standard deviation of 1.191. The mean score on the pre-survey for the students of low ability was 3.583 with a standard deviation of 1.165 which decreased to a mean score of 2.5 with a standard deviation of 1.624.

In the cooperative learning without individual accountability group the mean scores for the students of high ability was 3.182 with a standard deviation of .751 which decreased to a mean of 2.636 with a standard deviation of 1.12. The mean scores on the pre-survey for the students of low ability was 2.583 with a standard deviation of .9 which decreased to 2.5 with a standard deviation of .452.

In the traditional group the mean score of the pre-survey for the students of high ability was 3.727 with a standard deviation of .647 which increased to 3.818 with a standard deviation of .405. The mean score for the students of low ability on the pre-survey was 3.2 with a standard deviation of 1.398 which increased to a mean score of 3.3 with a standard deviation of 1.337.

Frequency Distribution

Cooperative Learning with Individual Accountability - Of the twenty three respondents twenty agreed with the statement and three disagreed. At the end of the study, fourteen agreed with the statement, four were undecided and five students disagreed.

Cooperative Learning without Individual Accountability - Of the twenty two respondents fifteen students agreed with the statement, seven students were undecided and one disagreed. At the end of the study, thirteen agreed with the statement, three were undecided and seven students disagreed.

Traditional- Of the twenty one respondents seventeen agreed with the statement, three were undecided and one disagreed. At the end of the study, nineteen agreed with the statement, one was undecided and one student disagreed. (See Table 22 for Frequency Distribution)

Table 21
Statement #1- Many students in my class help me when I need it.
Overall Mean Scores and Standard Deviation for surveys and treatment groups

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	3.348	1.152	2.609	1.406
Group B	2.87	1.343	2.565	1.343
Group C	3.471	1.078	3.571	.978

SD = standard deviation
M = mean score

Overall Mean Scores and Standard Deviation for Surveys by treatment Groups and Ability Groups

Treatment Groups	High		Low	
	M	SD	M	SD
Group A Pre	3.091	1.136	3.583	1.165
Post	2.727	1.191	2.5	1.624
Group B Pre	3.182	.751	2.583	.9
Post	2.636	1.12	2.5	.452
Group C Pre	3.727	.647	3.2	1.398
Post	3.818	.405	3.3	1.337

Table 22
Frequency Distribution
Statement #1- Many students in my class help me when I need it.

Categories	SA	A	U	D	SD
Group A					
Pre	15	5	0	2	1
Post	8	6	4	2	3
Group B					
Pre	6	9	7	1	0
Post	8	5	3	6	1
Group C					
Pre	16	1	3	0	1
Post	16	3	1	0	1

Legend
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional
Categories:
SA - strongly agree A- agree U - undecided D - disagree
SD-strongly disagree

Statement #5 - It is okay to make mistakes at school.

This statement was used to find out whether the students' attitudes toward school were one of seeing school as a safe place to try new things and to make mistakes. This is a positive statement. The results of the analysis of variance among treatments were $F(2,64) = 3.298$, $p < .05$. The analysis of variance between the cooperative learning groups and the traditional group was $F(1,65) = 6.328$, $p < .05$. The cooperative learning with individual accountability group had a mean score of 4.00 after the treatment. This statement met the accepted standard of .05 or better.

The mean on the pre-survey for the cooperative learning with individual accountability group was 3.391 with a standard deviation of 1.196 while the mean of the post-survey increased to 4.00 with a standard deviation of 0. The mean of the pre-survey for the cooperative learning without individual accountability group was 3.565 with a standard deviation of .992 while the mean of the post survey increased to 3.913 with a standard deviation of .288. The mean of the pre survey for the traditional group was 3.476 with a standard deviation of 1.209 while the mean of the post survey increased to 3.619 with a standard deviation of .865. (See Table 23 for the mean scores and standard deviation for all three treatment groups and by ability.)

Mean Scores by Ability

In the cooperative learning with individual accountability group the mean score for the students of high ability was 3.455 with a standard deviation of .647 which increased to a mean of 4.00 with a standard deviation of 0. The mean score on the pre-survey for the students of low ability was 3.333 with a standard deviation of 1.231 which increased to a mean score of 4.00 with a standard deviation of 0.

In the cooperative learning without individual accountability group the mean score for the students of high ability was 4.0 with a standard deviation of 0 which stayed the same as a mean of 4.0 with a standard deviation 0. The mean score on the pre-survey for the students of low ability was 3.167 with a standard deviation of 1.267 which increased to 3.883 with a standard deviation of .389.

In the traditional group the mean score of the pre survey for the students of high ability was 3.818 with a standard deviation of .405 which decreased to 3.727 with a standard deviation of 1.612. The mean score for the students of low ability on the pre survey was 3.1 with a standard deviation of 1.663 which increased to a mean score of 3.5 with a standard deviation of 1.08.

Frequency Distribution

Group A -Out of the twenty three respondents, twenty agreed with the statement, one was undecided, and two disagreed. At the end of the study of the twenty three, twenty three strongly agreed with the statement, zero were undecided and zero students disagreed.

Group B - Out of twenty three students, twenty agreed with the statement, two were undecided and one disagreed. At the end of the study, twenty one students agreed with the statement, two were undecided and zero disagreed.

Group C- Out of twenty one students, nineteen agreed with the statement, zero were undecided and two disagreed. After the study eighteen students agreed with the statement, two were undecided and one disagreed. (See Table 24 for Frequency Distribution)

Table 23

Statement #5 - It is okay to make mistakes at school.

Overall Mean Scores and Standard Deviation for surveys and treatment groups

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	3.391	1.196	4	0
Group B	3.565	.992	3.913	.288
Group C	3.476	1.209	3.619	.865

Legend

SD = standard deviation

M = mean score

Overall Mean Scores and Standard Deviation for Surveys by Treatment Groups and Ability Groups

Treatment Groups	High		Low	
	M	SD	M	SD
Group A				
Pre	3.455	.647	3.333	1.231
Post	4	0	4	0
Group B				
Pre	4	0	3.167	1.267
Post	4	0	3.883	.389
Group C				
Pre	3.818	.405	3.1	1.663
Post	3.727	1.612	3.5	1.08

Legend

Group A - Cooperative Learning with Individual Accountability

Group B - Cooperative Learning without Individual Accountability

Group C - Traditional

Table 24

Statement #5- It is okay to make mistakes at school

Categories	SA	A	U	D	SD
Group A					
Pre	16	4	1	0	2
Post	23	0	0	0	0
Group B					
Pre	18	2	2	0	1
Post	21	0	2	0	0
Group C					
Pre	16	3	0	0	2
Post	17	1	2	1	0

Legend

Group A - Cooperative Learning with Individual Accountability

Group B - Cooperative Learning without Individual Accountability

Group C - Traditional

Categories:

SA - strongly agree A- agree U - undecided D - disagree

SD-strongly disagree

Statement #2 Math is doing the same thing over and over again.

This statement was used to reveal whether or not students found mathematics to be repetitious and boring. This was a negative statement. This statement was one of the five statement that revealed how the student felt about mathematics.

The results of the analysis of variance between cooperative learning and traditional groups were found not to be significant. However, the results of the analysis of variance among treatment groups revealed no change over the course of the study. The results were significant at the beginning of the study, $F(2,64) = 5.489$, $p < .05$ and at the end of the study the results were found to be statistically significant, $F(2,64) = 3.543$, $p < .05$.

The mean on the pre-survey for the cooperative learning with individual accountability group was 1.174 with a standard deviation of 1.435 while the mean of the post-survey increased to 1.565 with a standard deviation of 1.441. The mean of the pre-survey for the cooperative learning without individual accountability was 2.348 with a standard deviation of 1.748 while the mean of the post survey increased to 2.739 with a standard deviation of 1.356. The mean of the pre survey for the traditional group was 2.714 with a standard deviation of 1.678 while the mean of the post survey decreased to 2.19 with a standard deviation of 1.692. (See Table 25 for Mean Scores and Standard Deviations.)

Mean Scores by Ability Groups

In the cooperative learning with individual accountability group the mean score for the students of high ability was 1.091 with a standard deviation of 1.136 which decreased to a mean of 1.00 with a standard deviation of 1.095. The mean score on the pre-survey for the students of low ability was 1.25 with a standard deviation of 1.357 which increased to a mean score of 2.083 with a standard deviation of 1.564.

In the cooperative learning without individual accountability the mean score for the students of high ability was 2.727 with a standard deviation of 1.794 which decreased to a mean of 2.545 with a standard deviation 1.508. The mean score on the pre-survey for the students of low ability was 2.00 with a standard deviation of 1.706 which increased to 2.917 with a standard deviation of 1.24.

In the traditional group the mean score of the pre survey for the students of high ability was 2.818 with a standard deviation of 1.722 which decreased to 2.364 with a standard deviation of 1.69. The mean score for the students of low ability on the pre survey was 2.6 with a standard deviation of 1.713 which decreased to a mean score of 2 with a standard deviation of 1.764.

Frequency Distribution

In group A -Out of the twenty three respondents fifteen agreed with the statement, four were undecided, and four disagreed. At the end of the study of the twenty three, thirteen agreed with the statement, three were undecided and seven students disagreed.

In Group B - Out of twenty three students nine agreed with the statement, one were undecided and thirteen disagreed. At the end of the study, three students agreed with the statement, six were undecided and fourteen disagreed.

In Group C- Out of twenty one students, six agreed with the statement, two were undecided and thirteen disagreed. After the study eight students agreed with the statement, two were undecided and eleven disagreed. (See Table 26 for Frequency Distribution)

Table 25

Statement #2 - Math is doing the same thing over and over again.
Means Scores and Standard Deviation by Treatment Group

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	1.174	1.435	1.565	1.441
Group B	2.348	1.748	2.739	1.356
Group C	2.714	1.678	2.19	1.692

Legend

SD = standard deviation
M = mean score

Overall Mean Scores and Standard Deviation for Surveys by treatment Groups and Ability Groups

Treatment Groups	High		Low	
Group A				
Pre	1.091	1.136	1.25	1.357
Post	1	1.095	2.083	1.564
Group B				
Pre	2.727	1.794	2	1.706
Post	2.545	1.508	2.917	1.24
Group C				
Pre	2.818	1.722	2.6	1.713
Post	2.364	1.69	2	1.764

Table 26

Frequency Distribution

Statement #2 Math is doing the same thing over and over again.

Categories	SA	A	U	D	SD
Group A					
Pre	11	4	4	1	3
Post	7	6	3	4	3
Group B					
Pre	6	3	1	3	10
Post	3	0	6	5	9
Group C					
Pre	4	2	2	1	12
Post	6	2	2	4	7

Legend

Group A - Cooperative Learning with Individual Accountability

Group B - Cooperative Learning without Individual Accountability

Group C - Traditional

Categories:

SA - strongly agree A- agree U - undecided D - disagree

SD-strongly disagree

ANOVA between the Treatment Groups and the High Ability Group

Results of the analysis of variance among the treatment groups and the high ability students revealed that statements #1, and #2 were found to have statistically significant results. Statement #1, many students in my class help me when I need it, was found to be statistically significant, $F(2, 30) = 5.032$, $p < .05$. Statement #2, math is doing the same thing over and over again, was found to be statistically significant at the beginning of the study, $F(2,30) = 3.595$, $p < .05$ and at the end of the study, $F(2, 30) = 3.071$, $p < .05$. Therefore, there is no change in the reactions of the students over the course of the study.(See Table 27 for the Results of the ANOVA)

The means scores for the cooperative learning with individual accountability group on statement #1 for the students of high ability were 3.091 with a standard deviation of 1.136 on the pre-survey and 2.727 with a standard deviation of 1.191 on the post survey. The means scores for the cooperative learning without individual accountability group on statement #1 for the students of high ability were 3.182 with a standard deviation of .751 on the pre-survey and 2.636 with a standard deviation of 1.12 on the post survey. The mean scores for the traditional group on statement #1 for the students of high ability were 3.727 with a standard deviation of .647 on the pre-survey and 3.818 with a standard deviation of .405 on the post survey.

Table 27
Results of the Analysis of Variance for the surveys by Treatment Groups and Students of High ability

Statement		F-Test	Prob.
#1	Pre	1.72	.20
	Post	5.032	.013*
#2	Pre	3.595	.04*
	Post	3.721	.036*
#3	Pre	.744	.43
	Post	.468	.63
#4	Pre	1.25	.301
	Post	2.222	.1259
#5	Pre	1.556	.2276
	Post	1.957	.159
#6	Pre	4.049	.0278*
	Post	2.468	.1
#7	Pre	.94	.40
	Post	.136	.87
#8	Pre	.045	.9565
	Post	1.527	.2336
#9	Pre	1.847	.1752
	Post	2.31	.1167
#10	Pre	.19	.82
	Post	.057	.9447

DF = 2,30

P <.05

Students' Attitudes towards Mathematics and towards School

The survey was designed with five statements that related to the students' attitudes towards mathematics and five statements that related to the students' attitudes towards school. An analysis of variance was conducted to reveal the differences in attitudes among the treatment groups. The ANOVA conducted on the students' attitudes towards school revealed no statistically significant differences. All groups had a positive attitude towards school. However, the attitudes towards mathematics revealed statistically significant differences.

The results for the analysis of variance was conducted on the sum of the five statements related to mathematics among treatment groups. The statements related to mathematics were #2, #4, #7, #8, #10. The results of the analysis of variance were not statistically significant at the beginning of the study, $F(2, 64)= 2.352$, $p>.05$. At the end the results of the analysis of variance were statistically significant, $F(2,64) = 4.128$, $p < .05$. The mean of the cooperative learning with individual accountability group was 12.348 with a standard deviation of 3.588 which increased to a mean of 13.043 with a standard deviation of 3.686. The mean of the cooperative learning without individual accountability group was 14.043 with a standard deviation of 3.686 which increased to a mean of 15.739

with a standard deviation of 2.88. The mean of the traditional group was 14.476 with a standard deviation of 3.01 which increased to 14.905 with a standard deviation of 3.129. (See Appendix 0 for the ANOVA for the Statement related to Mathematics among Treatment Groups. See Table 28 for the ANOVA of the Statement relating to Mathematics among Treatment Groups.)

Table 28
Results of the Analysis of Variance of the Statements related to Mathematics by Treatment

	DF	F	P
Pre	2,64	2.352	P = .10
Post	2,64	4.128	P = .02*

Means and Standard Deviations of the Surveys by Treatment

	Pre		Post	
	Mean	SD	Mean	SD
Group A	12.348	3.588	13.043	3.686
Group B	14.043	3.735	15.739	2.88
Group C	14.476	3.01	14.905	3.129

Legend
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional

Mathematics and the Students of Low Ability

The analysis of variance that was conducted on the students' attitudes towards mathematics revealed no statistically significant results at the beginning of the study, $F(2,30) = 2.812$, $P > .05$. At the end of the study the results moved toward statistically significant results, $F(2,30) = 3.24$, $p = .05$.

In the area of mathematics the mean of the students of low ability in the cooperative learning with individual accountability group was 10.917 with a standard deviation of 3.502 which increased to 11.833 with a standard deviation of 4.218. The mean of the students of low ability in the cooperative learning without individual accountability group was 12.917 with a standard deviation of 3.895 which increased to 15.583 with a standard deviation of 3.554. The mean of the students of low ability in the traditional group was 14.4 with a standard deviation of 2.797 which decreased to 13 with a standard deviation of 3.091. (See Appendix O for the ANOVA for the Statements related to Mathematics among Treatment Groups and Low Ability. See Table 29 for the ANOVA of the Statement relating to Mathematics among Treatment Groups and Low Ability.)

Table 29

Results of the Analysis of Variance for the Statements relating to Mathematics by Treatment and low ability

	DF	F-test	Probability
Pre	2,31	2.812	P=.0755
Post	2,31	3.24	P=.05*

Means for the Statements relating to Mathematics by Treatment Groups and Low Ability

Treatment	Pre		Post	
	M	SD	M	SD
Group A	10.917	3.502	11.833	4.218
Group B	12.917	3.895	15.583	3.554
Group C	14.4	2.797	13	3.091

Legend

M - means

SD- standard deviations

Group A - Cooperative Learning with Individual Accountability

Group B - Cooperative Learning without Individual Accountability

Group C - Traditional

ANOVA between the Three Treatment Groups

The ANOVA that was conducted between the cooperative learning with individual accountability group and the cooperative learning without individual accountability group on the students' attitudes towards mathematics at the beginning of the study revealed results that were not statistically significant, $F(1,44) = 2.465$, $p > .05$ and at the end of the study the results were $F(1,44) = 6.638$, $p < .05$.

The ANOVA that was conducted between the cooperative learning without individual accountability group and the traditional group on the students' attitudes towards mathematics were not statistically significant at the beginning, $F(1,42) = .177$, $p > .05$ or at the end, $F(1,42) = .849$, $p > .05$.

The ANOVA that was conducted between the cooperative learning with individual accountability group and the traditional group on the students' attitudes towards mathematics revealed that the results were statistically significant, $F(1,42) = 4.497$, $p < .05$ and at the end of the study the results were $F(1,42) = 3.228$, $p > .05$.

The cooperative learning without individual accountability had a statistically significant better attitude toward mathematics than the cooperative learning with individual accountability group, $F(1,44) = 7.638$, $p < .01$. (See Table 30 for the ANOVA of the between Treatment Groups)

Table 30

Results of the Analysis of Variance of the Surveys between treatment groups

Treatment	DF	F-test	Probability	Direction
A vs B				
Math				
Pre	1,44	2.465	p = .1236	
Post	1,44	6.638	p = .0083	B > A
B vs C				
Math				
Pre	1,42	.177	p = .6763	N.S.
Post	1,42	.849	p = .3622	N.S.
A vs C				
Math				
Pre	1,42	4.497	p = .0399	C>A
Post	1,42	3.228	p = .0796	N.S.

Legend

A = cooperative learning with individual accountability

B = cooperative learning without individual accountability

C = traditional

Summary of the Survey Results

Each statement on this survey conveyed some information about how the teaching strategies affected each group. Statement #3, I like school, and statement #4, It is important to know how to do Math, were the two statements that had similar results for each group. All of the groups agreed that they liked school and that math was important to know how to do.

The cooperative learning with individual accountability showed statistically significant differences in attitudes within statements #1 and #5. Statements #1 and Statement #5 related to the students' attitudes towards school. Examining statement #1 it was found that the students' attitudes towards their fellow classmates as helpers decreased. The emphasis on working well with your group members instead of your classmates could provide a rationale for the change. Statement #5 dealt with the students perception as to whether it was okay to make mistakes. These students felt unanimously that it was okay to make mistakes.

In the cooperative learning without individual accountability group two statements were found to have statistically significant results. The statement were #8 and #9. Statement #8 related to the students' attitudes towards mathematics. Statement #8 stated without math school would be more fun. At the beginning of the study the students of low ability agreed with this statement, whereas, by the end of the study there was an improvement towards a positive attitude towards math. The students in the high ability groups had a consistently positive attitude towards mathematics from the beginning to the end. In statement #9, my teacher is the only one who can help me with my work, there was improvement from the beginning of the study to the end of the study in both ability groups. The group as a whole agreed that the teacher was not the only one who could help them with their work. In statement #4, this group unanimously agreed strongly that it was important to know how to do math.

The analysis of variance conducted between the cooperative learning groups and the traditional group revealed that statement #1 and statement #5 were found to reveal significant differences. When the analysis of variance was conducted among the three treatment conditions statement #1, statement #2 and statement #5 were found to be significant. However, on closer examination statement #2 was significant at the beginning of the study and the significant results were maintained throughout the study. Little change in the mean scores occured over the course of the study.

The analysis of variance conducted on the five statements dealing with the students' attitudes towards school revealed no significant differences. All the treatment groups had a positive attitude towards school.

When the ANOVA was conducted on the sum of the five statements relating to mathematics the results indicated a statistically significant difference among the three treatment groups and when the results of the students of low ability were analyzed. With closer examination the ANOVA revealed that the students of the cooperative learning without individual accountability had a statistically significantly better attitude towards mathematics than the cooperative learning with individual accountability. The students of low ability in the cooperative learning without individual accountability group had developed a better attitude towards mathematics than the other two treatment groups as shown by the growth made in the mean score.

Chapter 5

Summary, Conclusions and Implications

The first purpose of this study was to examine whether or not process oriented individual accountability within the cooperative learning groups had a positive effect on student achievement as total groups, and within ability groups. Secondly, whether or not individual accountability strategies promoted better attitudes towards school and towards mathematics. In this chapter, findings of the study are summarized, the conclusions based upon the findings are presented, and implications for classroom use are discussed.

The study population consisted of seventy one grade three students from one suburban elementary school. By rotating every six lessons the grade three educators taught the three grade three classes the multiplication unit that was developed by the investigator. The instruments used in this study were three multiplication achievement tests; pre-test, post-test, retention test and a ten item Likert-scale survey. The study was limited to a specific population attending a suburban elementary school.

Summary of the Findings

Several conclusions were drawn from the results of the analysis of data. A total of fifteen hypotheses were developed. The hypotheses were examined one by one as to whether they were found to be significant or not. (See Table 31 for Results of the Hypotheses)

Hypothesis 1

Grade three students who are taught using cooperative learning strategies will achieve higher results on the multiplication unit test than the grade three students who are taught using traditional strategies.

The analysis of variance revealed that the cooperative learning groups did achieve higher results than the traditional group. The results were found to be statistically significant. This hypothesis can be accepted.

Hypothesis 2

Grade three students who are taught using cooperative learning with individual accountability will achieve higher results than students who are taught using traditional strategies.

The analysis of variance that was conducted between the cooperative learning with individual accountability and the traditional group revealed a statistically significant difference. This hypothesis can be accepted.

Hypothesis 3

Grade three students who are taught using cooperative learning with individual accountability will achieve higher results than grade three students who are taught using cooperative learning without individual accountability.

The analysis of variance that was conducted between these two groups did not reveal a statistically significant difference. However, the cooperative learning with individual accountability did achieve higher results than the cooperative learning without individual accountability group. This hypothesis can not be accepted.

Hypothesis 4

Grade three students who are taught using cooperative learning strategies without individual accountability strategies will achieve higher results than grade three students who are taught using traditional strategies.

Although the cooperative learning without individual accountability did achieve higher results than the traditional group, the results were not statistically significant. This hypothesis can not be accepted. The cooperative learning without individual accountability group did not achieve scores high enough to produce a statistically significant difference.

Hypothesis 5

Grade three students of high ability who are taught using cooperative learning with individual accountability strategies will achieve higher results than grade three students of high ability who are taught using traditional strategies.

The students of high ability in the cooperative learning with individual accountability did achieve higher results than the students of high ability in the traditional group, but the results of the analysis of variance were not statistically significant. This hypothesis can not be accepted.

Hypothesis 6

Grade three students of high ability who are taught using cooperative learning with individual accountability strategies will achieve higher results than students of high ability who are taught using cooperative learning without individual accountability strategies.

The students of high ability in the cooperative learning with individual accountability group did achieve higher results than the students of high ability in the cooperative learning without individual accountability treatment condition. The difference was not statistically significant. This hypothesis can not be accepted. The scores between these two cooperative learning groups revealed statistically significant differences on the pre-test. This statistically significant difference was not found when the results of the post-test were compared.

Hypothesis 7

Grade three students of high ability who are taught using cooperative learning without individual accountability strategies will achieve higher results than students of high ability who are taught using traditional strategies.

The students of high ability in the cooperative learning group did achieve higher results than the students of high ability in the traditional treatment condition. The difference was not statistically significant. This hypothesis can not be accepted.

Hypothesis 8

Grade three students of low ability who are taught using cooperative learning with individual accountability strategies will achieve higher results on the post-test achievement test than grade three students of low ability who are taught using traditional strategies.

The students of low ability in the cooperative learning with individual accountability treatment group did achieve significantly higher results on the post-test achievement test than the traditional group. This hypothesis can be accepted. The data suggests that the cooperative learning with the addition of the individual accountability strategies did effect the scores of the students of low ability.

Hypothesis 9

Grade three students of low ability who are taught using cooperative learning with individual accountability strategies will achieve higher results than students of low ability who are taught using cooperative learning without individual accountability.

The students of low ability in the cooperative learning with individual accountability group did achieve higher results on the post-test achievement test than the cooperative learning without individual accountability group. The results of the analysis of variance were not statistically significant. This hypothesis can not be accepted.

Hypothesis 10

Grade three students of low ability who are taught using cooperative learning without individual accountability strategies will achieve higher results than students of low ability who are taught using traditional strategies.

The analysis of variance between the students of low ability in the cooperative learning without individual accountability and the students of low ability in the traditional group revealed results that were not statistically significant. This hypothesis can not be accepted.

Hypothesis 11

Grade three students who are taught using cooperative learning strategies with individual accountability will retain the information better than students who are taught using cooperative learning without individual accountability.

Although the mean of the cooperative learning with individual accountability group was higher than the mean of the cooperative learning without individual accountability group , the results were not statistically significant. This hypothesis can not be accepted.

Table 31

Analysis of the Results of the Hypothesis

Measures	Pre-test			Post-test		
	Total			Total		
1+2 vs 3	N.S.			P < .05		
	Total	High	Low	Total	High	Low
1 vs 3	N.S.	N.S.	N.S.	P<.05	N.S.	P<.05
1 vs 2	P<.05	P<.05	P<.05	N.S.	N.S.	N.S.
2 vs 3	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Legend

Group 1 - Cooperative Learning with Process Oriented Individual Accountability Strategies

Group 2 - Cooperative Learning without Individual Accountability

Group 3 - Traditional

Hypothesis 12

The students in the cooperative learning groups will reveal a greater difference in their attitudes over the course of the study than the traditional group.

In the cooperative learning with individual accountability two statements met the accepted standard of .05. In the cooperative learning without individual accountability two different statements met the accepted standard of .05. In the traditional group, one of the statements met the accepted standard of .05. (See Table 32)

Hypothesis 13

Grade three students who are taught using cooperative learning strategies with individual accountability will have a better attitude toward school than grade three students who are involved in the traditional group.

When the statements related to school were summed the analysis of variance revealed no statistical difference among the treatment groups' attitudes. This hypothesis can not be accepted. (See Table 33 for Results of the Survey)

Hypothesis 14

Grade three students who are taught using cooperative learning with individual accountability will have a better attitude toward school than grade three students who are taught using cooperative learning without individual accountability.

The analysis of variance did not reveal a statistically significant difference between the two cooperative learning groups. This hypothesis can not be accepted.

Hypothesis 15

Grade three students who are taught using cooperative learning with individual accountability will have a better attitude toward mathematics than grade three students who are taught using traditional strategies.

The analysis of variance did not reveal a statistically significant difference when the scores of the cooperative learning with individual accountability group were compared to the traditional group. This hypothesis can not be accepted.

Hypothesis 16

Grade three students who are taught using cooperative learning with individual accountability will have a better attitude toward mathematics than grade three students who are taught using cooperative learning without individual accountability.

The analysis of variance revealed a statistically significant difference when the results of the cooperative learning with individual accountability group were compared to the cooperative learning without individual accountability group. This hypothesis can not be accepted. The cooperative learning without individual accountability group had a better attitude than the cooperative learning with individual accountability group.

Table 32

Significant Statements on the Survey

Statements	1	2	3	4	5	6	7	8	9	10
Group A	X	O	O	O	X	O	O	O	O	O
Group B	O	O	O	O	O	O	O	X	X	O
Group C	O	O	O	O	O	O	X	O	O	O

O = $p > .05$

X = $p < .05$

Legend

Group A - Cooperative Learning With Individual Accountability

Group B - Cooperative Learning Without Individual Accountability

Group C - Traditional

Table 33

Results of the ANOVA for the Survey towards School and towards Mathematics

Treatment Groups	School	Mathematics
All Treatment Groups	N.S.	$P < .05$
Students of High Ability	N.S.	N.S.
Students of Low Ability	N.S.	$P < .05$
1 vs 3	N.S.	N.S.
1 vs 2	N.S.	$P < .05$

Legend

1 - Cooperative Learning with Individual Accountability

2 - Cooperative Learning without Individual Accountability

3 - Traditional

Discussion of the Results

The successful implementation of cooperative learning involves three essential components, namely, the informed students, the knowledgeable educator, and the informed parent. This section is organized into three specific parts which discuss the results of the current study in relation to the three components. One, with reference to the analysis of the data a discussion of the students' achievement results and the students' survey results are presented. Two, the implications for instruction and the teachers' impressions of the study are discussed. Three, parental reactions to cooperative learning and to the current study are revealed.

Student Achievement Results

Mathematics is susceptible to the "free rider effect" due to the fact that questions can be completed quickly allowing for less competent students to be left out. Many educators were concerned that the "free rider effect" would deter the learning of these students. The literature supported the use of cooperative learning groups with extrinsic rewards to provide students with the additional support of their group members to learn new material. There was little research which advocated a different approach for early years students of high and low ability to enable them to become individually accountable for their learning as well as the learning of the other members of the group. As a possible solution to this problem, it was suggested by the investigator that educators should concentrate on the process of learning and the process of working in a group before concentrating on the final product. This study investigated the use of process oriented individual accountability strategies that promoted individual involvement and assisted early years students to understand the importance of their involvement to produce higher student achievement scores.

As a foundation it was necessary to see if the current study supported the literature that cooperative learning groups did promote higher students achievement scores than the traditional group. The results of the data revealed that this study supported the many research projects that have been done that demonstrate that students' academic achievement scores improve when cooperative learning strategies are implemented (Slavin, 1991; Johnson & Johnson, 1991). The two cooperative learning groups performed significantly better than the traditional group.

The results of the data, also, supported the hypothesis that process oriented individual accountability strategies implemented within cooperative learning groups reduced the "free rider effect" which resulted in higher student achievement scores than the traditional group. When students had an opportunity to concentrate on what was being learned rather than the outcome of learning, students' achievement scores showed improvement. Analyzing the results of the data there was a statistically significant difference between the two cooperative learning groups and the traditional group. When the cooperative learning with individual accountability group was compared to the traditional group, the difference was statistically significant. A statistically significant difference was not evident when the cooperative learning without individual accountability group was compared with the traditional group. Therefore, the data suggested that the implementation of process oriented individual accountability strategies promoted higher student achievement scores.

In further examination of the results of the data the analysis of variance that was conducted between the cooperative learning with individual accountability and the cooperative learning without individual accountability revealed that the results of the pre-test were statistically significant. However, when the two cooperative learning groups were compared to one another, the analysis of variance on the post-test revealed no statistical difference. There was a statistically significant difference between the cooperative learning with individual accountability and the traditional which was not reflected when the cooperative learning without individual accountability was compared to the traditional group. These results could be translated into support for the implementation of process oriented individual accountability strategies with early years students as a suitable alternative to product oriented individual accountability strategies which are linked to extrinsic rewards in reducing the "free rider effect".

Students Ability Groups

The study supported the use of cooperative learning for early years students of high ability as well as for students of low ability. It benefited all ability levels (Johnson and Johnson, 1989; Slavin, 1990). The students of high ability achieved higher results than the students of low ability in all three treatment conditions. It can be concluded that students of high ability have natural learning abilities, therefore, any instructional method would be effective.

The analysis of variance between the treatment conditions and the students of low ability revealed results which approached significance. The analysis of variance on the post test between the cooperative learning with individual accountability group and the traditional group revealed a statistically significant difference. The data suggested that the addition of process oriented individual accountability strategies provided the additional support needed for students of low ability to become involved in their learning. The strategies, also, prevented the students of high ability from completing the worksheet without the input of the other group members. The focus of instruction changed from the completion of the worksheet to the participation of all members in the completion of the worksheet. The results of the data supported the use of process oriented individual accountable strategies as an alternative to product oriented individual accountable strategies with early years low ability students.

Direct application of the results can be made to the classroom through the implementation of process oriented individual accountability strategies in the area of mathematics. By using these process oriented individual accountability strategies the educator was able to assess through observation whether or not students were participating which resulted in the reduction of the "free rider effect".

Student Survey Results

This study examined the effect of process oriented individual accountability strategies on early years students' attitudes towards school and towards mathematics. Examining the individual groups for attitude changes, the results of the traditional group revealed that one of the statements showed statistically significant differences over the course of the study. While in each of the two cooperative learning groups statistically significant differences were found in two statements.

The cooperative learning with individual accountability had a statistically significant difference in their attitude towards statement #1 and statement #5. Statement #1 reflected a negative attitude change from students in my class help me with my work to an attitude that students in their class do not help them with their work. The change may have been due to the emphasis on working well in the groups. The group members assisted each other, students were not allowed to go to other groups for assistance. Therefore, their group members were the only ones who could provide assistance, not their fellow classmates. Another possible reason for the change in attitude was through concentrating on the participation within the group may have led to fragmentation of the whole class group. Therefore, total class inclusion activities could provide the basis to promote the importance of working with all class members.

Another significant change in attitude was revealed in statement #5, It is okay to make mistakes. The group had a perfect mean score of 4.0 in agreement. These students viewed mistakes as a positive experience. Through experimenting with the different concepts, making mistakes and changing their technique the students developed a positive attitude towards learning. Since the emphasis of this group was on the process rather than the product the acceptance by the students to make mistakes reflects an understanding that in order to learn, one makes mistakes.

The cooperative learning without individual accountability group showed a statistically significant difference in statement #8 and statement #9. This group disagreed strongly with statement #8, Without math, school would be fun. A positive attitude towards mathematics was reflected in this statement. The students enjoyed the experience of working in cooperative learning groups. This group, also, strongly disagreed with statement #9, My teacher is the only person in my class who can help me with my work. Instead of the teacher being the only person who could help them with their work, the students viewed their group members as providing academic support. This group had a perfect mean score on statement #4, It is important to know how to do Math.

In the traditional group, statement #7, Math is easy, was found to be statistically significant. This statement was used to assess whether the students found Math easier as the unit progressed. The students' attitude reflected a positive attitude change towards Math becoming easier. This reaction could have been due to the nature of the unit. The hands-on activities of the multiplication unit were highly motivating, unlike, the usual method of using the grade three mathematics textbook.

When the sum of statements relating to Mathematics were analyzed it was found that the cooperative learning without individual accountability group had a significantly better attitude towards Mathematics than the cooperative learning with individual accountability group. The greatest improvement was found with the students of low ability in the cooperative learning without individual accountability group. It is important to note that the mean score of the cooperative learning with individual accountability did show growth, but not to the same extent as the cooperative learning without individual accountability. This finding suggests that the introduction of the individual accountability strategies did not have a negative effect on attitudes of the cooperative learning with individual accountability group. The study added support to the notion that through working in groups students experience a wider support base. This support base provided the assistance and security necessary to enable students to improve their attitude towards mathematics.

Five of the questions were summed to discover an overall attitude towards school. The results indicated that there was no significant difference among the three treatment groups' attitudes towards school throughout the study. All the treatment groups had a positive attitude toward school.

Teachers

The current study reinforced important issues for educators who are beginning to use cooperative learning strategies in their classrooms. Through the implementation of the Learning Together model developed by Johnson & Johnson, 1984, students made greater academic gains than students in the traditional group. The cooperative learning groups achieved significantly higher results than the traditional group. The addition of process oriented individual accountability strategies to the variables, positive interdependence, face to face interaction and interpersonal group processing skills produced achievement results that revealed a statistically significant difference when cooperative learning with individual accountability group was compared to the traditional group. This significant difference was not found when the scores of the cooperative learning without individual accountability were compared to the traditional group. The findings support the implementation of process oriented individual accountability strategies to promote student involvement in their learning.

When examining the needs of the two ability groups the findings supported the use of process oriented individual accountability strategies which resulted in higher students achievement scores for students of both ability groups. However, the students of low ability experienced more success in the cooperative learning with individual accountability group than the other two treatment groups. The additional support and the process oriented individual accountability strategies had a positive effect in reducing the "free rider effect". Students of low ability needed the additional structure provided by the process oriented individual accountability strategies, since the strategies provided these students with opportunities to become involved.

The current study investigated whether or not process oriented individual accountability strategies could reduce the "free rider effect" in the area of mathematics. The statistical results supported the assumption that through concentrating on the process rather than the outcome students experimented with the new concepts which resulted in higher student achievement. The students of low ability benefited from the process oriented individual accountability strategies as demonstrated by the statistically significant difference when compared to the traditional group. The cooperative learning groups provided an opportunity for these students to discuss and learn from their group members. The process oriented individual accountability strategies provided an opportunity for all students to be individually accountable. The achievement results improved without the addition of extrinsic rewards.

As described the survey revealed that through the use of cooperative learning strategies the students developed a healthy attitude towards Mathematics. The results of the survey indicated that the students of low ability in the cooperative learning without individual accountability had the greatest improvement in their attitude towards Mathematics. It was concluded that unlike the students of high ability who have natural learning abilities the students of low ability need additional support, both socially and academically. By teaching the social skills necessary and by providing the academic support the educator created an environment where most students were successful.

There was a statistically significant difference between the cooperative learning without individual accountability group and the cooperative learning with individual accountability group in their attitude towards Mathematics. The attitudes of the students in the cooperative learning with process oriented individual accountability did show growth. In general, the implementation of the process oriented individual accountability strategies did not effect the students' attitudes in the study to the same extent that the strategies promoted student achievement.

The statistical data supported the implementation of the following four strategies to improve student achievement scores in the area of Mathematics. The first way was to ask randomly a member of the group to explain the answer. The second way was to give specific resources to each member of the group, specific manipulatives to move, or a specific color of pencil to use so the teacher could observe quickly the involvement of each member of the group. The teacher observed whether the students were actively involved by looking at whether or not each student was moving his/her manipulatives or how much of a certain color of pencil was found in the assignment. The third way involved each member signing the paper only if the group felt that the member participated. Since cooperative learning involved the completion of one work sheet in each group each student was motivated to sign the sheet to show completion and involvement in the group. The fourth way involved each member of the group signing the paper if he/she could explain how to do the question to the group.

The teacher's observational skills were essential to assist each student to become individually accountable. The teacher monitored each group by asking questions and by observing the groups for student involvement. A student's name being left out on a worksheet indicated a problem which was quickly corrected by the teacher's involvement. A teacher's observational skills identified situations where members of the group were allowed to sign, but the students were not participating. By reinforcing the rules for signing, the situation was remedied. Another remedy for this problem was through using the strategy of randomly asking students to explain how the group was working or asking students how the group attained an answer in combination with the signing strategy. These strategies provided the additional support needed for most students to become active learners.

Teachers' Reactions

The teachers were very conscientious about the implementation of the study. They followed the teacher's guide precisely.

At the end of the study, the teachers felt that the students had a good understanding of the multiplication concepts, especially the students in the cooperative learning groups. The additional support of the group members promoted a clear understanding of multiplication through the repetition and clarification. The study reinforced the teachers' belief that cooperative learning promoted higher students achievement than the traditional group.

Teachers felt that the cooperative learning methods were more effective than traditional methods in meeting the diverse needs of the students. The teachers found using the cooperative learning strategies a more effective way of assisting all students. In the traditional group there was some frustration on the teacher's part in not being able to assist everyone to the same extent.

The current study reinforced the importance for early years teachers to focus on the process of learning rather than the final product. Teachers realized that it was through focussing on the process that resulted in better achievement scores on the post-test. Through the use of process oriented individual accountability strategies the students in the groups focussed on the completion of the worksheet by the whole group rather than a few members completing the worksheet for the group. As a results, the students of low ability made greater gains in the cooperative learning groups than the traditional group which the teachers did not expect. The implementation of the process oriented individual accountability strategies provided the support for the students of low ability to be successful.

These teachers were concerned about the "free rider effect" the results of this study revealed a solution to an obstacle that was preventing them from using cooperative learning on a regular basis. Process oriented cooperative learning strategies can reduce the "free rider effect".

In the traditional group students were sitting in groups of four similar to the other two treatment conditions. An important finding for teachers was that even when students sat in groups, it did not foster higher student achievement scores. This finding supported the literature that the five elements of cooperative learning must be present to improve student achievement scores. The students' talk tended to be unrelated to the academic work but, rather it was related to their social life. By fostering the skills necessary to work effectively in a group improves student achievement.

The current study reinforces the following four findings for teachers. One, the teaching of early years students should focus on the process of learning rather than just the final product. Two, students of low ability need the repetition and clarification that is provided by their group members in order to master the material. Three, the discussion within the group should be structured to relate to the learning goal. Four, in order to promote achievement beyond the traditional class, individual accountability strategies that promote student involvement in their learning and the learning of the other group members should be implemented into every lesson. Knowledgeable educators are the important element to student success.

Parents' Impressions

During the two presentations, Meet the Teacher Night and the Cooperative Learning Workshop, parents were supportive of the study and of the implementation of cooperative learning strategies with their children. Many parents commented that they wished their education had included cooperative learning strategies. Parents were eager to be informed of the results of the current study.

Conclusions

Within the limitations of the study the following conclusions can be drawn:

1. Students who were taught using the cooperative learning strategies performed significantly better than students taught using the traditional strategies.

2. Students in the cooperative learning with individual accountability made the greatest gains of all three groups.

A statistically significant difference was found between the cooperative learning with individual accountability and the traditional group.

3. Process oriented individual accountability strategies motivated students to participate which promoted higher student achievement with grade three students.

4. Students of low ability performed significantly better in the cooperative learning groups than the traditional group. A statistically significant difference was found between the cooperative learning with individual accountability group and the traditional group. Cooperative learning with process oriented individual accountability strategies assisted students of low ability to become actively involved in their learning which resulted in higher student achievement than the traditional group.

5. Students of high ability performed well in all three treatment conditions. It was concluded that the method of instruction did not

have a direct impact on the achievement scores of the students of high ability. The results suggested that the students of high ability were natural learners who were motivated and possessed the necessary learning skills to be successful in every treatment condition.

6. Students who were taught using cooperative learning strategies retained the material to the same extent in both groups.

7. Students of all treatment groups began the study with a positive attitude towards school and this attitude was maintained.

8. The cooperative learning strategies without the process individual accountability strategies had a greater impact on student attitudes towards Mathematics. Students of low ability in this group revealed a statistically significant difference when the ANOVA was conducted. The three variables, positive interdependence, face to face interaction, and interpersonal skills had a positive effect on the students' attitudes toward mathematics in the cooperative learning without individual accountability group. The cooperative learning without individual accountability group had a better attitude towards mathematics than the cooperative learning with individual accountability.

9. This study, also, supports that the essential components to the successful implementation of cooperative learning are knowledgeable educators, informed parents, and informed students.

Educational Implications

Successful implementation of cooperative learning strategies involved the combination of three components, namely, educators, students, and parents. Communication was a vital part of the instructional changes created by the introduction of cooperative learning strategies. Educators needed to be trained in the elements of cooperative learning and how to implement them within their classrooms. When an educator made the decision to implement cooperative learning strategies within his/her classroom, a variety of decisions were made with the needs of the students in mind. These decisions included the presentation of the unit in the most effective way to promote students' mastery of the material, the creation of activities to meet the needs of the varying abilities of the students, and the development of positive student attitudes towards the subject. The last important aspect of the implementation of cooperative learning was to inform parents about the changes to expect and the educators' rationale for making those changes. A major conclusion was drawn regarding the implementation of the process oriented individual accountability strategies for each of these components.

The Presentation of the Material

The current study supported the use of cooperative learning groups to promote student academic growth beyond the traditional classroom. More specifically, the elements of the Learning

Together Model in combination with the implementation of process oriented individual accountability strategies produced academic achievement scores beyond the traditional group. Within this cooperative learning group the educator promoted an environment where the process of working in groups and the process of learning were the major focuses. Process oriented individual accountability strategies provided most students with an opportunity to interact with their group members by explaining, elaborating, paraphrasing, summarizing as well as listening to discover a joint understanding of multiplication. The structured discussion assisted the students to become involved in comprehending the concept of multiplication.

The following four process oriented individual accountability strategies were found to assist groups to function more effectively resulting in the reduction of the "free rider effect". The first way was through randomly selecting a member of the group to explain the answer. The second way was to give specific resources to each member of the group, specific manipulatives to move, or a specific color of pencil to use so the educator observed the involvement of each member of the group. The third way involved each member being allowed to sign the paper only if the group felt the member participated. The fourth way involved each member of the group signing the paper only if he/she could explain to the group how to do the question .

The "free rider effect" was reduced by utilizing process oriented individual accountability strategies that emphasized the need for all members of the group to be involved. The inclusion of extrinsic rewards was unnecessary to promote higher student achievement than the traditional group. Cooperative learning with process oriented individual accountability strategies promoted higher student achievement results for students of high and low abilities.

Creation of the Activities for All

Cooperative learning strategies were effective in meeting the needs of students of high and low ability. Both groups benefited from the increase in student interactions and the development of social skills. Students of high ability were natural learners, therefore, all three treatment conditions were successful in promoting academic growth. The post test achievement results, however, revealed a significant difference between the students of low ability in the cooperative learning with individual accountability group and the students of low ability in the traditional group. The process oriented individual accountability strategies provided opportunities for more involvement of all members of the group. The immediate feedback, clarification, repetition, and review reinforced the multiplication concepts for these students.

Whenever an educator develops an activity the implementation of cooperative learning with process oriented individual accountability strategies should be taken into consideration. By implementing process oriented strategies that promote inclusion of all group members and creating activities that allow for explaining, elaborating, and listening within cooperative learning groups students are provided with a learning experience that produce positive academic results for students of all abilities.

Development of Positive Student Attitudes

The results of the survey reflected attitudinal changes that have educational implications for all educators who implement cooperative learning strategies within their classrooms. The cooperative learning without individual accountability and the traditional group revealed positive findings, such as, Math is easier, School is more fun with Math, The teacher is not the only person one can go to for help. However, in the cooperative learning with individual accountability group, the outcomes had implications for future consideration. These findings were reflected in the students' final responses to statement #1 and statement #5. The findings of each statement are presented and discussed. Important findings were, also, found when the five statements were totaled that related to the students' attitudes towards Mathematics and the students' attitudes towards school. These two findings are, also, discussed.

The cooperative learning with individual accountability group indicated a positive attitude change in statement #5. The students strongly agreed unanimously that it was okay to make mistakes. The emphasis on the process of working in a group and on the process of learning was reflected in the students' comfort with making mistakes. These students' perception of learning changed over the course of the study to reflect the importance of making mistakes and experimenting with the new concepts in order to learn them.

The survey revealed one area of concern for the educators of the students of the cooperative learning with individual accountability group. The final response to statement #1 that students in their class did not help them with their work was an outcome that needed to be explored. During the course of the study there was a negative change in attitude. These results were translated into a need for the educator to implement whole class inclusion activities to promote a positive attitude towards all class members. Working in groups can promote an climate of exclusion where the students want to work with just their group members. The goal is for all students to be able to work with all members of the class which should be addressed by the educator through whole-class inclusion activities.

The survey results in the area of Mathematics for the students of the cooperative learning without individual accountability revealed a significantly better attitude towards Mathematics than the cooperative learning with individual accountability. In particular the students of low ability in the cooperative learning without individual accountability group reported the greatest gains in developing a more positive attitude towards Mathematics. The mean score of the students of the cooperative learning with individual accountability group did increase, however, it did not increase to the same extent as the cooperative learning without individual accountability.

Informed Parents

At the beginning of the study the parents were informed of the rationale of the study and what instructional changes to expect. A month later a more detailed workshop was presented where parents experienced the differences between traditional instruction and cooperative learning instruction. The parents were supportive of the study which made the implementation of cooperative learning strategies a positive experience for all.

Summary of Educational Implications

Successful implementation of cooperative learning involved knowledgeable educators, informed parents, and informed students. Cooperative learning allowed students of varying abilities to develop academically, as well as, socially by using the various resources of the group members. Students of low ability, especially, benefited from the repetition and clarification provided by their group members. By concentrating on the process of working in a group and the process of learning most students in the groups were motivated to participate, to learn the material being presented, and to be responsible for his/her learning as well as each group member's learning. The use of extrinsic rewards as a motivator was replaced with process oriented individual accountability strategies.

Academically, this study supported the addition of the process oriented individual accountability strategies to the three variables as outlined by Johnson & Johnson (1989), positive interdependence, face to face interaction, and interpersonal skills within the cooperative learning groups to reduce the "free rider effect" and to improve student achievement results beyond the traditional classroom. The students of low ability experienced greater success in the cooperative learning with individual accountability group. Socially, the process oriented individual accountability strategies did not effect the students' attitudes towards Mathematics to the same extent that the strategies promoted higher student achievement.

Limitations

1. The findings can not be generalized beyond the population of the tudy.

2. The results can not be generalized to other subjects or subject material.

3. The traditional group's results for the retention test could not be used due to the teacher teaching an hour review multiplication lesson the day before the retention test was given. The parents of the three groups, especially in the traditional group, spent time reviewing multiplication over the vacation break which, also, effected the retention test results.

4. It was difficult for the educators to develop a rapport with the students in such a short time. The educators were more comfortable

teaching their own group. Also, discipline was a concern in some cases.

5. Some of the Grade Three Students who participated in this study had difficulty understanding how to answer the negative statements on the survey. It was confusing for some of them. More practice responding to negative statements may have given more accurate results.

Implications for Further Research

The following recommendations are made based on the results of this study.

1. Further research is required to determine the impact of individual accountability strategies on different subject matter, such as Language Arts, Science, or Social Studies.

2. This study should be replicated using a larger sample of elementary students from different areas.

3. Replication of the study where the pre-test results are not statistically significant might reveal a significant difference between the cooperative learning with individual accountability and the cooperative learning without individual accountability on the post instructional tests.

4. The element of individual accountability could be studied at a higher grade level. The process oriented individual accountability strategies could be compared to the product oriented individual

accountability strategies to determine which strategies are the most effective at a higher grade level.

5. The survey could be extended to include a greater number of specific statements. Doing so might explain the different attitudes associated with the treatment conditions.

6. This study could be replicated with the addition of an element that would assess the growth made by the students of high ability.

7. A survey could be developed to be completed by the parents of the students involved in the study to evaluate the parental attitude changes.

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Appendix A
Teacher's Guide and Student Worksheets for Grade 3
Multiplication

The students will be introduced to the concept of multiplication by brainstorming items that come in groups of 2, 3, 4, 5, 6, and 12.

Multiplication Unit Grade three Pretest and survey for all groups

Traditional

Lesson 1
Multiplication
Brainstorm as a class all the things in real life that come in groups. Teacher records

Individual Accountability

Lesson 1
Multiplication: By passing the paper back and forth in pairs-- children will brain-storm all the things in real lifethat come in groups. Pairs share with the other pair and add to their list where necessary. Students are randomly asked to share lists. Groups can add to their lists in a different color.

Without Individual Accountability

Lesson 1
Multiplication: By passing the paper from one person to the next in the groupchildren will brainstorm all the things in real life that come in groups. One person in a group is as-signed the reporter role and that per-son shares the list with the class. Groups add to their lists in a different color.

Story Problems

Review of what multiplication is?

Students are in groups of three. Each group is given a piece of paper 11 X 17". The groups are told to brainstorm all the things that are in groups.
Do groups of two together.
eyes ears arms hands legs socks mitts gloves eyebrows nostrils lips

bicycle wheels, pedals of bicycles, twins, opposites, lenses, slices of bread in a sandwich

The students in groups divide their paper in sections and list things that fall in the different groups.

3	4	5	6
tricycles	square	quintuplet	six-pack
lights on	rectangle	fingers	spider legs
stop light	car wheels	toes	hexagon
tennis balls	bike with	pentagon	
triangle	training wheels	pennies	
name Ian	dog's legs	in a nickel	

Student A records   Student B checks   Student C gopher, reporter

Individual accountability -- any one in the group can be asked to explain the answer of another group or question another group.

Using this list generate a class list to be used to develop story problems.

Groups of

1	2	3
4	5	6

Using the brainstorming list, the students will make up a booklet that shows a pattern.

Traditional	Individual Accountability	Without Individual Accountability
Lesson 2	Lesson 2	Lesson 2
Each child makes a book that shows a repeating pattern. What are the next three numbers? As time permits children share their books with the class	Individual Assignment Each child makes a book that shows a repeating pattern. What are the next three numbers? Children share their books with their groups then in an inside/outside circle students share their book with the person in front of them and then students exchange booklets and share that student's booklet. Teacher randomly asks a person to share the booklet they have .	Individual Assignment Each child makes a book that shows a repeating pattern. What are the next three numbers? Children share their books with their groups then share in an inside/outside circle where people exchange booklets and share that booklet.

Plan for the Booklet

Page 1	Page 2
Page 3	Page 4

The students will be able to skip count by 2, 3, 4, and 5. The numbers will be laid out from 0 to 49.

Traditional	Individual Accountability	Without Individual Accountability
Lesson 3 Number lines One set of numbers Teacher asks certain children to come to the front to do the task while the others watch. Teacher says the following pattern, counting by 2's.The student jumps from one number to the next, while one student removes the cards that are not said. The class records where the student jumps.Students need to think of ways to record the jumps. Brainstorm with the class. The teacher continues with counting by 3's,4's, 5's, 6's to 30. The teacher asks: 6 jumps of 2, 7 jumps of 3, 8 jumps of 2, 3 jumps of 5, 4 jumps of 5 Students record .	Lesson 3 Number lines Each group has a set of numbers. Teacher directs and circulates. Teacher talk, groups work, students explain. Students are randomly asked to give answers. Jobs rotate. Jumper, counter, checker and recorder, cards. Teachers says to count by 2's While one person jumps the card person pulls out the cards that are not used. The recorder fills in the question. The checker makes sure everyone understands. Follow the format as shown on the sheet. The teacher continues with counting by 3's,4's, 5's, 6's to 30. The teacher asks: 6 jumps of 2, 7 jumps of 3, 8 jumps of 2, 3 jumps of 5, 4 jumps of 5 Students record Randomly asked to explain. Sign to show agreement.	Lesson 3 Number lines Each group has a set of numbers. Teacher directs and circulates. Teacher talk, groups work, students explain. Jobs rotate. Jumper, counter, checker and recorder, cards. Teachers says to count by 2's While one person jumps the card person pulls out the cards that are not used. The recorder fills in the question. The checker makes sure everyone understands. Follow the format as shown on the sheet.The teacher continues with counting by 3's,4's, 5's, 6's to 30. The teacher asks: 6 jumps of 2, 7 jumps of 3, 8 jumps of 2, 3 jumps of 5, 4 jumps of 5 Students record .

Checker

Checks to see that every-
one in the group
understands.

Do you understand?
How did you get that answer?
Do you need help?
Can you explain that?

Number line
Record jumps.

a. 0, 2, ______, 6, ______, 10, _______, 14, ________, ________, _______ . . .

b. 0, 3, ______, 9, _______, 15, _________, 21, _______, _______ . . . . .

c. 0, 4, 8, ______, 16, ______, _______ , ________. . .

d. 0, 5, ______, 15, ______, 25, ______, 30 , _______, 40, ______. . . .

Make up your own pattern.

The students will use the number line to skip count in order to make the necessary jumps. Students will make up their own skip counting questions.

Traditional

Lesson 4
Skip Counting
Review-- Give the example.
6 jumps of 3=18
7jumps of 2=14
What do these number lines say.?____ jumps of ____ = ______
Do the assignment.
Review the sheet with the class.
Each child makes up their own.
Come to the front and share it with the class.

Individual Accountability

Lesson 4
Skip Counting
Review- Give the example.
6 jumps of 3=18
7jumps of 2=14
What do these number lines say?____ jumps of ____ =___
Do the assignment.

Randomly explain.
Review the sheet with the group.
Make up a numberline. Do inside/outside circle. Exchanging.

Without Individual Accountability

Lesson 4
Skip Counting
Review-- Give the example.
6 jumps of 3=18
7jumps of 2=14
What do these number lines say.
____ jumps of ____ = ______
Do the assignment.
Review the sheet with the groups.Make up your own numberline .(inside/outside circle.)

Skip Counting

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
How many jumps? _____ How far is the jump? ______ Where do you land? _______

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
How many jumps? _____ How far is the jump? ______ Where do you land? _______

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
How many jumps? _____ How far is the jump? ______ Where do you land? _______

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
How many jumps? _____ How far is the jump? ______ Where do you land? _______

Make your own skip jumping patterns.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
How many jumps? _____ How far is the jump? ______ Where do you land? _______

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
How many jumps? _____ How far is the jump? ______ Where do you land? _______

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
How many jumps? _____ How far is the jump? ______ Where do you land? _______

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
How many jumps? _____ How far is the jump? ______ Where do you land? _______

The students will be able use a number line to figure out the answers to different parts of the questions.

Traditional	Individual Accountability	Without Individual Accountability
Lesson 5- Skip Counting	Lesson 5	Lesson 5
Teacher uses single set of numbers. Showing the students jumps on a numberline. Students look at the following questions together with the teacher.	Each group has a set of numbers. Jobs rotate. Jumper, counter, checker and recorder, cards. Students can use small numbers on their desks. Making a number line and working with the little numbers. Teacher directs and circulates. Teacher talk, groups work, students explain. Students are asked randomly to give answers.	Each group has a set of numbers. Jobs rotate. Jumper, counter, checker and recorder, cards. Students can use small numbers on their desks. Making a number line and working with the little numbers. Teacher directs and circulates. Teacher talk, groups work, students explain.
_____ jumps of 8 = 24 _____jumps of 6 = 12 _____jumps of 4 = 20 _____jumps of 2 = 10	_____ jumps of 8 = 24 _____jumps of 6 = 12 _____jumps of 4 = 20 _____jumps of 2 = 103.	_____ jumps of 8 = 24 _____jumps of 6 = 12 _____jumps of 4 = 20 _____jumps of 2 = 103.
How many jumps of 3 = 12 How many jumps of 2 = 10 How many jumps of 5 = 15 How many jumps of 6 = 18	How many jumps of 3 = 12 How many jumps of 2 = 10 How many jumps of 5 = 15 How many jumps of 6 = 18	How many jumps of 3 = 12 How many jumps of 2 = 10 How many jumps of 5 = 15 How many jumps of 6 = 18
3 jumps of ____ = 6 4jumps of _____ = 16 2 jumps of ____ = 18 5 jumps of ____ = 10	3 jumps of ____ = 6 4jumps of _____ = 16 2 jumps of ____ = 18 5 jumps of ____ = 10	3 jumps of ____ = 6 4jumps of _____ = 16 2 jumps of ____ = 18 5 jumps of ____ = 10
Students record the questions on the numberlines in their books.	Do the booklet individually.	Do the booklet individually.

Skip Counting

Use the number line to answer these questions.

Four jumps of 6 equals _____ Five jumps of 2 equals ______

Three jumps of 8 equals ______ Two jumps of 9 equals _____

Two jumps of _____ equal 10 Three jumps of ___ equal 27

Four jumps of _____ equals 8. Five jumps of _____ equals 20

How many jumps of 2 equal 18? _____ How many jumps of 3 equal 18?________

How many jumps of 4 equals 12 ?______ How many jumps of 5 equals 0? ______

Pick two and show the number line.

Skip Counting

Make up your own questions and fill in the others.

______ jumps of ______ equals 12 Three jumps of ______ equals 24

______ jumps of ______ equals 20 Two jumps of ____ equals 6

_____ jumps of _____ equals 16 Five jumps of _____ equals 5

_____ jumps of _____ equals 10 Six jumps of ______ equals 18.

Pick one and show it on a number line.

The students will practice skip counting by 2, 3, 4, and 5's using a game format.

Traditional

Lesson 6
Storyboards / Corners

Using the numbers each child get an equal amount. Start skip counting the child who has the card put it up on the ledge of the board.

Storyboard
The child who has the work or picture that fits comes to the front and places it in the correct place as the song is sung.

Individual Accountability

Lesson 6
Storyboards/ Corners

Students are divided into four groups. Four sets of numbers are used. Skip counting as the number is said it is placed in front of the group. At the end the groups check to see if their cards are in order. If they are the class receives a point. Randomly a student is chosen to check to see if the order was correct. Story board Each group receives a packet.The answers are color coded. The students are randomly given a color. They can only manipulate their color. The song is sung" This old man". Students place the correct item in the correct spot.

Without Individual Accountability

Lesson 6
Storyboards/ Corners

Students are divided into four groups. Four sets of numbers are used. Skip counting as the number is said it is placed in front of the group. At the end the groups check to see if their cards are in order. If they are the class receives a point. A student is chosen as the checker to check to see if the order was correct. Story board Each group receives a packet.The answers are divided equally. The song is sung" This old man". Students place the correct item in the correct spot.

Story board

Fill in the pattern.

0, 2, 4, 6, ____, ____, ____, ____, ____, ____, ____.

0 3, 6, 9, ____, ____, ____, ____, ____, ____, ____

0, 4, 8, 12, ____, ____, ____, ____, ____, ____, ____

0, 5, 10, 15, ____, ____, ____, ____, ____, ____, ____

Numberline
Make up some patterns.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

Pattern:

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

Pattern:

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

Pattern:

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

Pattern:

The student will be able to randomly pick a question out of a hat and will be able to answer it using the number line. Ex. 6 jumps of 3, 4 jumps of 2, 3 jumps of 8

Traditional	Individual Accountability	Without Individual Accountability
Lesson 7 Number Line Teacher directed Each student has a chance to pick a question out of the hat. They record their answers in their book. Share with the class.	Lesson 7 Number Line Individual Assignment Each student has a chance to pick a question out of the hat. They record their answers in their book. Share with groups. The students are randomly asked to share another question in the group.	Lesson 7 Number Line Individual Assignment Each student has a chance to pick a question out of the hat. They record their answers in their book. Share with groups. The students are asked to share.

Number line-- What is the pattern? Give the next three numbers.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
Pattern:

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Pattern

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

Pattern:

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

Pattern:

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 2
Pattern

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
Pattern

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
Pattern

The students will be introduced to repeated addition. Instead of using the words "jumps of" the words "groups of" will be substituted.

Traditional

Lesson 8

Using counters
Teacher will ask a student to show 3 groups of 5.
The teacher will introduce that this is the same as 5 + 5 + 5 = 3 X 5. Another student will be asked to show 7 groups of 2.
b. 8 groups of 3 = 8 X 3
c. 3 groups of 8 = 3 X 8
d. 2 groups of 5 = 2 X 5

Repeated addition is the same as multiplication. It is slower. Make the connection with skip counting.
Record in the notebook.
Teacher checks for understanding and monitors those who are having trouble.

Individual Accountability

Lesson 8

Using counters Teacher will ask the groups to show 3 groups of 5.
The teacher will introduce that this is the same as 5 + 5 + 5 = 3 X 5 = 15
Roles : manipulator, checker, recorder, timekeeper
Rotate roles.
a. 7 groups of 2 = 7 X 2 = 14
b. 8 groups of 3 = 8 X 3 = 24
c. 3 groups of 8 = 3 X 8 = 24
d. 2 groups of 5 = 2 X 5= 10

Repeated addition is the same as multiplication. It is slower.
Make the connection with skip counting.
Randomly asked to explain.
Sign to show agreement.

Without Individual Accountability

Lesson 8

Using counters Teacher will ask the group to show 3 groups of 5.
The teacher will introduce that this is the same as 5 + 5 + 5= 3 X 5 = 15. Roles : manipulator, checker, recorder, timekeeper
Rotate roles.
a. 7 groups of 2 = 7 X 2

b. 8 groups of 3 = 8 X 3
c. 3 groups of 8 = 3 X 8
d. 2 groups of 5 = 2 X 5
Repeated addition is the same as multiplication. It is slower.
Make the connection with skip counting.
Checker explains.

Multiplication is a fast way of doing repeated addition.

Repeated Addition

	___ groups of ___	Repeated Addition
1.		
2.		
3.		
4.		

Make up your own

Picture	_____ groups of ___	Repeated addition

The students will be able to use the different strategies to figure out a multiplication question: picture, repeated addition, number line.

Traditional	Individual Accountability	Without Individual Accountability
Lesson 9	Lesson 9	Lesson 9
Repeated Addition Teacher shows a picture on the board. One student comes to the front to write what the equation would look like in repeated addition and what it would look like on a number line. After several examples, the students do four questions showing repeated addition and the number line.	Repeated Addition Each group has four pictures. As a group make up the equations showing the picture, repeated addition, and the number line. Roles-- drawer, printer, number line, checker. Rotate for each question. Randomly explain. Sign for agreement	Repeated Addition Each group has four pictures. As a group make up the equations showing the drawer, repeated addition, and the number line. Roles-- picture, printer, number line, checker. Rotate for each question.

Repeated addition

Number line

Picture	Repeated addition	Numberline

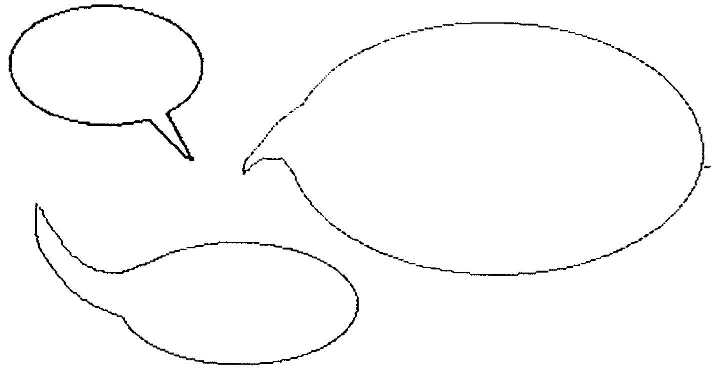
The students will be able to use all the strategies. By picking out one strategy the students will be able to fill in the rest of the strategies. For example, if the students picks out of the hat a repeated addition question, the student can draw a picture, show the number line, write the pattern for skip counting.

Traditional	Individual Accountability	Without Individual Accountability
Lesson 10	Lesson 10	Lesson 10
Bag of strategies Pick a slip out of the bag. Fill in the rest of the strategies that are missing. eg. If the student pulled out an array, they would make a number line, equation, groups of, and skip count pattern. Each child pulls out four pieces. Completes the sheet.	Bag of problems. As a group each student picks out four strategies. The papers are passed from one student to the next while each student fills in a part of the puzzle. Each student can be randomly asked to explain any question. Signatures verify agreement.	Bag of problems. As a group each student picks out four strategies. The papers are passed from one student to the next while each student fills in a part of the puzzle.
Do the 2nd sheet individually.	Individually do the second sheet.	Individually do the second sheet.

Fill in the parts of that are missing.

	Picture	Repeated Addition	Numberline	skip count	equation
1.					
2.					
3.					
4.					

5. Make your own leaving one strategy out. Exchange with your partner. Share with your group.



Make up your own multiplication fact.

Repeated addition ________+ ________+ __________

_____ groups of _____ = _______

_____ X ______ - ______

Show your equation on a number line.

Show your equation as a pattern.

________., __________, __________. . . . .

The students will be given 20 counters. The students will be able to make up different multiplication questions by grouping the counters into different arrays and recording them.

Traditional	Individual Accountability	Without Individual Accountability
Lesson 11	Lesson 11	Lesson 11
Individual Assignment Take atleast 12, but not more than 20 counters and make as many multiplication equations as you can. Draw your results in your book. Show the repeated addition equation and the multiplication equation. Share with the class. Teacher checks for understanding and monitors those who are having trouble..	**Individual Assignment** Take atleast 12, but not more than 20 counters and make as many multiplication equations as you can. Draw your results in your book. Show the repeated addition equation and the multiplication equation. Share with your group. Teacher checks for understanding and monitors those who are having trouble.	**Individual Assignment** Take atleast 12, but not more than 20 counters and make as many multiplication equations as your group can. Draw your results in your book. Show the repeated addition equation and the multiplication equation. Share with your group.Teacher checks for understanding and monitors those who are having trouble.

_____ counters-- Show how many combinations of repeated addition you can make. Draw the counters and print the equation.

The students will be introduced to arrays and equations.

Traditional

Lesson 12
Arrays
Organize the circles into easy to recognize patterns. Students come to the front one at a time to place circle in the proper position.
4 X 5
4 X 3

Look at a pattern and explain what the equation is.

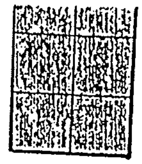
Give an equation for each of the arrays.
Make up your own array.

Individual Accountability

Lesson 12
Arrays
Organize the circles into easy to recognize patterns. Teacher shows how the items can be organized for easy identification. In groups the students make arrays for:
4 X 5
Roles: Each child has five circles. Each child takes turns putting on circles.
Randomly students are asked to explain. Checker, printer, encourager, timekeeper
2. 4 X 3
.In booklet show the following equations.
Give an equation for each of the arrays.
Make up your own array.
Share the number of circles needed among the group members.
Sign to show agreement.

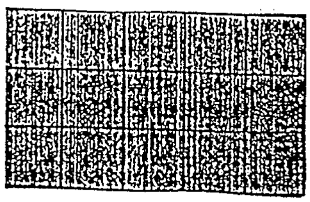
Without Individual Accountability

Lesson 12
Arrays
Organize the circles into easy to recognize patterns. Teacher shows how the items can be organized for easy identification. In groups the students make arrays for:
4 X 5
Roles: Each child has five circles. Each child takes turns putting on circles.
Checker, printer, encourager, timekeeper
Checker explains.
2. 4 X 3
.In booklet show the following equations.
Give an equation for each of the arrays.
Make up your own array.



Arrays

2.



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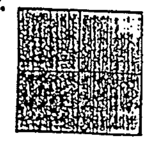

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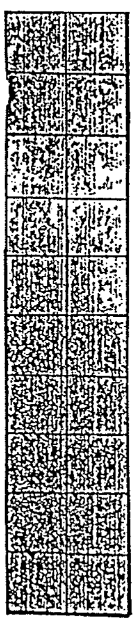

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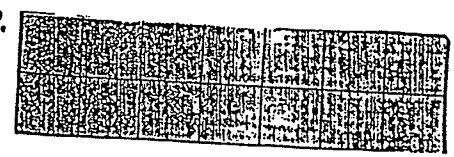

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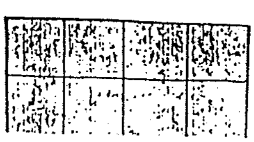

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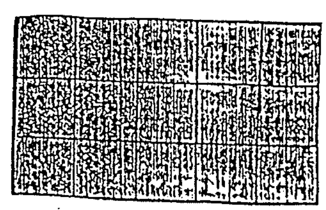
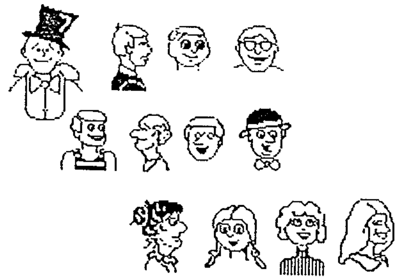




MULTIPLICATION

Look at the picture.

How many groups?_____
How many in each group? _____
How many altogether? ____

Repeated addition:

Multiplication: ______ groups of ____ = _____

Explain another way of grouping the people?

Arrays

Make a multiplication sentence for each array.

X X X X X

X X X X X

How many groups? ______

How many in each? _______

Multiplication sentence: _______ X _______ = ________

X X X X

X X X X

MULTIPLICATION SENTENCE:

____

X X X X

X X X X

MULTIPLICATION SENTENCE:

____

MAKE UP 2 MULTIPLICATION SENTENCES FOR THIS ARRAY.

X X X X X

X X X X X

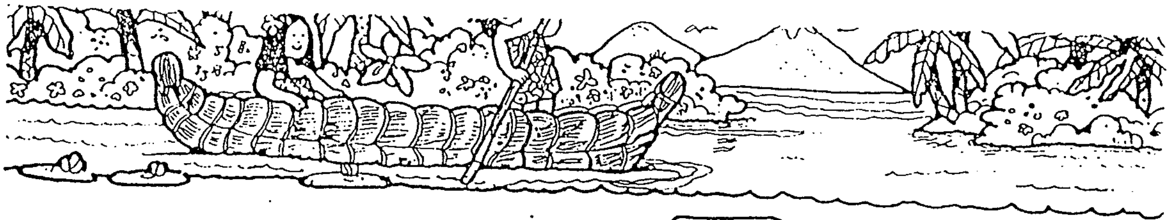
X X X X X

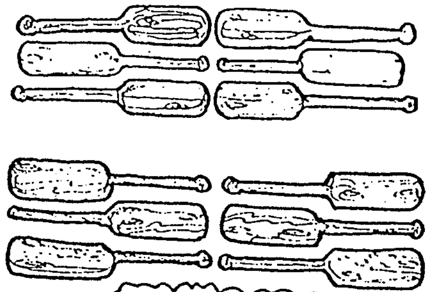
____

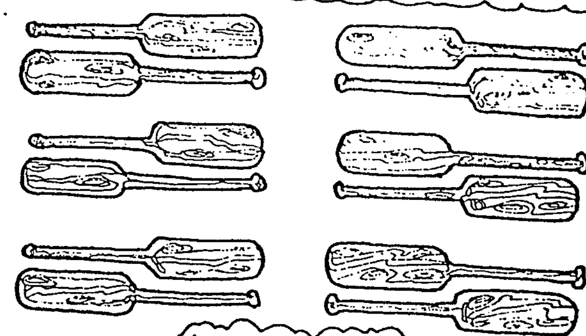
____

The students will be able to see that an array can be read in two different ways by looking at it sideways.

Traditional	Individual Accountability	Without Individual Accountability
Lesson 13 Do the review sheet. Commutative Property Look at the arrays that were done in the last lesson. See when you turn the paper it shows another equation, but the same number of circles are present. What is the difference? For each array there are two answers. Examine two more examples. 5X4, 3 X 2 Then make up two equations for each array that is shown. Make up two arrays of your own. Share these with the class to see if they can figure out the two equations.	Lesson 13 Do the review sheet individually. Commutative Property Look at the arrays that were done in the last lesson.See when you turn the paper it shows another equation, but the same number of circles are present. What is the difference? For each array there are two answers. Examine two more examples. 5X4, 3 X 2 In pairs a. make up two equations for each array that is shown. b. Make up two arrays. Share these with the other pair to see if they can figure out the two equations. Sign to show agreement. Randomly asked to explain.	Lesson 13 Do the review sheet individually .Commutative Property Look at the arrays that were done in the last lesson. See when you turn the paper it shows another equation, but the same number of circles are present. What is the difference? For each array there are two answers. Examine two more examples.5 X 4, 3 X 2 In pairs a. make up two equations for each array that is shown. b. Make up two arrays. Share these with the other pair to see if they can figure out the two equations.Checker will explain the arrays.





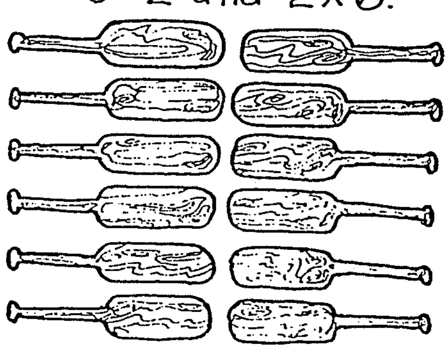


2 sets of 6
$2 \times 6 = 12$

6 sets of 2
$6 \times 2 = 12$

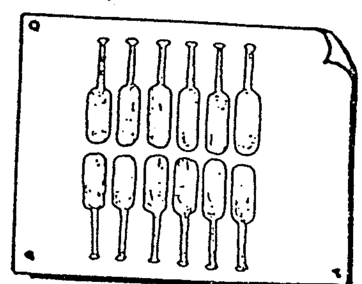
$$2 \times 6 = 6 \times 2$$

Here is another picture of 6×2 and 2×6.



6 Rows
2 Columns
$6 \times 2 = 12$

If you turn the page you see



2 Rows
6 Columns
$2 \times 6 = 12$

$2 \times 6 = 12$
$6 \times 2 = 12$

$$2 \times 6 = 6 \times 2$$

MULTIPLICATION REVIEW

6 + 6 + 6 = ____ IS THE SAME AS ____ GROUPS OF _____ = _______

3 + 3 + 3 = ____ IS THE SAME AS ____ GROUPS OF _____ = _______

5 + 5 + 5 + 5 = ____ IS THE SAME AS ____ GROUPS OF _____ = _______

2 + 2 +2 + 2 + 2 = ___ IS THE SAME AS ____ GROUPS OF ____ = _______

_____+ _____ + ______ + _____ = _______

XXX XXX XXX

XXX

______GROUPS OF ______ = ________

_____ X ______ = ______

_____ + ______ + _____ = _______

XXXXX

XXXXX

_____ GROUPS OF ______ = ______

XXXXX

_____ X ______ = ________

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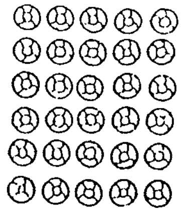

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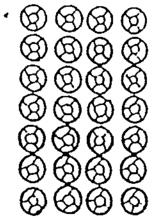

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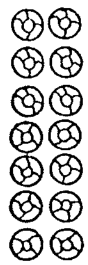

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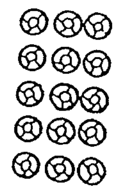

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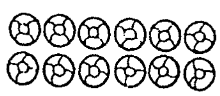

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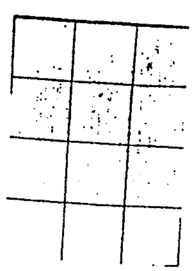

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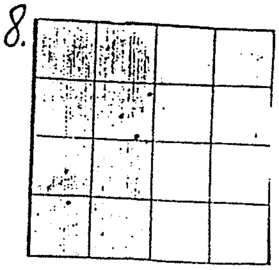
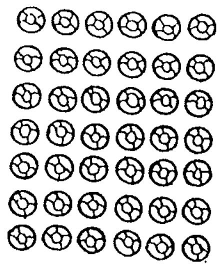
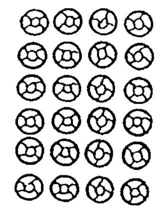
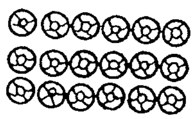
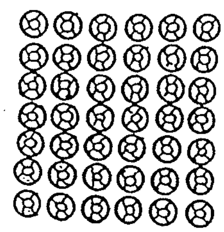
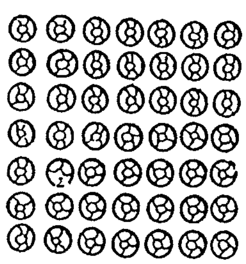


1. 

2. 

3. 

4. 

5. 

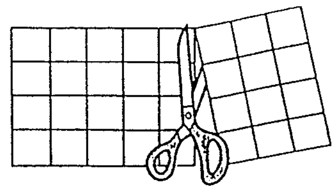
6. 

The students will be introduced to the distributive property. The students will understand that the number of groups can be organized in various combinations but the product is always the same.

Traditional	Individual Accountability	Without Individual Accountability
Lesson 14 Do the review sheet. Distributive Property Show 7 X 3 then cut it.If you know the answer raise your hand. 7 threes equals 4 threes and ___ threes 7 threes equals 5 threes and ____ threes 7 threes equals 7 threes and ___ threes By making different cuts in your arrays you can make up different combinations. Try 8 fours One at a time students come up to show where one can cut it and make up different combinations. Assignment: Show 8 sixes. List the combinations.	Lesson 14 Do the review sheet individually. Distributive Property Show 7X3 then cut it. In groups try to answer these questions. 7 threes equals 4 threes and ___ threes 7 threes equals 5 threes and ____ threes 7 threes equals 7 threes and ___ threes By making different cuts in your arrays you can make up different combinations. Try 8 fours. In groups list the different cuts that can be made with 8 X 6.	Lesson 14 Do the review sheet individually. Distributive Property Show 7X3 then cut it. In groups try to answer these questions. 7 threes equals 4 threes and ___ threes 7 threes equals 5 threes and ____ threes 7 threes equals 7 threes and ___ threes By making different cuts in your arrays you can make up different combinations. Try 8 fours In groups list the different cuts that can be made with 8 X 6.

Cut three 8 by 4 rectangles from graph paper. Color each one a different color.

One way to think about these fours is shown by this cut.

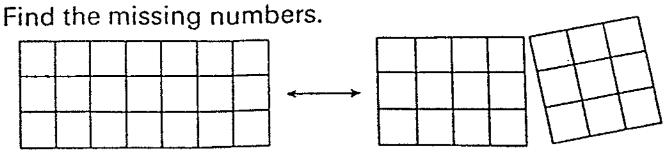


fours and fours

? Can you make different cuts in your rectangles to show other ways to think about 8 fours?	Record your results as shown above.

Discussing the Ideas

1. To help you understand the multiplication-addition principle, think of "breaking apart" a factor before you multiply. Find the missing numbers.

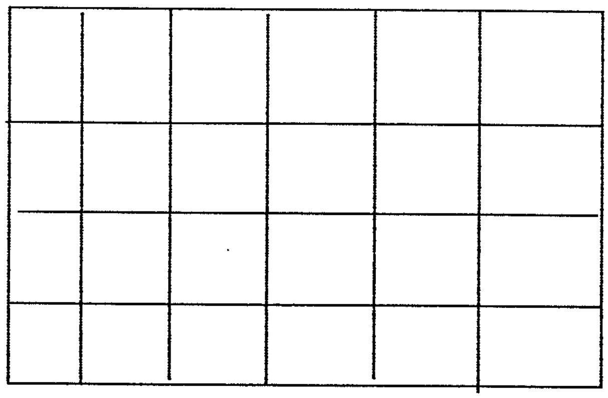


threes ⟷ threes and threes

(× 3) equals (× 3) + (× 3)

2. These are other examples of the multiplication-addition principle. Give the missing numbers.
   - A 8 fives equals 6 fives and __?__ fives.
   - B 6 eights equals __?__ eights and 2 eights.
   - C 7 sixes equals 5 sixes and __?__ sixes.

Distributive Property



7 X 4 equals ____ X 4 + ____ X 4 7 X 4 equals ____ X 4 + ____ X 4

7 X 4 equals ____ X 4 + ____ X 4 7 X 4 equals ____ X 4 + ____ X 4

Show 8 X 6

Draw an array and show the different combinations.

Show 8 X 2

The students will be given more practice with the distributive property.

Traditional	Individual Accountability	Without Individual Accountability
Lesson 15	Lesson 15	Lesson 15
Distributive Property As a class, one student at a time coming to the board to do the task. Show 7 X 4 a. Make the array b. Show the different cuts using different colours. c. Record the different cuts Show 6 X 2 8 X3 Do the same assign-ment. As a second strategy use circles to show five groups of 2 is the same as: 1 group of 2 + 4 groups of 2 2 groups of 2 + 3 groups of 2	Distributive Property In the group: roles: checker, time keeper, manipulator, printer. Show 7 X 4 a. Make the array b. Show the different cuts using different colours. c. Record the different cuts Randomly asked to check. Sign if you agree. Show 6 X 2 8 X 3 Do the same assign-ment. As a second strategy use circles to show five groups of 2 is the same as: 1 group of 2 + 4 groups of 2 2 groups of 2 + 3 groups of 2	Distributive Property In the group: roles: checker, time keeper, manipulator, printer. Show7 X 4 a. Make the array b. Show the different cuts using different colours. c. Record the differ-ent cuts Checker explains. Show 6 X 2 8 X 3 Do the same assign-ment. As a second strategy use circles to show five groups of 2 is the same as: 1 group of 2 + 4 groups of 2 2 groups of 2 + 3 groups of 2

Distributive Property

6 X 2

Draw the array and show the different combinations.

8 X 3

9 X 4

Distributive Property

1. 8 X 3 = ____ X 3 + 3 X 3
2. 6 X 2 = ____ X 2 + 4 X 2
3. 9 X 4 = ____ X 4 + 3 X 4
4. 2 X 2 = ____ X 2 + 1 X 2
5. 5 X 6 = ____ X 6 + 2 X 6
6. 8 X 4 = ____ X 4 + ____ X 4
7. 7 X 3 = ____ X 3 + ____ X 3
8. 3 X 7 = 1 X 7 + ____ X 7
9. 6 X 4 = 2 X 4 + ____ X 4
10. 8 X 5 = 2 X 5 + ____ X 5
11. 5 X 3 = 2 X 3 + ____ X 3
12. 7 X 2 = 5 X 2 + ____ X 2
13. 8 X 6 = 6 X 6 + ____ X 6
14. 4 X 4 = 2 X 4 + ____ X 4
15. 7 X 1 = 3 X 1 + ____ X 1

The students will work with several story problems. The strategy of drawing a picture and writing the equation will be shown to the students.

Traditional

Lesson 16

Story Problems

Pick a story problem from the first page.
Teacher:
a. Choose a student to read it.
b.Choose a student to make the array.
c. Choose a student to come to the board to write the equation.
d. Choose a student to give the answer.
Do another question.
Students do the sheet dealing with story problems.

Individual Accountability

Lesson 16

Story Problems
Each student picks a problem from the first page. Draws an array and writes an equation. Share with your group. Students will sign the paper if they agree with the answer. Randomly the teacher will ask students to explain their problems. (Numbered heads)

The group has four story problems.
Role - printer, manipulator, checker, reader. Roles rotate for each question.
As the teacher monitors the room, she asks a student to explain the answers.
Students sign if they agree with the answers.

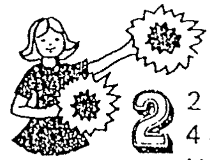
Without Individual Accountability

Lesson 16
Story Problems
One student will be identified as the checker who will do all the explaining.
Each student picks a problem from the first page. Draws an array and writes an equation.
Share with your group.
The teacher will ask students to explain their problems.

The group has four story problems.
Role - printer, manipulator, checker, reader. Roles rotate for each question.
As the teacher monitors the room, she asks a student to explain the answers.
Students sign if they agree with the answers.

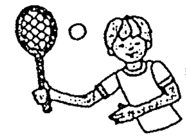
Short Sport Stories

1 2 hockey teams.
6 players on each team.
How many players?



2 2 basketball teams.
4 cheerleaders for each team.
How many cheerleaders?

3 Baseball game.
6 outs each inning.
9 innings.
How many outs?



4 Red Sox.
3 outs each inning.
9 innings.
How many outs?

5 Hockey game.
3 periods.
8 penalties each period.
How many penalties?

6 Tennis.
9 courts.
4 players on each court.
How many players?

7 Bowling. 8 balls in each rack. 7 racks. How many bowling balls?

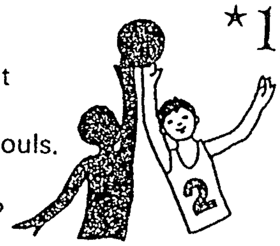
8 Baseball. 3 strikes, you're out.
8 strikeouts. How many strikes?

9 Football game.
6 points for a touchdown.
5 touchdowns.
How many points?

10 Football game.
6 points for a touchdown.
7 touchdowns.
How many points?

11 Softball. 9 players on each team.
7 teams. How many players?

12 Basketball.
5 fouls, you're out of the game.
4 players out on fouls.
How many fouls for these players?



★13 Football.
6 points for a touchdown.
Bulldogs scored 8 touchdowns and 4 extra points.
What was their score?

Story Problems

Draw a picture

1. 5 cents per apple.
   4 apples
   How much money?

2. 6 cars
   4 in each
   How many people?

3. 2 teams
   7 people on a team
   How many people?

4. 4 legs
   6 dogs
   How many legs.

Make up your own problem.

The students will continue to work with different story problems by expressing the problem in a sentence, an array, number line, and repeated addition.

Traditional

Lesson 17

Story Problems
Mini test is given to students. Reviewed by the teacher with the whole class after completion.Teacher monitors students who are doing poorly.

Make up a story problem.
Teacher:
a. Choose a student to give a problem.
b.Choose a student to make the array.
c. Choose a student to come to the board to write the equation.
d. Choose a student to give the answer.
Do another question.
Students make up three problems.

Lesson 18
Review Sheets

Individual Accountability
Lesson 17
Story Problems
Mini test is given to students.
Reviewed by the group members after completion.
Teacher corrects with the class.
Teacher monitors students who are doing poorly.

The group makes up four story problems.
Role - printer, manipulator, checker, reader. Roles rotate for each question.
As the teacher monitors the room, she asks a student to explain the answers.
Students sign if they agree with the answers.
Groups exchange with other groups and do the questions
The two groups get together and discuss how they did the questions.

Lesson 18
Review Sheets

Without Individual Accountability
Lesson 17
Story Problems
Mini test is given to students.
Reviewed by the group members after completion.
Teacher corrects with the class. Teacher monitors students who are doing poorly.

The group makes up four story problems.
Role - printer, manipulator, checker, reader. Roles rotate for each question.
As the teacher monitors the room, she asks the checker to explain the answers.
Groups exchange with other groups and do the question. The two groups get together and discuss how they did the questions.
Do another question.

Lesson 18
Review Sheets

Story Problems

1. 5 sets
   3 dots
   How many dots?

2. 4 pairs of shoes
   2 shoes in each pair
   How many shoes?

3. 5 words
   3 letters in each word
   How many letters?

4. 3 ants
   each ant has 6 legs
   How many legs?

5. 4 sets
   3 dots in each set
   How many dots?

6. 5 nickels
   5 pennies in a nickel
   How many pennies?

7. 8 boxes
   5 crayons in a box
   How many crayons?

8. 3 ducks
   each duck has 2 legs
   How many ducks?

DRAW A DIAGRAM

You are very sick. Your mother takes you to the doctor The doctor tells your mother to give you two vitamin pills every day for a week. How many pills will you take?

What could you do this problem ?
a. count
b. use repeated addition
c. multiply
d. draw a diagram

Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
___	_____	_____	_____	_____	_____	_____

How many groups?
How many in each?
Total number of pills______

____ + ____ + ____ + _____ + _____ + _____ + ____=______

_____ X _____ = ______

Draw a Diagram

1. You have five children in your family. Each child needs a pair of indoor runners and a pair of outdoor runners. How many pairs of shoes do your parents need to buy?

2. You and your three friends love Coke Classic. For three days in a row each of you drank two cokes a day. How many cans of coke did you buy?

What lake is very frightening?

2	4	6	8	10	12	14	16	18	20	22

$5 \times 2 =$ ____ E

$7 \times 2 =$ ____ E

$3 \times 2 =$ ____ A

$2 \times 4 =$ ____ K

$4 \times 1 =$ ____ L

$8 \times 2 =$ ____ R

$6 \times 3 =$ ____ I

$10 \times 2 =$ ____ E

What food represents dirt and goblins?

2	4	6	8	10	12	14	16	18	20

$2 \times 7 =$ ____ C

$9 \times 2 =$ ____ E

$10 \times 2 =$ ____ S

$1 \times 2 =$ ____ S

$2 \times 8 =$ ____ H

$2 \times 4 =$ ____ D

$6 \times 2 =$ ____ I

$4 \times 1 =$ ____ A

$1 \times 6 =$ ____ N

$5 \times 2 =$ ____ W

What tree is like an old joke?

1	2	3	4	5	6	7	8	9	10	11	12	13	14

$1 \times 3 =$ ____ H

$2 \times 2 =$ ____ E

$4 \times 2 =$ ____ E

$1 \times 11 =$ ____ N

$2 \times 1 =$ ____ T

$2 \times 5 =$ ____ T

$3 \times 3 =$ ____ S

$7 \times 1 =$ ____ H

$2 \times 3 =$ ____ C

$13 \times 1 =$ ____ T

$3 \times 4 =$ ____ U

Checking out my Social Skills

a. Place a check beside the statements which you feel apply to you.

___ I said things which made my partners feel good about themselves.

___ I made an effort to listen to everyone's ideas.

___ I helped tidy up.

___ I made sure my voice didn't get too loud.

___ I helped group members when they needed it.

___ I politely told people to keep working.

What could your group work on next time to work together better?

Group Processing

Name two things your group did well in working together. Name one thing your group could do even better.

1.__________________________________

2.

____

One thing to work on is:

____

1. We encouraged the people in our group:
   a. all of the time
   b. most of the time
   c. some of the time
   d. never

2. We thought the people in our group listened to each
   other:
   a. all of the time
   b. most of the time
   c. some of the time
   d. never

3. The people in our group helpoed one another:
   a. all of the time
   b. most of the time
   c. some of the time
   d. never

All members Sign here:

____

____

Appendix B
Achievement Tests - Pre-Test

Multiplication Pre - Test

Name ____________________
Date ____________________

1. Fill in the pattern.

   0 , 2, ____, 6, 8, ______, 12 , 14, _____, . . .

   0, 3, 6 , _____, 12, _____, 18, _____ . . .

   0, 4, 8 , ____, _____, _____, 24, . . .

2. What pattern is shown by the numberline? What are the next three numbers?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

Pattern : ____, ____, ____, _____, _____, ______. . .

The next three numbers are _____, _____, _____

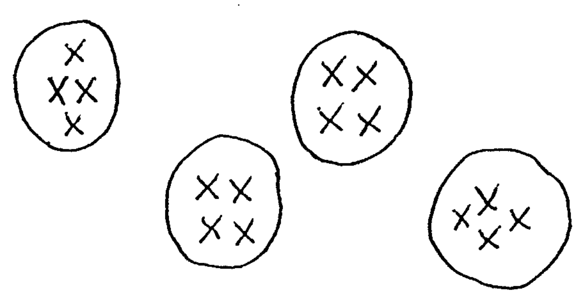
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

What is the equation that shown on this numberline? ____________________

8 jumps of 3 = _______ ____jumps of 4 = 20

How many jumps of 2 = 18 ______

3. Look at the picture. Fill in the blanks.



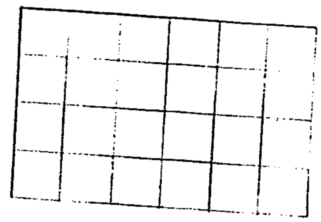
_____ + _____ + _____ + _____ = _____

_____ groups of ____ = ______

____ X _____ = _____

4. You have 12 counters. Make up 4 multiplication equations.

5. Give 2 equations for each array.



6. Fill in the blanks.

8 X 3 = (____ X 3) + (3 X 3)

6 X 5 = (2 X 5) + (____ X 5)

7. Draw a diagram.

7 players on a team
4 teams
How many players?

6 cars
7 people in a car
How many people?

Solve:

8 X 5 = ____

6 X 4 = _____

7 X 3 = ____

Appendix C
Achievement Test - Post-Test

Multiplication Post - Test

Name____________________
Date ____________________

1. Fill in the pattern.
   0 , 2, 4, 6, 8, _____, 12 , 14, _____, _____. . .

   0, 3, 6 , 9, 12, _____, _____, 21 . . .

   0, 4, 8 ,12, _____, _____, _____, . . .

2. What pattern is shown by the numberline? What are the next three numbers?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

Pattern : ____,____,____,_____,_____,______. . .
The next three numbers are _____,_____,_____

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

What is the equation that shown on this numberline? ________________

3 jumps of 8 = ______ ____jumps of 5 = 20

How many jumps of 2 = 16 _____

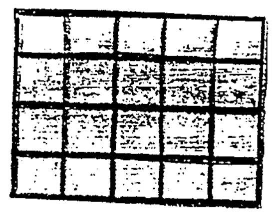
3. Look at the picture. Fill in the blanks.
_____ + _____ + _____ + _____ = _____

_____ groups of ___ = _____

___ X ____ = ____

4. You have 20 counters. Make up 4 multiplication equations.

5. Give 2 equations for each array.



6. Fill in the blanks.

6 X 3 = (____ X 3) + (3 X 3)

8 X 5 = (2 X 5) + (___ X 5)

7. Draw a diagram.

7 cows
4 legs
How many cows?

6 sets
7 dots in each set
How many dots?

Solve:

8 X 5 = ____

6 X 4 = ______

7 X 3 = ____

Multiplication Retention-Test

Name___________________

Date ___________________

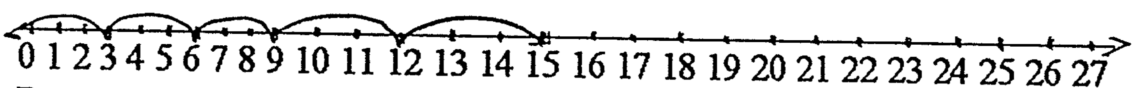
1. Fill in the pattern.

0 , 2, ____, 6, 8, ______, 12 , 14, _____, . . .

0, 3, 6 , _____, 12, _____, 18, _____ . . .

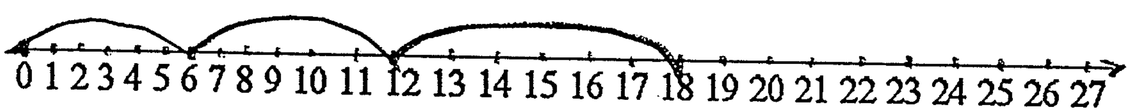
0, 4, 8 , ____, _____, _____, 24, . . .

2. What pattern is shown by the numberline? What are the next three numbers?



Pattern : ____,____,____,_____,_____,______. . .

The next three numbers are _____,_____,_____



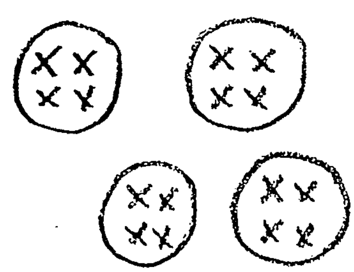
What is the equation that shown on this numberline? ________________

8 jumps of 3 = ______

____jumps of 4 = 20

How many jumps of 2 = 18 _____

3. Look at the picture. Fill in the blanks.



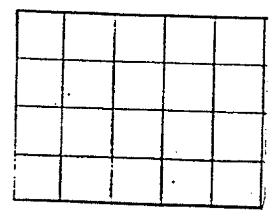
____ + ____ + ____ + ____ = ____

____ groups of ___ = _____

___ X ____ = ____

4. You have 12 counters. Make up 4 multiplication equations.

5. Give 2 equations for each array.



6. Fill in the blanks.

8 X 3 = (____ X 3) + (3 X 3)   6 X 5 = (2 X 5) + (___ X 5)

7. Draw a diagram.

7 players on a team
4 teams
How many players?

6 cars
7 people in a car
How many people?

Solve:

8 X 5 = ____   6 X 4 = _____   7 X 3 = ____

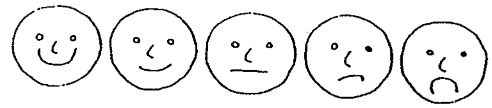
Raw Test Scores Data Sheet
Grade Three Multiplication

Name	Section	Pre-test	Post-test	Retention Test

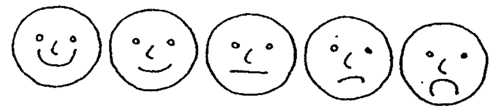
Appendix E
The Survey

Grade Three Survey

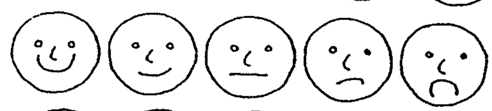
1. Many students in my class help me when I need it.



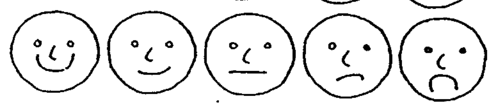
2. Math is doing the same thing over and over again.



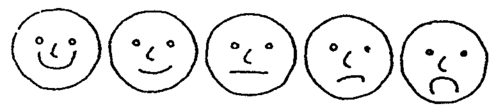
3. I like school.



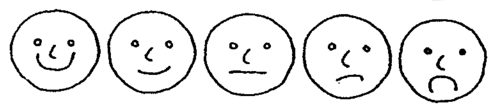
4. It is important to know how to do Math.



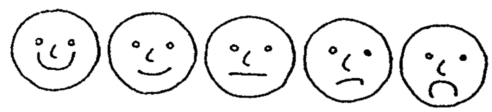
5. It is okay to make mistakes at school.



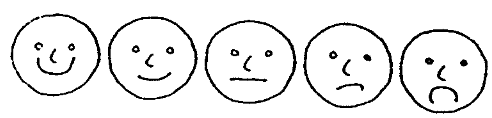
6. I often feel left out of things.



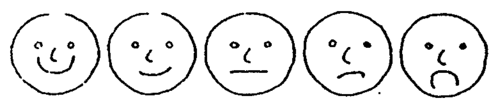
7. Math is easy.



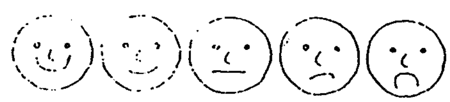
8. Without Math, school would be more fun.



9. My teacher is the only person in my class who can help me with my work.



10. Math is hard to understand.



Appendix F
RESULTS OF THE ANOVA FOR THE PRE-TESTS

Analysis of Variance for the Multiplication Pre-test Results of the Cooperative Learning Groups and Traditional Grouping

One Factor ANOVA X_1 : group Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.528	.528	.041
Within groups	69	891.782	12.924	p = .8404
Total	70	892.31		

Model II estimate of between component variance = -.408

Analysis of Variance for the Pre-test Achievement by Treatment Groups

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	51.991	25.996	2.104
Within groups	68	840.318	12.358	p = .1299
Total	70	892.31		

Model II estimate of between component variance = .578

Analysis of Variance for Pre-test Results for the Cooperative Learning with Individual Accountability and the Traditional Grouping

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	15.769	15.769	1.44
Within groups	46	503.71	10.95	p = .2363
Total	47	519.479		

Model II estimate of between component variance = .202

Analysis of Variance for Pre-test Results for the Cooperative Learning with Individual Accountability and the Cooperative Learning Without Individual Accountability Groupings.

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	51.464	51.464	4.139
Within groups	47	584.455	12.435	p = .0476
Total	48	635.918		

Model II estimate of between component variance = 1.599

Analysis of Variance for Pre-test Between Achievement Tests by Treatment Groups: Traditional and Without Individual Accountability

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	9.172	9.172	.666
Within groups	43	592.472	13.778	p = .4191
Total	44	601.644		

Model II estimate of between component variance = -.205

Analysis of Variance of the pre-test achievement results by treatment group and by ability

Anova table for a 2-factor Analysis of Variance on Y_1 : pre-test

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
treatment (A)	2	58.613	29.307	6.05	.0039
group-ability (B)	1	519.388	519.388	107.215	.0001
AB	2	5.2	2.6	.537	.5873
Error	65	314.883	4.844		

There were no missing cells found.

Analysis of Variance for the Pre-test by Treatment Group and high ability

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	45.167	22.584	3.889
Within groups	32	185.804	5.806	p = .0308
Total	34	230.971		

Model II estimate of between component variance = 1.443

Analysis of Variance for the Pre-test Results for the High Ability Group and the Cooperative Learning with Individual Accountability and the Traditional Group

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	7.366	7.366	1.315
Within groups	22	123.259	5.603	p = .2639
Total	23	130.625		

Model II estimate of between component variance = .148

Analysis of Variance of the Pre-test Results by the High Ability Group and the Cooperative Learning With Individual Accountability and Cooperative Learning without Individual Accountability

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	45.003	45.003	8.009
Within groups	22	123.622	5.619	p = .0097
Total	23	168.625		

Model II estimate of between component variance = 3.305

Analysis of Variance of the Pre-test Results by the High Ability Group and the Cooperative Learning Without Individual Accountability and the Traditional Grouping

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	14.727	14.727	2.362
Within groups	20	124.727	6.236	p = .14
Total	21	139.455		

Model II estimate of between component variance = .772

Analysis of Variance between Achievement Tests by Treatment Group and low ability

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	17.81	8.905	2.277
Within groups	33	129.079	3.911	p = .1185
Total	35	146.889		

Model II estimate of between component variance = .417

Analysis of Variance Between Achievement Tests by low ability and Cooperative Learning with Individual Accountability and Cooperative Learning Without Individual Accountability

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	16.543	16.543	5.219
Within groups	23	72.897	3.169	p = .0319
Total	24	89.44		

Model II estimate of between component variance = 1.072

Analysis of Variance Between Achievement Tests by low ability and the Cooperative Learning with Individual Accountability and the Traditional

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	8.421	8.421	2.457
Within groups	22	75.413	3.428	p = .1313
Total	23	83.833		

Model II estimate of between component variance = .419

Analysis of Variance Between Pre-test Achievement Tests by low ability and the Cooperative Learning Without Individual Accountability and the Traditional

One Factor ANOVA X_1 : treatment Y_1 : pre-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.727	.727	.133
Within groups	20	109.091	5.455	p = .7188
Total	21	109.818		

Model II estimate of between component variance = -.43

APPENDIX G
RESULTS OF THE ANOVA FOR THE POST-TESTS

Analysis of Variance for Post-test achievement results between the Cooperative Learning Groups and the Traditional Group

One Factor ANOVA X_1 : group Y_2 : post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	73.325	73.325	4.056
Within groups	69	1247.407	18.078	p = .0479
Total	70	1320.732		

Model II estimate of between component variance = 1.819

Analysis of Variance Post -Test Results for Achievement Among Treatment Groups

One Factor ANOVA X_1 : treatment Y_2 : post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	95.386	47.693	2.647
Within groups	68	1225.347	18.02	p = .0782
Total	70	1320.732		

Model II estimate of between component variance = 1.257

Analysis of Variance of the Post-test between the Cooperative Learning with Individual Accountability and the Traditional Group

One Factor ANOVA X_1 : treatment Y_1 : post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	95.35	95.35	4.457
Within groups	46	984.129	21.394	p = .0402
Total	47	1079.479		

Model II estimate of between component variance = 3.103

Analysis of Variance for the Post-test Results between the Cooperative learning without Individual Accountability and the Traditional Grouping

One Factor ANOVA X_1 : treatment Y_2: post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	24.769	24.769	1.103
Within groups	43	965.808	22.461	p = .2995
Total	44	990.578		

Model II estimate of between component variance = .103

Analysis of Variance for the Post-test Results between the Cooperative Learning with Individual Accountability and the Cooperative Learning without Individual Accountability

One Factor ANOVA X_1 : treatment Y_2 : post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	22.06	22.06	2.071
Within groups	47	500.756	10.654	p = .1568
Total	48	522.816		

Model II estimate of between component variance = .467

Analysis of Variance for The Post-test Results by Treatment Group and Ability

Anova table for a 2-factor Analysis of Variance on Y_2: post-test

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
treatment (A)	2	95.362	47.681	3.358	.0409
group-ability (B)	1	277.054	277.054	19.511	.0001
AB	2	36.485	18.243	1.285	.2837
Error	65	923.002	14.2		

There were no missing cells found.

Analysis of Variance of Post-test Results for Students of High Ability Among Treatment Groups

One Factor ANOVA X_1 : treatment Y_2 : post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	7.69	3.845	.732
Within groups	32	168.196	5.256	p = .4891
Total	34	175.886		

Model II estimate of between component variance = -.121

Analysis of Variance of the Post-test Results by the High Ability Group and the Cooperative Learning With Individual Accountability and the Traditional Grouping

One Factor ANOVA X_1 : treatment Y_2 : post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	7.274	7.274	1.447
Within groups	22	110.559	5.025	p = .2417
Total	23	117.833		

Model II estimate of between component variance = .189

Analysis of Variance of the Post-test Results by the High Ability Group and the Cooperative Learning With Individual Accountability and Cooperative Learning without Individual Accountability

One Factor ANOVA X_1 : treatment Y_1 : post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	3.274	3.274	.702
Within groups	22	102.559	4.662	p = .411
Total	23	105.833		

Model II estimate of between component variance = -.116

Analysis of Variance of the Post-test Results by the High Ability Group and the Cooperative Learning Without Individual Accountability and the Traditional Grouping

One Factor ANOVA X_1 : treatment Y_2: post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.727	.727	.118
Within groups	20	123.273	6.164	p = .7348
Total	21	124		

Model II estimate of between component variance = -.494

Analysis of Variance for the Post-test Results among the Treatment groups for students of Low Ability

One Factor ANOVA X_1 : treatment Y_1 : post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	124.166	62.083	2.714
Within groups	33	754.807	22.873	p = .081
Total	35	878.972		

Model II estimate of between component variance = 3.275

Analysis of Variance for the Post-Test Results of the Students of Low ability between the Cooperative Learning With Individual Accountability and the Traditional Group

One Factor ANOVA X_1 : treatment Y_2: post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	123.485	123.485	4.231
Within groups	22	642.14	29.188	p = .0517
Total	23	765.625		

Model II estimate of between component variance = 7.913

Analysis of Variance for the Post-test Results for Students of Low Ability by Cooperative Learning with Individual Accountability and the Cooperative Learning without Individual Accountability

One Factor ANOVA X_1 : treatment Y_2 : post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	20.103	20.103	1.606
Within groups	23	287.897	12.517	p = .2177
Total	24	308		

Model II estimate of between component variance = .608

Analysis of Variance for the Post-test for the Students of Low Ability for the Cooperative Learning Without Individual Accountability and the Traditional Group

One Factor ANOVA X_1 : treatment Y_1 : post-test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	43.642	43.642	1.581
Within groups	21	579.576	27.599	p = .2224
Total	22	623.217		

Model II estimate of between component variance = 1.398

Post-test Achievement Results for the Students of High Ability

Table G -1
Results of the ANOVA of the Multiplication Post-test Results by Treatment Group and high ability

Measures	DF	F	P
Overall	2,66	1.285	.2837
High	2,32	.732	.4891
Ind vs Without	1,22	1.447	.2417
Ind. vs Traditional	1,22	.702	.4110
Without vs Trad.	1,20	.118	.7348

Means and Standard Deviations of the Post-test Achievement Test for the Overall Group and the High Ability

Treatment Group	N	M	SD
Individual Accountability	26	21.692	3.222
High Group	13	22.923	1.935
Without Ind. Accountability	23	20.348	3.311
High Group	11	22.182	2.400
Traditional	22	18.864	5.874
High Group	11	21.818	2.562

APPENDIX H
RESULTS OF THE ANOVA FOR THE RETENTION TESTS

Analysis of Variance for the Retention Test between the Cooperative Learning Group and the Traditional Group

One Factor ANOVA X_1 : group Y_1 : Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	1.035	1.035	.052
Within groups	68	1365.837	20.086	p = .8211
Total	69	1366.871		

Model II estimate of between component variance = -.648

Analysis of Variance for the Retention Test Among Treatment Groups

One Factor ANOVA X_1 : treatment Y_1 : Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	4.774	2.387	.117
Within groups	67	1362.098	20.33	p = .8894
Total	69	1366.871		

Model II estimate of between component variance = -.772

Analysis of Variance for the Retention Test for the Cooperative Learning with Individual Accountability and the Traditional Group

One Factor ANOVA X_1 : treatment Y_1 : Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	3.507E-4	3.507E-4	1.691E-5
Within groups	45	933.489	20.744	p = .9967
Total	46	933.489		

Model II estimate of between component variance = -.893

Analysis of Variance for the Retention Test for the Cooperative Learning With Individual Accountability and the Cooperative Learning Without Individual Accountability

One Factor ANOVA X_1 : treatment Y_1 : Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	3.739	3.739	.227
Within groups	47	774.955	16.488	p = .6361
Total	48	778.694		

Model II estimate of between component variance = -.522

Analysis of Variance for the Retention Test for the Cooperative Learning Without Individual Accountability and the Traditional Group

One Factor ANOVA X_1 : treatment Y_1 : Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	3.43	3.43	.142
Within groups	42	1015.752	24.185	p = .7084
Total	43	1019.182		

Model II estimate of between component variance = -.945

Analysis of Variance for the Retention Test by Treatment Groups and Ability

Anova table for a 2-factor Analysis of Variance on Y_1 : Retention Test

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
treatment (A)	2	2.71	1.355	.085	.9186
group-ability (B)	1	342.678	342.678	21.517	.0001
AB	2	1.635	.817	.051	.95
Error	64	1019.276	15.926		

There were no missing cells found.

Analysis of Variance of the Retention -test Results by the High Ability Group and Treatment Groups

One Factor ANOVA X_1 : treatment Y_3: Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	1.637	.818	.15
Within groups	32	175.049	5.47	p = .8616
Total	34	176.686		

Model II estimate of between component variance = -.4

Analysis of Variance of the Retention-test Results by the High Ability Group and the Cooperative Learning With Individual Accountability and the Traditional Grouping

One Factor ANOVA X_1 : treatment Y_3: Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.421	.421	.088
Within groups	22	105.413	4.791	p = .7698
Total	23	105.833		

Model II estimate of between component variance = -.367

Analysis of Variance of the Retention-test Results by the High Ability Group and the Cooperative Learning With Individual Accountability and Cooperative Learning without Individual Accountability

One Factor ANOVA X_1 : treatment Y_3 : Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.466	.466	.102
Within groups	22	100.867	4.585	p = .7528
Total	23	101.333		

Model II estimate of between component variance = -.346

Analysis of Variance of the Retention-test Results by the High Ability Group and the Cooperative Learning Without Individual Accountability and the Traditional Grouping

One Factor ANOVA X_1 : treatment Y_3 : Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	1.636	1.636	.228
Within groups	20	143.818	7.191	p = .6385
Total	21	145.455		

Model II estimate of between component variance = -.505

Analysis of Variance of the Retention Test for Students of Low Ability Among Treatment Groups

One Factor ANOVA X_1 : treatment Y_1 : Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	2.745	1.372	.052
Within groups	32	844.227	26.382	p = .9494
Total	34	846.971		

Model II estimate of between component variance = -2.156

Analysis of Variance of the Retention Test for Students of Low Ability between Cooperative Learning with Individual Accountability and the Traditional

One Factor ANOVA X_1 : treatment Y_1 : Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	1.327	1.327	.047
Within groups	21	597.977	28.475	p = .8311
Total	22	599.304		

Model II estimate of between component variance = -2.402

Analysis of Variance of the Retention Test for Students of Low Ability between Cooperative Learning with Individual Accountability and Cooperative Learning without Individual Accountability

One Factor ANOVA X_1 : treatment Y_1 : Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	2.513	2.513	.128
Within groups	23	453.327	19.71	p = .7243
Total	24	455.84		

Model II estimate of between component variance = -1.378

Analysis of Variance of the Retention Test for Students of Low Ability etween Cooperative Learning without Individual Accountability and the Traditional Group

One Factor ANOVA X_1 : treatment Y_1 : Retention Test

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.123	.123	.004
Within groups	20	637.15	31.857	p = .9511
Total	21	637.273		

Model II estimate of between component variance = -2.909

Retention Test Achievement Results

Table H - 1

Results of the ANOVA of the Multiplication Retention test Results by Treatment Group

Measures	DF	F	P
Treatment Groups	2,67	.117	.8894
Ind vs Without	1,45	1.69	.9967
Ind. vs Traditional	1,47	.227	.6361
Without vs Trad.	1,42	.142	.7084

Means and Standard Deviations of the Retention-test

Treatment Group	N	M	SD
Individual Accountability	26	20.423	3.722
Without Ind. Accountability	23	19.87	4.414
Traditional	22	20.429	5.418

Table H- 2

Results of the ANOVA of the Multiplication Retention test Results by Treatment Group and High Ability

Measures	DF	F	P
Treatment vs Ability	2,64	.051	.9500
Ind vs Without	1,22	.102	.7528
Ind. vs Traditional	1,22	.088	.7698
Without vs Trad.	1,20	.228	.6385

Means and Standard Deviations of the Retention-test

Treatment Group	N	M	SD
Individual Accountability	26	20.423	3.722
High Ability	13	22.462	1.613
Low Ability	13	18.385	4.150
Without Ind. Accountability	23	19.87	4.414
High Ability	11	22.182	2.639
Low Ability	12	17.750	4.731
Traditional	22	20.429	5.418
High Ability	11	22.727	2.724
Low Ability	11	17.9	6.590

Table H- 3
Results of the ANOVA of the Multiplication Retention test Results by Treatment Group and Low Ability

Measures	DF	F	P
Treatment vs Ability	2,33	2.277	.1185
Ind vs Without	1,23	.128	.7243
Ind. vs Traditional	1,21	.047	.8311
Without vs Trad.	1,20	.004	.9511

Means and Standard Deviations of the Retention-test

Treatment Group	N	M	SD
Individual Accountability	26	20.423	3.722
High Ability	13	22.452	1.613
Low Ability	13	18.385	4.15
Without Ind. Accountability	23	19.87	4.414
High Ability	11	22.182	2.639
Low Ability	12	17.750	4.731
Traditional	22	20.429	5.418
High Ability	11	22.727	2.724
Low Ability	11	17.9	6.59

SURVEY STATISTICAL RESULTS

Appendix I

Results of the Paired T-Tests for the Cooperative Learning with Individual Accountability

Paired t-Test X_1: QUESTION 1 Y_1: QUESTION 2A

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	.739	2.254	.0345

Paired t-Test X_2: QUESTION 2 Y_2: QUESTION 2B

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.391	-1.123	.2737

Paired t-Test X_3: QUESTION 3 Y_3: QUESTION 2C

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	0	0	1

Paired t-Test X_4: QUESTION 4 Y_4: QUESTION 2D

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.174	-1	.3282

Paired t-Test X_5: QUESTION 5 Y_5: QUESTION 2E

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.609	-2.44	.0232

Paired t-Test X_6: QUESTION 6 Y_6: QUESTION 2F

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	.043	.096	.9241

Paired t-Test X_7: QUESTION 7 Y_7: QUESTION 2G

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	.174	.536	.5975

Paired t-Test X_8: QUESTION 8 Y_8: QUESTION 2H

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.391	-.941	.3569

Paired t-Test X_9: QUESTION 9 Y_9: QUESTION 2I

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.652	-1.488	.151

Paired t-Test X_{10}: QUESTION 10 Y_{10}: QUESTION 2J

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	.087	.183	.8562

Appendix J
Results of the Paired T-Tests for the Cooperative Learning without Individual Accountability Group

Paired t-Test X_1: QUESTION 1 Y_1: QUESTION 2A

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	.304	1.046	.3071

Paired t-Test X_2: QUESTION 2 Y_2: QUESTION 2B

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.391	-1.438	.1646

Paired t-Test X_3: QUESTION 3 Y_3: QUESTION 2C

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.13	-.68	.5035

Paired t-Test X_4: QUESTION 4 Y_4: QUESTION 2D

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.217	-1.553	.1347

Paired t-Test X_5: QUESTION 5 Y_5: QUESTION 2E

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.348	-1.558	.1335

Paired t-Test X_6: QUESTION 6 Y_6: QUESTION 2F

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	.043	.146	.8854

Paired t-Test X_7: QUESTION 7 Y_7: QUESTION 2G

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	.043	.13	.8981

Paired t-Test X_8: QUESTION 8 Y_8: QUESTION 2H

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.957	-2.591	.0167

Paired t-Test X_9: QUESTION 9 Y_9: QUESTION 2I

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.87	-3.07	.0056

Paired t-Test X_{10}: QUESTION 10 Y_{10}: QUESTION 2J

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
22	-.174	-.5	.6223

Appendix K
Results of the Paired T-Tests for the Traditional Group

Paired t-Test X_1: QUESTION 1 Y_1: QUESTION 2A

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
20	-.095	-.295	.7711

Paired t-Test X_2: QUESTION 2 Y_2: QUESTION 2B

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
20	.524	1.1	.2844

Paired t-Test X_3: QUESTION 3 Y_3: QUESTION 2C

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
20	.238	1.045	.3086

Paired t-Test X_4: QUESTION 4 Y_4: QUESTION 2D

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
20	-.143	-.9	.3786

Paired t-Test X_5: QUESTION 5 Y_5: QUESTION 2E

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
20	-.143	-.548	.5899

Paired t-Test X_6: QUESTION 6 Y_6: QUESTION 2F

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
20	.333	.674	.5079

Paired t-Test X_7: QUESTION 7 Y_7: QUESTION 2G

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
20	-.762	-1.896	.0725

Paired t-Test X_8: QUESTION 8 Y_8: QUESTION 2H

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
20	-.048	-.1	.9212

Paired t-Test X_9: QUESTION 9 Y_9: QUESTION 2I

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
20	.524	1.29	.2117

Paired t-Test X_{10}: QUESTION 10 Y_{10}: QUESTION 2J

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
20	0	0	1

Appendix L
Results of the ANOVA for the Surveys by the Cooperative Learning Groups and The Traditional Group

One Factor ANOVA X_1 : group Y_{11} : QUESTION 1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	1.947	1.947	1.765
Within groups	65	71.695	1.103	p = .1886
Total	66	73.642		

Model II estimate of between component variance = .029

One Factor ANOVA X_1 : group Y_1 : QUESTION 2A

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	13.974	13.974	8.879
Within groups	65	102.295	1.574	p = .0041
Total	66	116.269		

Model II estimate of between component variance = .43

One Factor ANOVA X_1 : group Y_{12}: QUESTION 2

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	13.106	13.106	4.613
Within groups	65	184.655	2.841	p = .0355
Total	66	197.761		

Model II estimate of between component variance = .356

One Factor ANOVA X_1 : group Y_2 : QUESTION 2B

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.021	.021	.009
Within groups	65	159.173	2.449	p = .9262
Total	66	159.194		

Model II estimate of between component variance = -.084

One Factor ANOVA X_1 : group Y_{13} : QUESTION 3

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.49	.49	.396
Within groups	65	80.257	1.235	p = .5311
Total	66	80.746		

Model II estimate of between component variance = -.026

One Factor ANOVA X_1 : group Y_3 : QUESTION 2C

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.204	.204	.174
Within groups	65	76.452	1.176	p = .6782
Total	66	76.657		

Model II estimate of between component variance = -.034

One Factor ANOVA X_1 : group Y_{14} : QUESTION 4

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.007	.007	.014
Within groups	65	34.679	.534	p = .9061
Total	66	34.687		

Model II estimate of between component variance = -.018

One Factor ANOVA X_1 : group Y_4 : QUESTION 2D

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.013	.013	.128
Within groups	65	6.614	.102	p = .722
Total	66	6.627		

Model II estimate of between component variance = -.003

One Factor ANOVA X_1 : group Y_{15} : QUESTION 5

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	6.180E-5	6.180E-5	4.857E-5
Within groups	65	82.716	1.273	p = .9945
Total	66	82.716		

Model II estimate of between component variance = -.044

One Factor ANOVA X_1 : group Y_5 : QUESTION 2E

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	1.642	1.642	6.328
Within groups	65	16.865	.259	p = .0144
Total	66	18.507		

Model II estimate of between component variance = .048

One Factor ANOVA X_1 : group Y_{16} : QUESTION 6

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	12.101	12.101	5.141
Within groups	65	153.003	2.354	p = .0267
Total	66	165.104		

Model II estimate of between component variance = .338

One Factor ANOVA X_1 : group Y_6 : QUESTION 2F

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	5.655	5.655	2.371
Within groups	65	155.061	2.386	p = .1285
Total	66	160.716		

Model II estimate of between component variance = .113

One Factor ANOVA X_1 : group Y_{17} : QUESTION 7

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	7.549	7.549	4.053
Within groups	65	121.078	1.863	p = .0482
Total	66	128.627		

Model II estimate of between component variance = .197

One Factor ANOVA X_1 : group Y_7 : QUESTION 2G

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.312	.312	.179
Within groups	65	113.151	1.741	p = .6737
Total	66	113.463		

Model II estimate of between component variance = -.05

One Factor ANOVA X_1 : group Y_{18} : QUESTION 8

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	10.902	10.902	3.262
Within groups	65	217.217	3.342	p = .0755
Total	66	228.119		

Model II estimate of between component variance = .262

One Factor ANOVA X_1 : group Y_7 : QUESTION 2G

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.312	.312	.179
Within groups	65	113.151	1.741	p = .6737
Total	66	113.463		

Model II estimate of between component variance = -.05

One Factor ANOVA X_1 : group Y_{18} : QUESTION 8

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	10.902	10.902	3.262
Within groups	65	217.217	3.342	p = .0755
Total	66	228.119		

Model II estimate of between component variance = .262

One Factor ANOVA X_1 : group Y_8 : QUESTION 2H

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.853	.853	.289
Within groups	65	192.192	2.957	p = .593
Total	66	193.045		

Model II estimate of between component variance = -.073

One Factor ANOVA X_1 : group Y_{19} : QUESTION 9

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	7.965	7.965	2.505
Within groups	65	206.692	3.18	p = .1183
Total	66	214.657		

Model II estimate of between component variance = .166

One Factor ANOVA X_1 : group Y_9 : QUESTION 21

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	4.226	4.226	1.654
Within groups	65	166.042	2.554	p = .2029
Total	66	170.269		

Model II estimate of between component variance = .058

One Factor ANOVA X_1 : group Y_{20} : QUESTION 10

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.362	.362	.17
Within groups	65	138.295	2.128	[illegible]
Total	66	138.657		

Model II estimate of between component variance = -.061

One Factor **ANOVA** X_1 : group Y_{10} : **QUESTION 2J**

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	1	.19	.19	.082
Within groups	65	150.556	2.316	p = .7753
Total	66	150.746		

Model II estimate of between component variance = -.074

Appendix M
Results of the ANOVA by Treatment Groups

Analysis of Variance for the Pre-Survey and Post -Survey Among Treatment Groups

One Factor ANOVA X_1 : TREATMENT Y_1 : QUESTION 1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	4.578	2.289	2.121
Within groups	64	69.064	1.079	p = .1283
Total	66	73.642		

Model II estimate of between component variance = .054

One Factor ANOVA X_1 : TREATMENT Y_2 : QUESTION 2A

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	13.995	6.998	4.379
Within groups	64	102.273	1.598	p = .0165
Total	66	116.269		

Model II estimate of between component variance = .242

One Factor ANOVA X_1 : TREATMENT Y_{12} : QUESTION 2

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	28.954	14.477	5.489
Within groups	64	168.807	2.638	p = .0063
Total	66	197.761		

Model II estimate of between component variance = .531

One Factor ANOVA X_1 : TREATMENT Y_{13} : QUESTION 3

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	1.881	.94	.763
Within groups	64	78.865	1.232	p = .4704
Total	66	80.746		

Model II estimate of between component variance = -.013

One Factor ANOVA X_1 : TREATMENT Y_3 : QUESTION 2C

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	2.835	1.417	1.229
Within groups	64	73.822	1.153	p = .2995
Total	66	76.657		

Model II estimate of between component variance = .012

One Factor ANOVA X_1 : TREATMENT Y_{14} : QUESTION 4

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.094	.047	.087
Within groups	64	34.592	.541	p = .9165
Total	66	34.687		

Model II estimate of between component variance = -.022

One Factor ANOVA X_1 : TREATMENT Y_4 : QUESTION 2D

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.209	.104	1.04
Within groups	64	6.418	.1	p = .3593
Total	66	6.627		

Model II estimate of between component variance = 1.810E-4

One Factor ANOVA X_1 : TREATMENT Y_{15} : QUESTION 5

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.348	.174	.135
Within groups	64	82.369	1.287	p = .8738
Total	66	82.716		

Model II estimate of between component variance = -.05

One Factor ANOVA X_1 : TREATMENT Y_5 : QUESTION 2E

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	1.729	.864	3.298
Within groups	64	16.778	.262	p = .0433
Total	66	18.507		

Model II estimate of between component variance = .027

One Factor ANOVA X_1 : TREATMENT Y_{16} : QUESTION 6

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	15.775	7.888	3.381
Within groups	64	149.329	2.333	p = .0402
Total	66	165.104		

Model II estimate of between component variance = .249

One Factor ANOVA X_1 : TREATMENT Y_6 : QUESTION 2F

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	9.329	4.665	1.972
Within groups	64	151.387	2.365	p = .1475
Total	66	160.716		

Model II estimate of between component variance = .103

One Factor ANOVA X_1 : TREATMENT Y_{17} : QUESTION 7

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	7.745	3.872	2.05
Within groups	64	120.882	1.889	p = .1371
Total	66	128.627		

Model II estimate of between component variance = .089

One Factor ANOVA X_1 : TREATMENT Y_7 : QUESTION 2G

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.312	.156	.088
Within groups	64	113.151	1.768	p = .9158
Total	66	113.463		

Model II estimate of between component variance = -.072

One Factor ANOVA X_1 : TREATMENT Y_{18} : QUESTION 8

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	11.685	5.842	1.728
Within groups	64	216.435	3.382	p = .1859
Total	66	228.119		

Model II estimate of between component variance = .11

One Factor ANOVA X_1 : TREATMENT Y_8 : QUESTION 2H

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	8.701	4.351	1.51
Within groups	64	184.344	2.88	p = .2286
Total	66	193.045		

Model II estimate of between component variance = .066

One Factor ANOVA X_1 : TREATMENT Y_{19} : QUESTION 9

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	12.226	6.113	1.933
Within groups	64	202.431	3.163	p = .1531
Total	66	214.657		

Model II estimate of between component variance = .132

One Factor ANOVA X_1 : TREATMENT Y_9 : QUESTION 2I

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	12.074	6.037	2.442
Within groups	64	158.195	2.472	p = .095
Total	66	170.269		

Model II estimate of between component variance = .16

One Factor ANOVA X_1 : TREATMENT Y_{20} : QUESTION 10

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	1.427	.713	.333
Within groups	64	137.23	2.144	p = .7182
Total	66	138.657		

Model II estimate of between component variance = -.064

One Factor ANOVA X_1 : TREATMENT Y_{10} : QUESTION 2J

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	3.864	1.932	.842
Within groups	64	146.882	2.295	p = .4356
Total	66	150.746		

Model II estimate of between component variance = -.016

Appendix N
Analysis of Variance for the Pre-Survey and the Post-Survey for the Treatment Groups and the Students of High ability

One Factor ANOVA X_1 : TREATMENT Y_1 : QUESTION 1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	2.606	1.303	1.72
Within groups	30	22.727	.758	p = .1963
Total	32	25.333		

Model II estimate of between component variance = .05

One Factor ANOVA X_1 : TREATMENT Y_2 : QUESTION 2A

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	9.515	4.758	5.032
Within groups	30	28.364	.945	p = .013
Total	32	37.879		

Model II estimate of between component variance = .347

One Factor ANOVA X_1 : TREATMENT Y_3 : QUESTION 2

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	20.788	10.394	3.595
Within groups	30	86.727	2.891	p = .0398
Total	32	107.515		

Model II estimate of between component variance = .682

One Factor ANOVA X_1 : TREATMENT Y_4 : QUESTION 2B

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	15.697	7.848	3.721
Within groups	30	63.273	2.109	p = .036
Total	32	78.97		

Model II estimate of between component variance = .522

One Factor ANOVA X_1 : TREATMENT Y_5 : QUESTION 3

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	1.515	.758	.744
Within groups	30	30.545	1.018	p = .4838
Total	32	32.061		

Model II estimate of between component variance = -.024

One Factor ANOVA X_1 : TREATMENT Y_6 : QUESTION 2C

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.788	.394	.468
Within groups	30	25.273	.842	p = .631
Total	32	26.061		

Model II estimate of between component variance = -.041

One Factor ANOVA X_1 : TREATMENT Y_7 : QUESTION 4

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.788	.394	1.25
Within groups	30	9.455	.315	p = .301
Total	32	10.242		

Model II estimate of between component variance = .007

One Factor ANOVA X_1 : TREATMENT Y_8 : QUESTION 2D

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.242	.121	2.222
Within groups	30	1.636	.055	p = .1259
Total	32	1.879		

Model II estimate of between component variance = .006

One Factor ANOVA X_1 : TREATMENT Y_9 : QUESTION 5

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	1.697	.848	1.556
Within groups	30	16.364	.545	p = .2276
Total	32	18.061		

Model II estimate of between component variance = .028

One Factor ANOVA X_1 : TREATMENT Y_{10} : QUESTION 2E

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.545	.273	1.957
Within groups	30	4.182	.139	p = .159
Total	32	4.727		

Model II estimate of between component variance = .012

One Factor ANOVA X_1 : TREATMENT Y_{11} : QUESTION 6

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	13.152	6.576	4.049
Within groups	30	48.727	1.624	p = .0278
Total	32	61.879		

Model II estimate of between component variance = .45

One Factor ANOVA X_1: TREATMENT Y_{12}: QUESTION 2F

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	9.455	4.727	2.468
Within groups	30	57.455	1.915	p = .1018
Total	32	66.909		

Model II estimate of between component variance = .256

One Factor ANOVA X_1: TREATMENT Y_{13}: QUESTION 7

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	3.818	1.909	.94
Within groups	30	60.909	2.03	p = .4017
Total	32	64.727		

Model II estimate of between component variance = -.011

One Factor ANOVA X_1: TREATMENT Y_{14}: QUESTION 2G

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.424	.212	.136
Within groups	30	46.909	1.564	p = .8737
Total	32	47.333		

Model II estimate of between component variance = -.123

One Factor ANOVA X_1 : TREATMENT Y_{15}: QUESTION 8

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.242	.121	.045
Within groups	30	81.636	2.721	p = .9565
Total	32	81.879		

Model II estimate of between component variance = -.236

One Factor ANOVA X_1 : TREATMENT Y_{16}: QUESTION 2H

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	4.424	2.212	1.527
Within groups	30	43.455	1.448	p = .2336
Total	32	47.879		

Model II estimate of between component variance = .069

One Factor ANOVA X_1 : TREATMENT Y_{17}: QUESTION 9

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	8.061	4.03	1.847
Within groups	30	65.455	2.182	p = .1752
Total	32	73.515		

Model II estimate of between component variance = .168

One Factor ANOVA X_1 : TREATMENT Y_{18} : QUESTION 2I

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	5.879	2.939	2.31
Within groups	30	38.182	1.273	p = .1167
Total	32	44.061		

Model II estimate of between component variance = .152

One Factor ANOVA X_1 : TREATMENT Y_{19} : QUESTION 10

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.727	.364	.19
Within groups	30	57.455	1.915	p = .8281
Total	32	58.182		

Model II estimate of between component variance = -.141

One Factor ANOVA X_1 : TREATMENT Y_{20} : QUESTION 2J

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.182	.091	.057
Within groups	30	47.818	1.594	p = .9447
Total	32	48		

Model II estimate of between component variance = -.137

Appendix O
Analysis of Variance for the Statement Relating to Mathematics by Treatment Group

One Factor ANOVA X_1 : TREATMENT Y_3: Mathematics 1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	56.707	28.354	2.352
Within groups	64	771.412	12.053	p = .1033
Total	66	828.119		

Model II estimate of between component variance = .731

One Factor ANOVA X_1 : TREATMENT Y_3: Mathematics 1

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	23	12.348	3.588	.748
WITHOUT	23	14.043	3.735	.779
TRADITIONAL	21	14.476	3.01	.657

One Factor ANOVA X_1 : TREATMENT Y_4: mathematics 2

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	87.366	43.683	4.128
Within groups	64	677.201	10.581	p = .0206
Total	66	764.567		

Model II estimate of between component variance = 1.483

One Factor ANOVA X_1 : TREATMENT Y_4 : mathematics 2

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	23	13.043	3.686	.769
WITHOUT	23	15.739	2.88	.6
TRADITIONAL	21	14.905	3.129	.683

Analysis of Variance for the Statement Relating to Mathematics for the Students of Low ability and by Treatment Groups

One Factor ANOVA X_1 : TREATMENT Y_3 : Mathematics 1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	67.531	33.766	2.812
Within groups	31	372.233	12.008	p = .0755
Total	33	439.765		

Model II estimate of between component variance = 1.927

One Factor ANOVA X_1 : TREATMENT Y_3 : Mathematics 1

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	12	10.917	3.502	1.011
WITHOUT	12	12.917	3.895	1.125
TRADITIONAL	10	14.4	2.797	.884

One Factor ANOVA X_1 : TREATMENT Y_4 : mathematics 2

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	87.917	43.958	3.24
Within groups	31	420.583	13.567	p = .0527
Total	33	508.5		

Model II estimate of between component variance = 2.691

One Factor ANOVA X_1 : TREATMENT Y_4 : mathematics 2

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	12	11.833	4.218	1.218
WITHOUT	12	15.583	3.554	1.026
TRADITIONAL	10	13	3.091	.978

Appendix P
Insignificant Results for the Surveys

Table P - 1
Means and Standard Deviation for the Pre Survey and the Post Survey Results by Treatment Group

Statement	Group A Means	Group A SD	Group B Means	Group B SD	Group C Means	Group C SD
#1						
Pre	3.348	1.15	2.87	1.34	3.471	1.078
Post	2.609	1.406	2.565	1.34	3.571	.978
#2						
Pre	1.174	1.435	2.348	1.748	2.714	1.678
Post	1.565	1.441	2.739	1.356	2.19	1.692
#3						
Pre	3.261	1.251	3.609	1.033	3.619	1.024
Post	3.261	1.287	3.739	.541	3.381	1.244
#4						
Pre	3.696	.822	3.783	.671	3.762	.7
Post	3.87	.344	4	0	3.905	.436
#5						
Pre	3.391	1.196	3.565	.992	3.476	1.209
Post	4	0	3.913	.288	3.619	.865
#6						
Pre	2.087	1.676	2.652	1.465	3.286	1.419
Post	2.043	1.069	2.609	1.5	2.952	1.5
#7						
Pre	3.217	1.166	3.087	1.24	2.429	1.69
Post	3.043	1.364	3.043	1.296	3.19	1.327
#8						
Pre	2	1.977	2.261	1.815	3	1.703
Post	2.391	1.924	3.217	1.445	3.048	1.687
#9						
Pre	2	1.834	2.609	1.275	3.048	1.746
Post	2.652	1.668	3.478	1.275	2.524	1.75
#10						
Pre	`2.261	1.544	2.565	1.376	2.371	1.469
Post	2.174	1.669	2.739	1.251	2 .571	1.599

Legend

Pre- First Survey
Post - Final Survey
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional

Table P -2

Results of the Analysis of Variance for the Surveys by Treatment Groups and by Ability

Number	Treatment		Cooperative vs. Traditional	
	Pre	Post	Pre	Post
1.	F= 2.008	F=.131	F=.726	F=.255
	P= .143	P=.=8777	P=.3972	P=.6153
2.	F= .419	F= 1.295	F= .005	F= 1.769
	P= .6598	P= .2814	P= .9416	P= .1883
3.	F= .3101	F= .91	F= 5.087	F= .447
	P= .0522*	P= .4078	P= .0276*	P= .5061
4.	F= 2.146	F=1.246	F=.166	F= 2.208
	P= .1257	P=.295	P=.6852	P= .1423
5.	F= .671	F= .288	F= .17	F=.284
	P= .5148	P= .751	P= .6816	P= .5958
6.	F= .902	F= 1.508	F= .002	F= .684
	P= .411	P= .2295	P= .9637	P= .4113
7.	F= .061	F= .247	F= .013	F= .055
	P= .9413	P= .7817	P= .908	P= .8153
8.	F= 2.106	F= 2.741	F= 4.306	F= 1.829
	P= .1305	P= .0725*	P= .0421*	P= .1811
9.	F= 1.933	F= 2.442	F= 2.505	F=1.654
	P= .3176	P= .6037	P= .2948	P= .359
10.	F= .648	F= .385	F= 1.252	F= .034
	P= .5267	P= .6824	P= .2674	P= .8544

Treatment Groups - DF = 2,64

Cooperative Learning vs Traditional - DF = 1,65

Table P - 3
Results of the Analysis of Variance for the Surveys by Treatment Groups and Students of Law ability

Statement		F-Test	Prob.
#1	Pre	2.281	.1191
	Post	.971	.3899
#2	Pre	1.988	.154
	Post	1.28	.2924
#3	Pre	2.885	.071
	Post	1.428	.2551
#4	Pre	1.068	.3561
	Post	.75	.4806
#5	Pre	.085	.9186
	Post	1.774	.1865
#6	Pre	1.02	.3724
	Post	1.194	.3166
#7	Pre	1.077	.3531
	Post	.171	.8432
#8	Pre	3.604	.0391
	Post	2.502	.0983
#9	Pre	1.389	.2643
	Post	1.454	.2492
#10	Pre	.712	.4987
	Post	.994	.3815

DF = 2, 31

Table P - 4
Means and Standard Deviations of the pre and post surveys for the ability groupings of the Cooperative Learning with Individual Accountability Group

Statement		High		Low	
		M	SD	M	SD
1.	Pre	3.091	1.136	3.583	1.165
	Post	2.727	1.191	2.5	1.624
2.	Pre	1.091	1.578	1.25	1.357
	Post	1	1.095	2.083	1.564
3.	Pre	3.727	.647	2.833	1.528
	Post	3.636	.674	2.917	1.621
3.	Pre	4	0	3.417	1.084
	Post	3.818	.405	3.917	.289
5.	Pre	3.455	1.214	3.333	1.231
	Post	4	0	4	0
6.	Pre	2.182	1.722	2	1.706
	Post	2.091	1.514	2	1.758
7.	Pre	3.273	1.272	3.167	1.115
	Post	3.455	1.036	2.667	1.557
8.	Pre	3	1.732	1.083	1.782
	Post	3.182	1.471	1.667	2.06
9.	Pre	2.445	1.809	1.583	1.832
	Post	3	1.342	2.333	1.923
10.	Pre	2.545	1.572	2	1.537
	Post	2.909	1.3	1.5	1.732

Table P - 5

Means and Standard Deviations of the pre and post surveys for the ability groupings of the Cooperative Learning Without Individual Accountability Treatment Condition

Statement	High		Low	
	M	SD	M	SD
1. Pre	3.182	.751	2.583	.9
Post	2.636	1.12	2.5	.452
2. Pre	2.727	1.794	2	1.706
Post	2.545	1.508	2.917	1.24
3. Pre	3.727	.905	3.5	1.168
Post	3.727	.647	3.75	.452
4. Pre	3.636	.924	3.917	.289
Post	4	0	4	0
5. Pre	4	0	3.167	1.267
Post	4	0	3.883	.389
6. Pre	3.364	1.027	2	1.537
Post	3.364	.924	1.917	1.621
7. Pre	3	1.342	3.167	1.193
Post	3.182	1.471	2.917	1.165
8. Pre	3.182	1.401	1.417	1.782
Post	3.091	1.375	3.333	1.557
9. Pre	3.636	.809	1.667	1.875
Post	4	0	3	1.651
10. Pre	2.727	1.272	2.417	1.505
Post	3.091	1.044	2.417	1.379

Table P - 6
Means and Standard Deviations of the pre and post surveys for the ability groupings of the Traditional Treatment Condition

Statement		High		Low	
		M	SD	M	SD
1.	Pre	3.727	.647	3.2	1.398
	Post	3.818	.405	3.3	1.33
2.	Pre	2.818	1.722	2.6	1.713
	Post	2.364	1.69	2	1.764
3.	Pre	3.273	1.348	4	0
	Post	3.364	1.286	3.4	1.265
4.	Pre	3.909	.302	3.6	.966
	Post	4	0	3.8	.632
5.	Pre	3.818	.405	3.1	1.663
	Post	3.727	.647	3.5	1.08
6.	Pre	3.636	.924	2.9	1.792
	Post	3	1.612	2.9	1.449
7.	Pre	2.455	1.635	2.4	1.838
	Post	3.364	1.206	3	1.491
8.	Pre	3	1.789	3	1.7
	Post	3.909	.539	2.1	2.025
9.	Pre	3.273	1.618	2.8	1.932
	Post	3.273	1.421	1.7	1.767
10.	Pre	2.364	1.286	2.8	1.687
	Post	3	1.414	2.1	1.729

Table P - 7

Results of the Analysis of Variance of the Statements relating to School by Treatment

	DF	F-test	Probability
Pre	2,64	3.556	P = .0343
Post	2,64	1.667	P = .1968

Means and Standard Deviations of the Surveys by Treatment

	Pre		Post	
School	Mean	SD	Mean	SD
Group A	14.087	3.592	14.565	4.378
Group B	15.304	3.843	16.304	3.239
Group C	16.905	2.982	16.048	2.439

Legend

Group A - Cooperative Learning with Individual Accountability

Group B - Cooperative Learning without Individual Accountability

Group C - Traditional

Table P - 8

Results of the Analysis of Variance for the Statements relating to School by Treatment and high ability

School	DF	F-test	Probability	Direction
Pre	2,30	5.985	P= .0065	
Post	2,30	2.692	P= .0841	N.S.

Means for the Statement relating to School by Treatment Groups and High Ability

Treatment	Pre		Post	
School	M	SD	M	SD
Group A	14.909	2.982	15.455	3.532
Group B	17.909	1.64	17.727	1.618
Group C	17.727	2.005	17.182	1.471

Legend

M - means

SD- standard deviations

Group A - Cooperative Learning with Individual Accountability

Group B - Cooperative Learning without Individual Accountability

Group C - Traditional

Table P - 9

Results of the Analysis of Variance for the Statements relating to School by Treatment and low ability

School	DF	F-test	Probability	Direction
Pre	2,31	2.012	P= .1509	N.S.
Post	2,31	.324	P= .7258	N.S.

Means for the Statements relating to School by Treatment Groups and Low Ability

Treatment	Pre		Post	
	M	SD	M	SD
Group A	13.333	4.053	13.75	5.048
Group B	12.917	3.753	15	1.108
Group C	16	3.682	14.8	2.741

Legend
M - means
SD- standard deviations
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional

Table P - 10

Results of the Analysis of Variance for the Statements relating to Mathematics by Treatment and high ability

	DF	F-test	Probability	Direction
Pre	2,30	.486	P=.6196	N.S.
Post	2,30	2.964	P=.0669	N.S.

Means for the Statements relating to Mathematics by Treatment Groups and High Ability

Treatment	Pre		Post	
	M	SD	M	SD
Mathematics				
Group A	13.909	3.113	14.364	2.58
Group B	15.273	3.289	15.909	2.071
Group C	14.545	3.328	16.636	2.014

Legend
M - means
SD- standard deviations
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional

Table F -11
Statement #3 I like school.
Overall Mean Scores and Standard Deviation for surveys and treatment groups

Treatment	Pre-Survey		Post-Survey	
	M	SD	M	SD
Group A	3.261	1.251	3.261	1.287
Group B	3.609	1.033	3.739	.541
Group C	3.619	1.024	3.381	1.244

Legend
SD = standard deviation
M = mean score

Statement #3 - I like school
Mean Scores and Standard Deviation for Surveys by treatment group and abilities

Treatment Groups	High		Low	
	M	SD	M	SD
Group A				
Pre	3.727	.647	2.833	1.528
Post	3.636	.674	2.917	1.621
Group B				
Pre	3.727	.905	3.5	1.168
Post	3.727	.647	3.75	.452
Group C				
Pre	3.273	1.348	4	0
Post	3.364	1.286	3.4	1.265

Frequency Distribution
Statement #3 I like school

Categories	SA	A	U	D	SD
Group A					
Pre	15	3	3	0	2
Post	15	4	1	1	2
Group B					
Pre	19	2	5	1	1
Post	18	4	1	0	0
Group C					
Pre	18	0	2	0	1
Post	15	3	1	0	2

Legend
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional
Categories:SA - strongly agree A - agree U - undecided D - disagree SD-strongly disagree

Table P - 12
Statement #4 - It is important to know how to do Math
Overall Mean Scores and Standard Deviation for surveys and treatment groups

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	3.696	.822	3.87	.344
Group B	3.783	.671	4	0
Group C	3.762	.7	3.905	.436

Legend
SD = standard deviation
M = mean score

Statement #4 Overall Mean Scores and Standard Deviation for surveys by treatment groups and ability groupi

Treatment Group	High		Low	
	M	SD	M	SD
Group A Pre	4	0	3.417	1.08
Post	3.818	.405	3.917	.289
Group B Pre	3.636	.924	3.917	.289
Post	4	0	4	0
Group C Pre	3.909	.302	3.6	.966
Post	4	0	3.8	.632

Frequency Distribution
Statement #4 It is important to know how to do Math.

Categories	SA	A	U	D	SD
Group A					
Pre	20	0	2	1	0
Post	20	3	0	0	0
Group B					
Pre	20	2	0	1	0
Post	23	0	0	0	0
Group C					
Pre	18	2	0	1	0
Post	20	0	1	0	0

Legend
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional
Categories:SA - strongly agree A - agree U - undecided D - disagree SD-strongly disagree

Table P - 13
Statement #5 - It is okay to make mistakes at school.
Overall Mean Scores and Standard Deviation for surveys and treatment groups

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	3.391	1.196	4	0
Group B	3.565	.992	3.913	.288
Group C	3.476	1.209	3.619	.865

Legend
SD = standard deviation
M = mean score

Overall Mean Scores and Standard Deviation for Surveys by Treatment Groups and Ability Groupings

Treatment Groups	High		Low	
	M	SD	M	SD
Group A				
Pre	3.455	.647	3.333	1.231
Post	4	0	4	0
Group B				
Pre	4	0	3.167	1.267
Post	4	0	3.883	.389
Group C				
Pre	3.818	.405	3.1	1.663
Post	3.727	1.612	3.5	1.08

Table P - 13
Statement #5- It is okay to make mistakes at school

Categories	SA	A	U	D	SD
Group A					
Pre	16	4	1	0	2
Post	23	0	0	0	0
Group B					
Pre	18	2	2	0	1
Post	21	0	2	0	0
Group C					
Pre	16	3	0	0	2
Post	17	1	2	1	0

Legend
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional
Categories:
SA - strongly agree A - agree U - undecided D - disagree SD-strongly disagree

Table P - 14
Statement #6 I often feel left out of things.
Overall Mean Scores and Standard Deviation for surveys and treatment groups

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	2.087	1.676	2.043	1.069
Group B	2.652	1.465	2.609	1.5
Group C	3.286	1.419	2.952	1.5

Legend

SD = standard deviation
M = mean score

Statement #6 Overall Means Scores and Standard Deviation for the Surveys by treatment groups and abilities

Treatment Groups	M	SD	M	SD
	High		Low	
Group A Pre	2.182	1.722	2	1.706
Post	2.091	1.514	2	1.758
Group B Pre	3.364	1.027	2	.289
Post	3.364	.924	1.917	1.621
Group C Pre	3.636	.924	2.9	1.792
Post	3	1.612	2.9	1.449

Frequency Distribution
Statement #6 I often feel left out of things.

Categories	SA	A	U	D	SD
Group A					
Pre	7	2	3	4	7
Post	6	3	5	2	7
Group B					
Pre	3	2	5	3	10
Post	4	1	4	5	9
Group C					
Pre	2	2	0	1	16
Post	3	1	2	3	12

Legend
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional
Categories:SA - strongly agree A - agree U - undecided D - disagree SD-strongly disagree

Table P -15

Statement #7 Math is easy

Overall Mean Scores and Standard Deviation for surveys and treatment groups

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	3.217	1.166	3.043	1.364
Group B	3.087	1.24	3.043	1.296
Group C	2.429	1.69	3.19	1.327

Legend
SD = standard deviation
M = mean score

Statements #7 Overall Mean Scores and Standard Deviation for the Surveys by treatment group and abilities

Treatment Groups	High		Low	
	M	SD	M	SD
Group A Pre	3.273	1.272	3.167	1.115
Post	3.455	1.036	2.667	1.557
Group B Pre	3	1.342	3.167	1.193
Post	3.182	1.471	2.917	1.165
Group C Pre	2.455	1.635	2.4	1.838
Post	3.264	1.206	3	1.491

Frequency Distribution
Statement #7 Math is easy.

Categories	SA	A	U	D	SD
Group A					
Pre	15	1	4	3	0
Post	13	4	2	2	2
Group B					
Pre	12	5	4	0	2
Post	12	5	3	1	2
Group C					
Pre	10	0	5	1	5
Post	14	2	1	3	1

Legend
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional
Categories:SA - strongly agree A - agree U - undecided D - disagree SD-strongly disagree

Table P - 16

Statement #8- Without Math, school would be more fun.

Overall Mean Scores and Standard Deviation for surveys and treatment groups

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	2	1.977	2.391	1.924
Group B	2.261	1.815	3.217	1.445
Group C	3	1.703	3.048	1.687

Legend

SD = standard deviation

M = mean score

Statement #8 Mean Scores and Standard Deviation for the Surveys by treatment group and abilities

Treatment Groups		High		Low	
		M	SD	M	SD
Group A	Pre	3	1.732	1.083	1.782
	Post	3.182	1.471	1.667	2.06
Group B	Pre	3.182	1.401	1.417	1.782
	Post	3.091	1.375	3.333	1.557
Group C	Pre	3	1.789	3	1.7
	Post	3.909	.539	2.1	2.025

Frequency Distribution

Statement #8 Without Math, school would be more fun.

Categories	SA	A	U	D	SD
Group A					
Pre	10	2	0	0	11
Post	8	1	1	0	13
Group B					
Pre	7	3	0	3	10
Post	2	1	3	5	12
Group C					
Pre	0	5	1	1	14
Post	0	5	0	2	14

Legend

Group A - Cooperative Learning with Individual Accountability

Group B - Cooperative Learning without Individual Accountability

Group C - Traditional

Categories:SA - strongly agree A - agree U - undecided D - disagree SD-strongly disagree

Table F - 18
Statement #10- Math is hard to understand.
Overall Mean Scores and Standard Deviation for surveys and treatment groups

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	2.261	1.544	2.174	1.669
Group B	2.565	1.376	2.739	1.251
Group C	2.571	1.469	2.571	1.599

Legend
SD = standard deviation
M = mean score

Statement #10 Mean Scores and Standard Deviation for the Surveys by treatment groups and Abilities

Treatment Groups	High		Low	
	M	SD	M	SD
Group A Pre	2.545	1.572	2	1.537
Post	2.909	1.3	1.5	1.732
Group B Pre	2.727	1.272	2.417	1.505
Post	3.091	1.044	2.417	1.379
Group C Pre	2.364	1.286	2.8	1.687
Post	3	1.414	2.1	1.729

Frequency Distribution
Statement #10 Math is hard to understand.

Categories	SA	A	U	D	SD
Group A					
Pre	8	2	5	4	4
Post	6	3	3	3	8
Group B					
Pre	1	6	4	3	9
Post	1	3	6	4	9
Group C					
Pre	3	1	7	1	9
Post	4	2	2	4	9

Legend
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional
Categories:SA - strongly agree A - agree U - undecided D - disagree SD-strongly disagree

Table P - 17
Statement #9
My teacher is the only one who can help me with my work.
Overall Mean Scores and Standard Deviation for surveys and treatment groups

Treatment Groups	Pre survey		Post Survey	
	M	SD	M	SD
Group A	2	1.834	2.652	1.668
Group B	2.609	1.275	3.478	1.275
Group C	3.048	1.746	2.524	1.75

Legend
SD = standard deviation
M = mean score

Statement #9 Mean Scores and Standard Deviation for the Surveys by treatment group and Abilities

Treatment		High		Low	
		M	SD	M	SD
Group A	Pre	2.445	1.809	1.583	1.832
	Post	3	1.342	2.333	1.923
Group B	Pre	3.636	.809	1.667	1.875
	Post	4	0	3	1.651
Group C	Pre	3.273	1.618	2.8	1.932
	Post	3.273	1.421	1.7	1.767

Frequency Distribution
Statement #9 My teacher is the only person in my class who can help me with my work.

Categories	SA	A	U	D	SD
Group A Pre	9	2	0	4	8
Post	5	1	3	2	12
Group B Pre	6	0	4	0	13
Post	2	1	0	1	19
Group C Pre	5	0	0	0	16
Post	5	2	2	1	12

Legend
Group A - Cooperative Learning with Individual Accountability
Group B - Cooperative Learning without Individual Accountability
Group C - Traditional
Categories:SA - strongly agree A - agree U - undecided D - disagree SD-strongly disagree

Appendix
Analysis of Variance for the Pre-Survey and the Post-Survey by the Treatment Groups and Low Ability

One Factor ANOVA X_1 : TREATMENT Y_1 : QUESTION 1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	6.096	3.048	2.281
Within groups	31	41.433	1.337	p = .1191
Total	33	47.529		

Model II estimate of between component variance = .152

One Factor ANOVA X_1 : TREATMENT Y_2: QUESTION 2A

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	4.518	2.259	.971
Within groups	31	72.1	2.326	p = .3899
Total	33	76.618		

Model II estimate of between component variance = -.006

One Factor ANOVA X_1 : TREATMENT Y_3 : QUESTION 2

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	10.085	5.043	1.988
Within groups	31	78.65	2.537	p = .1541
Total	33	88.735		

Model II estimate of between component variance = .222

One Factor ANOVA X_1 : TREATMENT Y_4 : QUESTION 2B

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	5.931	2.966	1.28
Within groups	31	71.833	2.317	p = .2924
Total	33	77.765		

Model II estimate of between component variance = .057

One Factor ANOVA X_1 : TREATMENT Y_5 : QUESTION 3

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	7.569	3.784	2.885
Within groups	31	40.667	1.312	p = .071
Total	33	48.235		

Model II estimate of between component variance = .219

One Factor ANOVA X_1 : TREATMENT Y_6 : QUESTION 2C

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	4.198	2.099	1.428
Within groups	31	45.567	1.47	p = .2551
Total	33	49.765		

Model II estimate of between component variance = .056

One Factor ANOVA X_1 : TREATMENT Y_7 : QUESTION 4

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	1.531	.766	1.068
Within groups	31	22.233	.717	p = .3561
Total	33	23.765		

Model II estimate of between component variance = .004

One Factor ANOVA X_1 : TREATMENT Y_8 : QUESTION 2D

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.219	.109	.75
Within groups	31	4.517	.146	p = .4806
Total	33	4.735		

Model II estimate of between component variance = -.003

One Factor ANOVA X_1 : TREATMENT Y_9 : QUESTION 5

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.325	.163	.085
Within groups	31	59.233	1.911	p = .9186
Total	33	59.559		

Model II estimate of between component variance = -.155

One Factor ANOVA X_1 : TREATMENT Y_{10} : QUESTION 2E

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	1.392	.696	1.774
Within groups	31	12.167	.392	p = .1865
Total	33	13.559		

Model II estimate of between component variance = .027

One Factor ANOVA X_1 : TREATMENT Y_{11} : QUESTION 6

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	5.718	2.859	1.02
Within groups	31	86.9	2.803	p = .3724
Total	33	92.618		

Model II estimate of between component variance = .005

One Factor ANOVA X_1: TREATMENT Y_{12}: QUESTION 2F

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	6.301	3.15	1.194
Within groups	31	81.817	2.639	p = .3166
Total	33	88.118		

Model II estimate of between component variance = .045

One Factor ANOVA X_1: TREATMENT Y_{13}: QUESTION 7

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	4.149	2.075	1.077
Within groups	31	59.733	1.927	p = .3531
Total	33	63.882		

Model II estimate of between component variance = .013

One Factor ANOVA X_1: TREATMENT Y_{14}: QUESTION 2G

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.681	.341	.171
Within groups	31	61.583	1.987	p = .8432
Total	33	62.265		

Model II estimate of between component variance = -.146

One Factor ANOVA X_1 : TREATMENT Y_{15} : QUESTION 8

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	22.284	11.142	3.604
Within groups	31	95.833	3.091	p = .0391
Total	33	118.118		

Model II estimate of between component variance = .713

One Factor ANOVA X_1 : TREATMENT Y_{16} : QUESTION 2H

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	17.796	8.898	2.502
Within groups	31	110.233	3.556	p = .0983
Total	33	128.029		

Model II estimate of between component variance = .473

One Factor ANOVA X_1 : TREATMENT Y_{17} : QUESTION 9

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	9.787	4.894	1.389
Within groups	31	109.183	3.522	p = .2643
Total	33	118.971		

Model II estimate of between component variance = .121

One Factor ANOVA X_1 : TREATMENT Y_{18} : QUESTION 2I

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	9.263	4.631	1.454
Within groups	31	98.767	3.186	p = .2492
Total	33	108.029		

Model II estimate of between component variance = .128

One Factor ANOVA X_1 : TREATMENT Y_{19} : QUESTION 10

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	3.513	1.756	.712
Within groups	31	76.517	2.468	p = .4987
Total	33	80.029		

Model II estimate of between component variance = -.063

One Factor ANOVA X_1 : TREATMENT Y_{20} : QUESTION 2J

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	5.183	2.592	.994
Within groups	31	80.817	2.607	p = .3815
Total	33	86		

Model II estimate of between component variance = -.001

Analysis of Variance for the Statement Relating to School by Treatment Groups

One Factor ANOVA X_1 : TREATMENT Y_1 : School 1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	87.405	43.703	3.556
Within groups	64	786.505	12.289	p = .0343
Total	66	873.91		

Model II estimate of between component variance = 1.408

One Factor ANOVA X_1 : TREATMENT Y_1 : School 1

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	23	14.087	3.592	.749
WITHOUT	23	15.304	3.843	.801
TRADITIONAL	21	16.905	2.982	.651

One Factor ANOVA X_1 : TREATMENT Y_2 : School 2

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	40.198	20.099	1.667
Within groups	64	771.474	12.054	p = .1968
Total	66	811.672		

Model II estimate of between component variance = .361

One Factor ANOVA X_1 : TREATMENT Y_1 : School 2

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	23	14.565	4.378	.913
WITHOUT	23	16.304	3.239	.675
TRADITIONAL	21	16.048	2.439	.532

Analysis of Variance for the Statement Relating to School for the Students of High ability and by Treatment Groups

One Factor ANOVA X_1 : TREATMENT Y_1 : School 1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	62.242	31.121	5.985
Within groups	30	156	5.2	p = .0065
Total	32	218.242		

Model II estimate of between component variance = 2.356

One Factor ANOVA X_1 : TREATMENT Y_1 : School 1

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	11	14.909	2.982	.899
WITHOUT	11	17.909	1.64	.495
TRADITIONAL	11	17.727	2.005	.604

One Factor ANOVA X_1 : TREATMENT Y_2 : School 2

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	30.97	15.485	2.692
Within groups	30	172.545	5.752	p = .0841
Total	32	203.515		

Model II estimate of between component variance = .885

One Factor ANOVA X_1 : TREATMENT Y_2 : School 2

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	11	15.455	3.532	1.065
WITHOUT	11	17.727	1.618	.488
TRADITIONAL	11	17.182	1.471	.444

Analysis of Variance for the Statement Relating to School for the Students of Low ability and by Treatment Groups

One Factor ANOVA X_1 : TREATMENT Y_1 : School 1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	59.387	29.694	2.012
Within groups	31	457.583	14.761	p = .1509
Total	33	516.971		

Model II estimate of between component variance = 1.322

One Factor ANOVA X_1 : TREATMENT Y_1 : School 1

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	12	13.333	4.053	1.17
WITHOUT	12	12.917	3.753	1.083
TRADITIONAL	10	16	3.682	1.164

One Factor ANOVA X_1 : TREATMENT Y_2 : School 2

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	10.65	5.325	.324
Within groups	31	509.85	16.447	p = .7258
Total	33	520.5		

Model II estimate of between component variance = -.985

One Factor ANOVA X_1 : TREATMENT Y_2 : School 2

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	12	13.75	5.048	1.457
WITHOUT	12	15	3.838	1.108
TRADITIONAL	10	14.8	2.741	.867

Analysis of Variance for the Statement Relating to Mathematics for the Students of High ability and by Treatment Groups

One Factor ANOVA X_1 : TREATMENT Y_3 : Mathematics 1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	10.242	5.121	.486
Within groups	30	315.818	10.527	p = .6196
Total	32	326.061		

Model II estimate of between component variance = -.491

One Factor ANOVA X_1 : TREATMENT Y_3 : Mathematics 1

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	11	13.909	3.113	.939
WITHOUT	11	15.273	3.289	.992
TRADITIONAL	11	14.545	3.328	1.003

One Factor ANOVA X_1 : TREATMENT Y_4 : mathematics 2

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	29.636	14.818	2.964
Within groups	30	150	5	p = .0669
Total	32	179.636		

Model II estimate of between component variance = .893

One Factor ANOVA X_1 : TREATMENT Y_4 : mathematics 2

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
IND	11	14.364	2.58	.778
WITHOUT	11	15.909	2.071	.625
TRADITIONAL	11	16.636	2.014	.607