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The effect of cooperative learning on the mathematical achievement of fifth grade students

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THE EFFECT OF COOPERATIVE LEARNING ON THE MATHEMATICAL ACHIEVEMENT OF FIFTH GRADE STUDENTS

by
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ABSTRACT

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The goal of this study was to investigate the effects of cooperative learning on mathematical academic achievement in fifth grade students. The design of this research also studied the extent cooperative learning has on reducing mathematics anxiety and generating mathematical interest. The sample involved one group of students ($n = 21$), which were drawn from a class of ten and eleven year old students. This study utilized a pretest - posttest, one group design. The subjects were exposed to two treatments, traditional instructional methods and cooperative learning instructional methods. A mean difference comparison found a significant difference in the mathematical achievement of fifth grade students when using cooperative learning strategies as compared to traditional mathematics instruction. Surveys were also utilized to determine the effects the treatments had on anxiety levels and interest in mathematics. *T* tests for independent samples found the fifth grade students who experienced mathematics through cooperative learning did have reduced mathematics anxiety and had an increased interest in mathematics than fifth grade students who experienced mathematics through traditional instructional methods.

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Chapter I

Scope of the Study

Introduction

Our country has changed from an industrial society to an informational society and with it have changed the uses of mathematics in society. Today, in a society overwhelmed with information, people need to analyze and interpret data. It is also very important to be able to utilize the available technology in solving real-life problems using mathematical thinking. As a result, what students learn and how they learn information must change to keep pace with the growing technology (Kennedy & Tipps, 1994).

Mathematics anxiety is a fear of mathematics or an intense, negative emotional reaction to the subject. Some researchers who have studied the problem contend that a majority of adults suffer from mathematics anxiety to some degree. Frequently it starts in the elementary years (Kennedy & Tipps, 1994). Many people have abandoned mathematics because they learned to fear it when they were young (Andrews, McFeggan, & Patterson, 1998).

Not all students feel mathematics anxiety. Some find mathematics to be boring, given customary paper and pencil repetitive math problems. Traditional math lessons emphasize memorization and speed (Rasmussen, 1999). Kennedy & Tipps (1994) have described some shortcomings common to typical mathematics instruction. Among other things, they maintain that children have usually been forbidden to help others or ask

others for help. Many teachers will accept only "one right way" of solving problems. These practices can lead students to believe that mathematics is inflexible, non-creative, and not fun.

Statement of the Problem

The goal of this study was to investigate the effects of cooperative learning on subject interest and anxiety levels towards mathematics. The study also focused on the effects of cooperative learning on mathematical academic achievement and making math more enjoyable for students. The question was, "Would there be a difference in mathematics achievement when fifth grade students used cooperative learning methods instead of traditional mathematics instruction methods?" Another question was, "Would cooperative learning, when used in mathematics class, reduce mathematical anxiety and generate more interest in the subject matter?"

Statement of the Hypothesis

The hypothesis of this study was that there would be a significant difference in the mathematical achievement of fifth grade students when they were taught mathematics through cooperative learning strategies than fifth grade students who were taught mathematics through traditional instructional methods.

The second hypothesis was that fifth grade students who experienced mathematics through cooperative learning would have reduced mathematics anxiety and generate more mathematical interest than fifth grade students who experienced mathematics through traditional instructional methods.

Limitations of the Study

A limitation is a factor that restricts or puts a restraint on the study. The following were the limitations of this study.

The first limitation was that the researcher was assigned to a specific classroom therefore, the study was limited to a fifth grade class. The size of the sample was confined to one classroom. Another aspect of this limitation was the students were not randomly selected. As a result of this limitation, the results of this research are not generalizable to other populations.

The second limitation was that the design of this research did not include a control group. The same group of students was exposed to two different treatments. It is possible that when two groups are administered two or more treatments a difference may occur after the first treatment that may affect the outcomes of the subsequent treatments.

The third limitation was the subject matter that was taught. The subject matter of traditional instruction was division, the student were taught dividing by two-digit divisors. During cooperative learning instruction the subject matter was geometry. The test results may have been skewed because geometry was more interesting to the students.

The fourth limitation is related to the time of year the research took place. The traditional instruction method occurred during the month of March, while the cooperative learning instructional method occurred during April. The time of year may have affected the results of this study. It must also be noted that the study was conducted over a period of two months therefore, the students' growth in maturity may have affected their performance.

Definition of Terms

The following terms have been defined for this research.

Traditional Instructional Methods (TIM) - refers to the practice of teaching mathematical concepts by lecturing and having students complete problems individually.

Cooperative Learning Instructional Methods (CLIM) - refers to those structured learning methods in which students work in small groups helping each other master academic materials.

Individual Accountability - refers to the responsibility that each student is liable for

Group Rewards - refers to a reward system in which students are reward based on the performance of the whole group

Equal Opportunities for Success - refers to the emphasis that teams and individuals are not in competition with one another

Heterogeneous groups - refers to a group of students that contains mixed academic abilities.

Chapter II
Review of Literature

Introduction

Mathematical thinking is important in using the growing technology that is changing our society. However, many people have learned to fear mathematics from the time they were young (Andrews, McFeggan, & Patterson, 1998). Others view mathematics as boring (Rasmussen, 1999). This research studied the affects of cooperative learning strategies on achievement in mathematics of fifth grade students. The extent cooperative learning has on generating mathematical interest and reducing mathematics anxiety was also studied in this research.

Cooperative Learning

> Cooperative learning defined is the instructional use of small groups so that students work together to maximize their own and each other's learning. Within cooperative learning groups or cohorts, students are given two responsibilities: to learn the assigned material and to make sure that all other members of the group do likewise. In cooperative learning situations, students perceive that they can reach their learning goals only if the other students in the learning group do so. Students discuss the material to be learned with each other, help and assist each other to understand it, and encourage each other to work hard.
>
> (Johnson & Johnson, 1992, p.174 as cited by Bernero, 2000, p.9)

Slavin (1991, p.71) stated that cooperative learning has been promoted as a solution to "an astonishing array of educational problems" and has been endorsed as a learning strategy by numerous researchers who have investigated its effects on student achievement, as well as on the contexts and ways in which children work together in

classrooms. Cooperative learning methods have been cited as a means for improvements in both student achievement and the quality of students' interpersonal relationships (Slavin). Its roots as cooperative/team based learning distinguish cooperative learning from the competitive/ individualistic instruction of the traditional classroom (Johnson & Johnson, 1994). With the use of cooperative strategies, teachers become facilitators rather than dispensers of knowledge. Cooperative learning encourages group interaction with assigned roles, with each member sharing responsibility for the group and the work produced (Johnson & Johnson, 1992).

Taking the form of small group projects, group discussion, and peer tutoring, cooperative learning has been incorporated into the traditional classroom for many years. Since the 1970's, cooperative learning has taken on a more formal and structured approach causing specific cooperative learning strategies to be developed and researched (Slavin, 1995).

The Structural Approach to Cooperative Learning

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. Structures usually involve a series of steps, with prescribed behavior at each step. Structures may be used repeatedly with almost any subject matter, at a wide range of grade levels, and at various points in a lesson plan. Accordingly, structures can be combined to form "multi-structural" lessons in which each structure provides a learning experience upon which subsequent structures expand, leading toward predetermined academic, cognitive, and social objectives (Kagan, 1990).

A variety of cooperative learning structures or techniques have evolved while keeping the essential element, students working together in small groups aiding each other in learning. The most widely used and researched methods include student team learning, learning together, and group investigation (Putnam 1997).

John Hopkins University's researchers have developed specific student team learning methods: Student Teams-Achievement Divisions (STAD), Teams-Games-Tournament (TGT), Jigsaw II, and Team Accelerated Instruction (TAI) (Slavin 1995).

The STAD method assigns students to four or five member learning teams which are mixed in ability, sex, and ethnicity. Class begins with an introduction to new material by a lecture or discussion. Teams study worksheets on the material, work on problems, and quiz each other. All teammates must understand the material before a team is finished studying. Quizzes are given individually and students earn points for their teams based on individual improvement from past scores (Slavin 1995).

TGT uses the same teams, instructional format, and worksheets as STAD. However, students participate in weekly tournaments to test their knowledge of the materials learned. The teacher chooses which students play whom by the students' ability level of the material. This creates equal competition and makes it possible for students of all levels to contribute points to their teams (Slavin 1991).

As in TGT and STAD, teachers who use Jigsaw II assign students to four or five member teams. Jigsaw II, which is a modification of the original Jigsaw, requires all students to read a common narrative instead of a unique section as in the original. Each student is given a topic on which to become an expert. Members from different teams form expert groups to discuss these topics. Afterwards, they return to their teams to teach

teammates about the topic. Like STAD and TGT, students take individual quizzes and earn points for individual score improvements (Slavin 1982).

TAI is a combination of team learning and individual instruction applied to the teaching of mathematics. Students work in heterogeneous teams as in the aforementioned methods. Teams study together and check each other's work. Team scores are based on the average number of units covered along with the accuracy of the units for a given week. Teachers pull students who are at the same ability level to form teaching groups. These students return to their teams to teach the new material. Team recognition is given in the same manner as other STL methods (Slavin, 1995).

Learning Together, devised by Johnson and Johnson (1994), is a method that has a strong focus on interpersonal skills. Each lesson is required to have a social skill objective as well as the academic objective. Also recommended is that each cooperative lesson should include positive interdependence, face to face promotive interaction, individual accountability, and group processing. Students work together to complete assignments that can last from one class period to several weeks. Special purpose groups are used to focus attention or provide closure to an activity. Along with these groups, cooperative base groups meet about twice weekly to provide support in cognitive and social development. In this group, students can check each other's homework, discuss assignments, and update those students who have been absent (Johnson & Johnson, 1994).

In Group Investigation (GI), developed by Shlomo and Yael Sharan, students take an active part in planning what they will study and how. Students form cooperative groups according to common interest in a topic. All group members help plan how to

research their topic. Then they divide the work among themselves, and each group synthesizes and summarizes its work and presents these findings to the class (Slavin 1982). In planing and carrying out GI, students progress through six consecutive stages. These stages can be compressed into a week or two, or they can be carried out over several months, depending on the scope of the topic under investigation and the skillfulness of the students and the teacher (Sharan & Sharan, 1990).

Sharan and Sharan (1990) studied the various effects of Group Investigation and found students from the GI classes generally demonstrated a higher level of academic achievement than their peers taught with the whole-class method. Group Investigation has also been found to promote cooperation and mutual assistance among the students. Sharan and Sharan (1990) reported that GI even promotes positive social interaction among classmates from different ethnic groups. Group Investigation is an effective organizational medium for encouraging and guiding students' involvement in learning. Students actively share in influencing the nature of events in their classroom (Sharan & Sharan, 1990).

Why is Group Investigation so effective? First and foremost, "it gives students more control over their learning than other teaching methods" (Sharan & Sharan, 1990, p.20). Students inquire into those aspects of a subject that interests them most. They raise questions that reflect their different interests, backgrounds, values, and abilities. These differences are the groups greatest asset: "they ensure a wide range of knowledge and skills" (Sharan & Sharan, 1990, p.21).

There are a number of different structures, as well as variations among them. This variety is necessary because the structures have different functions or domains of

usefulness. Different structures are useful for distinct objectives such as team building, class building, communication building, mastery, and concept development. Whether the objective is to create a poem, write an autobiography, or learn the relationship of experimental and theoretical probability, the teacher's ability to use a range of structures increases the range of learning experiences for students, resulting in lesson designs that are richer in the academic, cognitive, and social domains (Kagan, 1990). By "building on the outcomes of the previous structures, the teacher is thus able to orchestrate dynamic learning experiences for students" (Kagan, 1990, p.13).

Cooperative Learning versus Traditional Techniques

A considerable amount of research comparing the effects of cooperative learning to that of control groups exists. Control groups consist of traditional classrooms using competitive or individualistic techniques. Johnson and Johnson (1992) define competitive efforts as those situations where students work against each other for a goal that can only be attained by a few students. In competitive situations students will achieve at the expense of someone else's failure. Individualistic efforts are those when individual students work by themselves for goals that are unrelated to the achievement of their classmates.

Based on a meta-analysis of the existing research comparing cooperative, competitive, and individualistic efforts, Johnson and Johnson (1992) concluded that cooperative learning results in higher academic achievement or individualistic learning efforts. In the same analysis, Johnson and Johnson further concluded that cooperative efforts result in greater interpersonal attraction and increased social support than did competitive and individualistic efforts. Additionally, the authors reviewed over 79

studies on self-esteem and concluded that cooperative efforts result in higher self-esteem than did competitive or individualistic efforts. Johnson and Johnson (1989) have also stated that test anxiety and classroom anxiety is significantly reduced when cooperative learning is used.

Researchers have come to agree that cooperative learning is a valuable component of classroom learning. Cooperative learning also creates an environment of active, involved, exploratory learning which "promotes innovation in teaching and classroom techniques" (Panitz, 2000, p.8).

Elements of a Successful Cooperative Learning Group

Researchers have found that children in an autocratically led group seemed discontented, often aggressive, and lacking in initiative. Students in groups without a leader experienced similar problems, members appeared frustrated and much of the work remained unfinished. In marked contrast, children in groups organized with a democratic leader, someone who allowed the group to set its own agendas and priorities, appeared far more productive, socially satisfied, and demonstrated greater originality and independence in the work they completed (Mueller & Fleming, 2001).

Mueller and Fleming (2001) studied how teachers might structure and guide children's group-learning experiences. Findings revealed that when working in groups, children require periods of unstructured time to organize themselves and to learn how to work together toward a mutual goal. "Observations from this study suggest that the teacher plays a central role in setting up the conditions for cooperative learning" (p. 267).

Research has also shown that cooperative learning is most effective when each team member is assigned a role or job. Each team member is responsible for his/her

particular job and may ask other team members for help. Students do not want to disappoint their team and therefore finish their task. Teams are assessed on the finished product and students are individually assessed (Augustine, Gruber, & Hanson, 1989).

There is wide agreement among reviewers of the cooperative learning literature that cooperative methods can and usually do have a positive effect on student achievement. There is also a strong consensus that the achievement effects are not seen for all forms of cooperative learning but depend on three essential features. One of these features is group goals, or positive interdependence: the cooperative group must work together to earn recognition, grades, rewards, and other indicators of group success. While team goals and success are emphasized, it is important to note that teams are not in competition for rewards. The second essential feature is individual accountability, the group's success depends on the individual learning of all group members (Slavin, 1990). The last and a very important essential feature is an equal opportunity for success (Slavin, 1995).

Positive Effects

The positive effects of cooperative learning are astounding and can be seen in many areas. Cooperative structures address different student learning styles in every class, including verbal, visual, and kinesthetic (Panitz, 2001). Cooperative activities help identify widespread student misconceptions, and enable the teacher to focus on specific concepts. This strategy provides a more realistic simulation for solving problems in the real world (Andrews, McFeggan, & Patterson, 1998). It requires listening, compromising, collaborating, and reaching consensus. Each of these traits will prove valuable in the students' futures. Beyond academic and vocational training, interpersonal

skills are frequently cited as the most important set of skills contributing to a person's career success. Cooperative learning has also proven to enhance social skills. Kennedy and Tipps (1994) has stated that cooperative learning creates and improves inter-group relations, including cross-race and cross-culture friendships and the social acceptance of mainstreamed children.

> If our future generations are to behave rationally across the full range of social situations, our classrooms must include cooperative, interdependent learning situations along with competitive and individualistic learning situations....It would be foolish to prepare students to be only cooperative as it would be to prepare them to be only competitive.
>
> (Kagan, 1994, p.1-2)

Our country has changed from an industrial society to an informational society and with it, we have changed the uses of mathematics in society. Today, in a society overwhelmed with information, people need to analyze and interpret data. It is also very important to be able to utilize the available technology in solving real-life problems using mathematical thinking. As a result, what students learn and how they learn it must change to keep pace with the growing technology (Kennedy & Tipps, 1994).

Mathematics Instruction

Mathematics anxiety is a fear of math or an intense, negative emotional reaction to the subject. Some researchers who have studied the problem contend that a majority of adults suffer from mathematics anxiety to some degree, and it frequently starts in the elementary years (Kennedy & Tipps, 1994). Many people have abandoned mathematics because they learned to fear it when they were young. This fear or loathing of math "seems to make people unempowered to make decisions themselves" (Rasmussen, 1999,

p.2). Once adopted, these feelings of math anxiety are hard to lose, even in adulthood (Rasmussen, 1999).

Not all students feel math anxiety. Some find math to be plain boring, given customary paper and pencil repetitive math problems. Traditional math lessons emphasize memorization and speed (Rasmussen, 1999). Kennedy & Tipps (1994) have described some shortcomings common to typical math instruction. Among other things, they maintain that children have usually been forbidden to help others or ask others for help. Many teachers will accept only "one right way" of working-out problems. These practices can lead students to believe that mathematics is inflexible, non-creative, and not fun.

Some instructional approaches provoke some students to view mathematics as an unrelated set of rules and procedures. Many students experience difficulty when applying their knowledge and skills because those knowledge and skills are, at large, fragmented, isolated, and mechanical. To make the process of learning mathematics meaningful, students must see the development and the relationship among concepts and make sense of what they study. Students must have a direct experience in manipulating and arranging real-world objects, observing patterns and regularities across different models and expressing their thinking through images and pictures. They must be prompted to use their intuition and senses, to guess and make hypotheses, to test by trial and error, and to make even unfeasible conjectures (Panasuk, Stone, &Todd, 2002). The process of integrating more realistic problems into the math curriculum is one of several presented in the literature in order to improve the attitudes of students toward mathematics (Bernero, 2000). Students' personal attention of mental building blocks, experiences, and

accurate relations to real life mathematics are the tools to think and to use prior knowledge in creative and original ways. Successful teachers do not communicate the definitions, rules or procedures. They help their students to build mental representations and lead them to their own discoveries (Panasuk, Stone, & Todd, 2002). If a problem is a realistic application using mathematics, then students can see the importance of the skills involved. As students practice and work on solving meaningful problems, they are learning and working on how to transfer their skills and ideas to similar situations. When the students can see the potential use of learning this skill, their level of motivation increase (Panasuk, Stone, & Todd, 2002).

Cooperative Learning in Mathematics Instruction

> The National Council for Teachers of Mathematics (NCTM), as well as most other national organizations that contribute to the planning of school curriculum, has long recommended that instruction in math, as well as other subjects, rely less on the teacher and more on small group learning.
>
> (Bell, 1978, p.353)

Cooperative learning techniques, when used extensively in math classes, generate many advantages for the students and teachers. Students' critical thinking skills are enhanced; motivation levels are increased as students become familiar with working with their peers, leading to a new found enjoyment of mathematics classes; achievement levels increase and thus math anxiety is reduced and self-esteem is increased (Panitz, 2001).

Dissatisfaction with students' performance in mathematics in the US has led to various efforts toward improvement. While some researchers have examined content or instruction, others have turned their attention to classroom organization, calling for more frequent use of small groups during mathematics learning. These researchers have found

that many students were developing the ability to work with others and use strengths that others bring to a task. Work groups frequently provide students an opportunity to explore diverse and in some cases, more advanced mathematics. Good et al. (1990) found comparatively more students exchanged mathematical ideas when they were in small work groups than in achievement groups. The students in work groups were also found to be more active learners and more motivated and enthusiastic about mathematics. Students need to discuss what they have learned with the teacher and other students in order to understand and explain the activities they have worked on (Good et al., 1990).

Kumar and Harizuka (1998) conducted a study on the effectiveness of the cooperative learning-based approach as compared with lecture-plus-demonstration on academic achievement in mathematics and learning awareness of students in elementary school. Their study showed that the cooperative learning-based approach had a positive effect on two scores, learning awareness and achievement in mathematics of the elementary school children. The experimental group improved significantly, and the students became more aware of their own learning strategies in terms of semantic content, summarization, response, and processing strategy, and memory. This confirms the proposition of Slavin (1990) that such a learning approach yields better performance by students in elementary school. These findings are supported by other researchers as well. However, contrary to the finding of Mulryan (1995) who observed that boys showed more active cooperation than girls, this study did not exhibit such a trend.

Students enjoy the comfort they find in working together. This comfort level leads to improve attitudes and efforts. As the students work cooperatively on a task, their ability to derive their own learning is increased since they are active in their study of

mathematics rather than passive. Their level of understanding in this situation is retained longer than students who have only a teacher or textbook explanation from which to learn. It is much easier for students to be motivated to learn when they have the proper support system. That support system is cooperative learning (Putnam, 1997). "Teachers who encourage group work know about the social academic benefits for children who work together, share ideas, and explain concepts to help one another understand mathematics" (Kennedy & Tipps, 1994, p.15).

Chapter III

Methodology

Introduction

The design of this research was to study the effects of cooperative learning strategies on fifth grade achievement in mathematics. The study also researched the extent cooperative learning has on generating mathematical interest and reducing mathematics anxiety. Cooperative learning methods have been cited as a means for improvements in both student achievement and the quality of students' interpersonal relationships (Slavin, 1991). With the use of cooperative strategies, teachers become facilitators rather than dispensers of knowledge (Johnson & Johnson, 1992). Cooperative learning techniques, when used extensively in math classes, generate many advantages for the students and teachers (Panitz, 2001).

Sample and Subjects

This study took place in February, March, and April of 2003. The sample of this study was fifth grade students from a school district in southern New Jersey.

The sample involved one group of subjects, which were drawn from a class of ten and eleven year old students. There were twenty-one students in the class, twelve boys and nine girls. Five students were classified, therefore the teacher was provided with a basic skills instructor support for three days a week during mathematics. The teacher was also provided with a classroom aide everyday during mathematics. One child was in

a talented and gifted program and the other fifteen ranged from low to high in academic abilities. Two of the twenty-one students were reading on a third grade level. Three of the students were reading on a fourth grade level. Ten students were reading on a fifth grade level and six students were reading on levels ranging from sixth to eighth grade.

Two of the students were African American, one student was an Asian American, and the remaining eighteen students were Caucasian.

Research and Design Procedure

This study utilized a pretest-posttest, one-group design. The subjects were given a pretest, introduced to a treatment, and then given a posttest. These pretests and posttests were compared to determine whether there was a significant difference after the treatment.

There were two treatments. The first treatment was Traditional Instructional Method (TIM). The second treatment was Cooperative Learning Instructional Method (CLIM). The results of the two treatments were compared to determine if using cooperative learning increased the mathematical academic achievement.

Traditional Instructional Method

The first pretest (see appendix A) assessed the students on previous knowledge of two-digit division. This pretest determined how much each student knew before the lessons were taught. The students had not been instructed on the material tested and were not told about the test beforehand. The students were then taught for three weeks by using TIM. The TIM consisted of teacher lecture, worksheets, problems from the book, and manipulatives. The students did not work together during class time on any mathematical assignment.

At the end of the chapter the students took the posttest (see appendix A). The posttest assessed the students in the same mathematical area that was taught and that appeared on the pretest. The pretest and posttest were compared for each individual child to determine how much each student had improved in two-digit division.

The day after the posttest the students completed the first survey (see appendix B). The survey had questions pertaining to the likes and dislikes of school in general. Students were also asked to circle the manner in which the individual preferred to work, either alone or in groups. The purpose was to see how the students perceived school after being taught by the traditional method of instruction. This survey was collected by the researcher. Then the second survey (see appendix B) was passed out to the students. This survey reflected the students' likes and dislikes of mathematics. Students were also asked to circle the manner in which the individual preferred to work during mathematics, either alone or in groups. The purpose was to ascertain if the assumption that many students suffer from mathematics anxiety was an accurate assumption and/or lack of interest was accurate. Another purpose of this survey was to determine if using cooperative learning as a tool to teach mathematics increased mathematical interest and enjoyment.

Cooperative Learning Instructional Method

The following day the students took a second pretest (see appendix C) assessing the students on previous knowledge of the new mathematical area to be taught. This second pretest determined how much knowledge, of geometry, each student possessed before instruction. The students had not been instructed on the material tested. To

prevent any type of preparation for the test the students were not told about the test beforehand. The students were then taught for three weeks by using CLIM.

The CLIM consisted of little teacher instruction and much teacher guidance. The students worked together to solve mathematical problems. Three methods were used during the cooperative learning including individual accountability, group rewards, and equal opportunities for success. For this research students were placed in heterogeneous groups. The researcher created three groups of four students and two groups of five students. Groups were established by the teacher/researcher and were based on ability. In order to group the students by ability the research assessed the students' scores on the first posttest. The students' scores were divided into low, middle, and high ability. Each group included at least one student from each ability level.

The day before the first cooperative learning session, the researcher/teacher discussed with the class the importance of working together to help each member learn the material. To promote unity among team members, students created a group name as well as established group rules. Different rules were created for each group because what worked for one group did not work for another. However, the researcher/teacher did provide the students with many rules that should have been followed. The groups were allowed to choose from the teacher's suggestions and to make their own.

On the first day of cooperative learning the students were informed that they would receive individual grades on his/her mathematics assignments as well as earning a team score (see appendix D). Teams received a group score that was determined by how much the team as a whole improved from one assignment to the next. Teams and individuals could earn Anderson Apples for a variety of accomplishments (see appendix

D). The students could trade in their tickets for prizes at the end of every week. Teams were not in competition with each other as that would jeopardize their learning. This also provided equal opportunities for success.

At the end of the chapter, the students took a posttest (see appendix C). The two tests of each student were compared to see to what extent the student had improved in geometry.

Again, the day after this posttest, the students received the two surveys. The surveys from each student were compared to determine any changes in the attitudes towards school. From the surveys it was determined what effect the two different treatments had on the students' anxiety level during mathematics and their interest in mathematics. All tests and surveys were collected and analyzed by the researcher.

All four tests were worth the same numerical value. The researcher found the difference between the first pretest and the first posttest for each student. This number was compared to the difference found between the second pretest and the second posttest. Comparisons were made to determine whether a significant difference occurred between the two teaching methods.

Description of the Instrument

The study used a multi-instrument data collection approach. The first instruments were the pretests and posttests (see appendices A & C). The skills that were tested came from the fifth grade curriculum.

The surveys served as an instrument to collect data (see appendix B). Two surveys were used in this study. The surveys were one page in length. For each item, the students marked on the scale what best described their feelings on the question. The

students' responses were converted to a numerical system, either a one, two, three, four, or five. Each student received two scores after the first treatment, and two scores after the second treatment. A low numerical value represented an overall good feeling towards school or mathematics. A high score represented a negative feeling towards school or mathematics. The students circled one of the two choices for the question on their working style preference. Each student also circled their favorite academic subjects based on the four choices given.

Chapter IV

Analysis of Findings

Introduction

Researchers have come to agree that cooperative learning is a valuable component of classroom learning (Panitz, 2000). The effects of cooperative learning strategies on fifth grade achievement in mathematics was studied in this research. The design of this research also studied the extent cooperative learning has on generating mathematical interest and reducing mathematics anxiety. This study utilized a pretest - posttest, one group design. The subjects were exposed to two treatments, TIM and CLIM. Surveys were also utilized to determine the effects the treatments had on anxiety levels and interest in mathematics.

Results of Mathematical Achievement

Several tests were used to was used to analyze the data. A *t* test was performed on the test data. The difference was found between the first pretest and the first posttest. Then the difference was found between the second pretest and the second posttest. Table 1 lists the individual scores on each test along with the individual differences. The mean and standard deviation were also computed. The mean for the first pretest was 50 with a standard deviation of 26.65. The mean for the first posttest after the traditional treatment was 82.62 with a standard deviation of 14.19. The mean for the second pretest was 32.38

with a standard deviation of 16.09. The mean for the second posttest after the cooperative learning treatment was 78.24 with a standard deviation of 13.11 (see table 1).

table 1

Raw Scores of Mathematics Tests Shown as Percentages

Student #	Pretest 1	Posttest 1	Pretest 2	Posttest 2
1	10	87	10	52
2	50	73	10	48
3	70	87	20	70
4	70	87	30	83
5	60	93	30	71
6	30	70	30	83
7	50	80	10	79
8	10	73	20	75
9	40	93	40	79
10	40	93	20	83
11	80	93	50	75
12	40	80	40	83
13	40	40	20	90
14	10	93	40	88
15	70	93	60	75
16	10	53	20	58
17	100	87	60	92
18	80	93	60	100
19	40	87	40	88
20	80	93	30	79
21	70	87	40	92
Mean	50.00	82.62	32.38	78.24
Std. Deviation	26.65	14.19	16.09	13.11

Next the researcher analyzed the data using a post hoc test using multiple comparisons. This found the mean differences necessary to determine the average increase of points. The mean difference is significant at the p = .05 level. The difference of means score when comparing the first pretest with the first posttest was 32.62. A significance value of .000 was obtained which was significant at the p = .05 level. The difference of means when comparing the second pretest with the second posttest was 45.86. A significance value of .000 was obtained which was significant at the p = .05 level (see table 2).

table 2

Mean Difference Comparisons

Tests	Mean Difference	Significance level
Pretest 1 and Posttest 1	32.62*	.000
Pretest 2 and Posttest 2	45.86*	.000

* The mean difference is significant at the .05 level.

The data indicates a larger mean difference between pretest 2 and posttest 2 than the mean difference between pretest 1 and posttest 1. There is sufficient evidence to support the first hypothesis. There was a significant difference in the mathematical achievement of fifth grade students, when they were taught mathematics through cooperative learning strategies as compared to the mathematical achievement of the same fifth grade students when they were taught mathematics through traditional instructional methods.

Results of Mathematics Anxiety and Interest

T tests for independent samples were performed on two groups of data. Comparisons were made for the differences between the surveys for pre-CLIM and post-CLIM. The results of survey #1 are shown in table 3. A low numerical value represented an overall good feeling towards school, with the possible lowest for each question being one. A high numerical value represented a negative feeling towards school, with the possible highest for each question being five. For five out of six questions, in the post-CLIM survey #1, the mean numerical value decreased. This indicated that the students feelings toward school slightly improved after being taught mathematics through CLIM. The numerical value for question letter C stayed the same.

table 3

Group Statistics for Survey #1 Questions A - F

Question	Occurrence of survey	Mean	Std. Deviation	Std. Error Mean
A	pre-CLIM	3.10	1.22	.27
	post-CLIM	2.76	1.18	.26
B	pre-CLIM	2.43	.81	.18
	post-CLIM	2.24	.89	.19
C	pre-CLIM	2.52	1.08	.24
	post-CLIM	2.52	1.03	.22
D	pre-CLIM	1.76	.94	.21
	post-CLIM	1.57	.87	.19
E	pre-CLIM	2.71	.72	.16
	post-CLIM	2.48	.68	.15
F	pre-CLIM	2.29	.96	.21
	post-CLIM	2.10	.89	.19

N = 21

Survey #1 also asked questions two questions about favorite academic subject and the preference of working alone or in a group. Before cooperative learning nine students out of 21 chose mathematics as their favorite academic subject. After cooperative

learning 12 students chose mathematics as their favorite academic subject (see table 4). Cooperative learning did generate more interest in mathematics. Twelve students preferred to work in groups before cooperative learning. After cooperative learning 15 students preferred to work in groups (see table 5).

table 4

Results of Favorite Academic Subject from Survey #1

Academic Subject	Pre-CLIM	Post-CLIM
Social Studies	4	1
Science	6	6
Math	9	12
Language Arts	2	2

table 5

Results of Working Style from Survey #1

Preference of working	Pre-CLIM	Post-CLIM
Alone	9	6
With a group	12	15

Comparisons were made of survey #2 between the pre-CLIM surveys and the post-CLIM surveys. The results of survey #2 are shown in table 6. A low numerical value represented an overall good feeling towards school, with the possible lowest for each question being one. A high numerical value represented a negative feeling towards school, with the possible highest for each question being five. The numerical values for each question before the treatment do not show high mean anxiety levels toward mathematics in this fifth grade class. However, five out of six questions showed a decrease in the mean value after the treatment. This indicates that the feelings of the

students towards mathematics improved after CLIM. Question letter C showed a numerical value increase.

table 6

Group Statistics for Survey #2 Questions A - F

Question	Occurrence of survey	Mean	Std. Deviation	Std. Error Mean
A	pre-CLIM	2.76	1.34	.29
	post-CLIM	2.43	1.25	.27
B	pre-CLIM	2.33	.91	.20
	post-CLIM	2.10	.89	.19
C	pre-CLIM	2.38	1.16	.25
	post-CLIM	2.52	1.21	.26
D	pre-CLIM	1.71	.90	.20
	post-CLIM	1.57	.87	.19
E	pre-CLIM	2.38	1.07	.23
	post-CLIM	2.14	.73	.16
F	pre-CLIM	2.24	1.00	.22
	post-CLIM	2.14	1.01	.22

N = 21

Survey #2 also asked the students to choose their individual working style when doing mathematics, alone or with a group. Before the treatment, 10 students indicated they preferred to work alone when doing mathematics, while 11 preferred a group. After CLIM, six students preferred to work alone and 15 preferred in work with a group when doing mathematics (see table 7).

table7

Results of Working Style from Survey #2

Preference of working	Pre-CLIM	Post-CLIM
Alone	10	6
With a group	11	15

Chapter V

Summary, Conclusions, & Recommendations

Introduction

Many advantages for students and teachers have been generated in math class by the extensive use of cooperative learning techniques (Panitz, 2001). Cooperative learning methods have been cited as a means for improvements in both student achievement and the quality of students' interpersonal relationships (Slavin, 1991). This research studied the effects of cooperative learning strategies on fifth grade achievement in mathematics. This study utilized a pretest-posttest, one group design. The subjects were exposed to two treatments. The design of this research also studied the extent cooperative learning has on generating mathematical interest and reducing mathematics anxiety. The data for this study shows that there was a greater improvement in grades when utilizing the cooperative learning instructional method.

Summary of the Problem

This study investigated the effects of cooperative learning on mathematical academic achievement. The goal was to answer the question, "Would there be a difference in mathematics achievement when fifth grade students were taught by cooperative learning instructional methods instead of traditional instructional methods?"

The study also focused on the effects of cooperative learning on subject interest and anxiety levels towards mathematics. The question was, "Would cooperative learning, when used in mathematics class, reduce mathematical anxiety and generate more interest in the subject matter?"

Summary of the Hypothesis

There were two hypotheses stated in this study. The first stated that there would be a significant difference in the mathematical achievement of fifth grade students when they were taught mathematics through cooperative learning strategies than fifth grade students who were taught mathematics through traditional instructional methods. The second hypothesis stated that fifth grade students who experienced mathematics through cooperative learning would have reduced mathematics anxiety and generate more mathematical interest than fifth grade students who experienced mathematics through traditional instructional methods.

Summary of the Procedure

This study utilized a pretest-posttest, one-group design with two different treatments. The subjects were given a pretest on two-digit division. They were then taught two-digit division by the TIM, the first treatment. A posttest was then given to the subjects. The pretest and posttest were compared to determine whether there was a significant difference after the treatment.

The subjects were then given a pretest on geometry. The treatment, CLIM, was introduced to teach geometry to the subjects. Finally the subjects were given a posttest. Again the two tests were compared to determine whether there was a significant difference after the treatment.

This study also utilized two surveys that served as an instrument to collect data. The two surveys were given to the subjects the day after each of the posttests. Each student received two scores after the first treatment and two scored after the second treatment. A low score would represent an overall positive feeling towards mathematics or school whereas a high score would represent a negative feeling. All test and surveys were collected and analyzed by the researcher.

Summary of the Findings

The mean difference that was found between the first pretest and the first posttest was 32.62 with a significance value of .000. The mean difference that was found between the second pretest and the second posttest was 45.86 with a significance value of .000. The data indicates a larger mean difference between pretest 2 and posttest 2 than the mean difference between pretest 1 and posttest 1.

Comparisons were made for the differences between the surveys for pre-CLIM and post- CLIM. The mean numerical value decreased, in the post-CLIM survey #1, for five out of the six questions. This indicates an increased positive attitude towards school. The post-CLIM survey #1 also showed an increase of students who choose mathematics as their favorite subject.

When comparing pre-CLIM survey #2 and post-CLIM survey #2, a decrease in the mean value was found in five out of the six questions. This indicates that the feelings of the students towards mathematics improved after CLIM. A comparison also found that after the treatment an increased number of students preferred to work with groups rather than alone when doing mathematics.

Conclusions

The results of this study indicated that there was a significant difference in the mathematical achievement of fifth grade students when using cooperative learning strategies as compared to traditional mathematics instruction. This study supports the results of previous studies that have also shown a favorable significant difference when using cooperative learning to teach mathematics as well as other subjects.

According to the pre-CLIM survey #2, the mean scores did not show that many students were suffering from mathematics anxiety, which was an assumption among other research. However the post-CLIM survey #2 did show a decrease in the mean numerical value which indicates that after the treatment the students' feeling positively increased towards mathematics. Fifth grade students who experienced mathematics through cooperative learning did have reduced mathematics anxiety than the fifth grade students who experienced mathematics through traditional instructional method. This study also found that the fifth grade students who experienced mathematics through cooperative learning did increase their interest in mathematics than fifth grade students who experienced mathematics through traditional instructional methods.

Implications and Recommendations

Cooperative learning has proven to be a successful tool to be used in achieving positive results across grade levels and subject areas. Further research might utilize a larger sample along with a control group in order to generalize the results.

This study used rewards for outlined achievements during the cooperative learning treatment. However, during the traditional instructional treatment rewards were not used possibly affecting the results of this study. These rewards served as incentives to do well and earn improved grades. A study that utilizes a reward system during the

traditional instructional treatment as well as the cooperative learning treatment would be helpful to determine if the rewards had a significant effect on the increased achievement.

In this research, all members of a team had to turn in their homework in order for the members to receive an Anderson Apple. The researcher saw a marked increase in the number of students turning in homework. Whereas, roughly fifty percent of the students were handing in homework during the traditional instructional treatment, 95 to 100 percent of the students were handing in homework during the cooperative learning treatment. It would make sense that the students scores would improve simply due to practice outside of the classroom.

The researcher had not received formal cooperative learning training. A study examining the effects of cooperative learning when taught by teachers with the appropriate training versus cooperative learning when taught by teachers without the training would be interesting.

References

Andrews, S., McFeggan, C., & Patterson, C. (1998). Problems students encounter during math instruction in mixed-ability classrooms. Published master's thesis, Saint Xavier University, Illinois. (ERIC Document Reproduction Service No. ED436355)

Augustine, D.K., Gruber, K.D., & Hanson, L.R. (1989). Cooperation works! Educational Leadership, 47(4), 4-7.

Bell, F. (1978). *Teaching and learning mathematics*. Dubuque, IA: Wm. C. Brown.

Bernero, J. (2000). Motivating students in math using cooperative learning. Published master's thesis, Saint Xavier University, Illinois. (ERIC Document Reproduction Service No. ED446999)

Good, T.L., Reys, B.J., Grouws, D.A., & Mulryan, C.M. (1990). Using Work-groups in mathematics instruction. *Educational Leadership, 47*(4), 56-62.

Johnson, D.W., & Johnson, R.T. (1989). Toward a cooperative effort: A response to slavin. *Educational Leadership, 46*(7), 80-81.

Johnson, D.W., & Johnson, R.T. (1992). Positive interdependence: Key to effective cooperation. In R. Hertz-Lazarowitz & N. Miller, eds. *Interaction in Cooperative Groups: The Theoretical Anatomy of Group Learning*. Cambridge, MA: Cambridge University Press.

Johnson, D.W., & Johnson, R.T. (1994). Learning together. In S. Shlomo (ed). *Handbook of cooperative learning methods*.(p. 66-81). Westport, CT: Greenwood Press.

Kagan, S. (1990). The structural approach to cooperative learning. *Educational Leadership, 47*(4), 12-15.

Kagan, S. (1994). *Cooperative learning*. San Juan Capistrano, CA: Kagan Cooperative Learning.

Kennedy, L., & Tipps, S. (1994). *Guiding children's learning of mathematics*. California: Wadsworth.

Kumar, S., & Harizuka, S. (1998). Cooperative learning-based approach and development of learning awareness and achievement in mathematics in elementary school. *Psychological Reports, 82*(2), 587-591.

Mueller, A., & Fleming, T. (2001). Cooperative learning: Listening to how children work at school. *Journal of Educational Research, 94*(5), 259-269.

Mulryan, C.M. (1995). Fifth and sixth grader's involvement and participation in cooperative small groups in mathematics. *The Elementary School Journal, 95*(4), 297-310.

Panasuk, R., Stone, W., & Todd, J. (2002). Lesson planning strategy for effective mathematics teaching. *Education, 122* (4), 808-827.

Panitz, T. (2001). Using cooperative learning 100% of the time in mathematics classes establishes a student-centered interactive learning environment. Cape Cod Community College, Massachusetts. (ERIC Document Reproduction Service No. ED448063)

Putnam, J.(1997). *Cooperative learning in diverse classrooms*. Upper Saddle River, NJ: Prentice-Hall, Inc.

Rasmussen, K. (1999). Break the chain. *ASCD Curriculum Update*. 2-3.

Sharan, Y., & Sharan, S. (1990). Group investigation expands cooperative learning. *Educational Leadership, 47*(4), 17-21.

Slavin, R.E. (1982). *Cooperative Learning: Student Teams*. National Educational Association of the United States.

Slavin, R.E. (1983). When does cooperative learning increase student achievement. *Psychological Bulletin, 94*(3), 429-445.

Slavin, R.E. (1990). Research on cooperative learning: Consensus and controversy. *Educational Leadership, 47(*4), 52-54.

Slavin, R.E. (1991). Synthesis of research on cooperative learning. *Educational Leadership, 48*(5), 71-82

Slavin, R.E. (1995). *Cooperative learning: Theory, research, and practice*. (2nd ed). Boston: Allyn & Bacon.

Appendix A

Pretest 1 and Posttest 1

Pretest 1

Name_____ Date_____

Write the correct answer for each.

Show your work.

Divide.

1. $30\overline{)150}$

2. $40\overline{)3{,}200}$

Use compatible numbers to estimate each quotient.

3. $22\overline{)769}$

4. $16\overline{)394}$

Divide. Show your work.

5. $14\overline{)326}$

6. $24\overline{)502}$

Solve.

7. A 70-inch length of ribbon was cut into 14 equal parts. What length is each part? Show your work. Explain.

This table shows the quiz scores for 12 students. Use the table to answer questions 8 - 10.

Quiz Scores

Boys	Girls
72	**74**
79	**81**
80	**86**
89	**94**
96	**99**
100	**100**

8. How many points were earned altogether by the girls?

_____

9. What is the average score of the boys?

_____

10. How many boys and girls scored more than 80 points on the quiz?

_____

Posttest 1

Name_____ Date_____

Write the correct answer for each.

Show your work.

Divide.

1. $40\overline{)120}$

2. $50\overline{)3,500}$

Use compatible numbers to estimate each quotient.

3. $19\overline{)303}$

4. $72\overline{)2,810}$

Divide. Show your work.

5. $13\overline{)419}$

6. $16\overline{)1,248}$

Solve.

7. A bicycle wheel is spinning around 240 times each minute. How many times is it spinning around each second? (1 minute = 60 seconds) Show your work. Explain.

This table shows how 6 boys and 6 girls responded when asked: "How many pets do you have?" Use the table to answer questions 8 - 10.

Quiz Scores

Boys	Girls
1	**0**
2	**1**
2	**1**
2	**2**
4	**3**
7	**5**

8. How many pets are shown altogether in the table?

_____

9. What is the average number of the pets that the girls have?

_____

10. How many students said they have more than 1 pet?

_____

Appendix B

Surveys

Student Survey #1

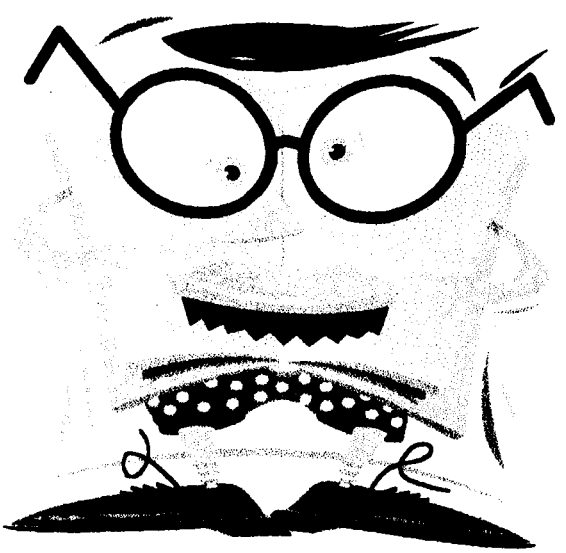
Please mark on the scale what best describes your feelings for the following question.

When I think of school, I think.....

A.	Very Interesting	Interesting	Neutral	Boring	Very Boring
	1	2	3	4	5
B.	Very Happy	Happy	Neutral	Sad	Very Sad
	1	2	3	4	5
C.	Very Easy	Easy	Neutral	Hard	Very Hard
	1	2	3	4	5
D.	Very Important	Important	Neutral	Useless	Very Useless
	1	2	3	4	5
E.	Very Excited	Excited	Neutral	Nervous	Very Nervous
	1	2	3	4	5
F.	Very Good Grades	Good Grades	Average Grades	Bad Grades	Very Bad Grades
	1	2	3	4	5

Circle your favorite academic subject.

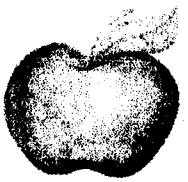
Social Studies **Science** **Math** **Language Arts**



Please circle

I like to work (alone with a group).

Student Survey #2



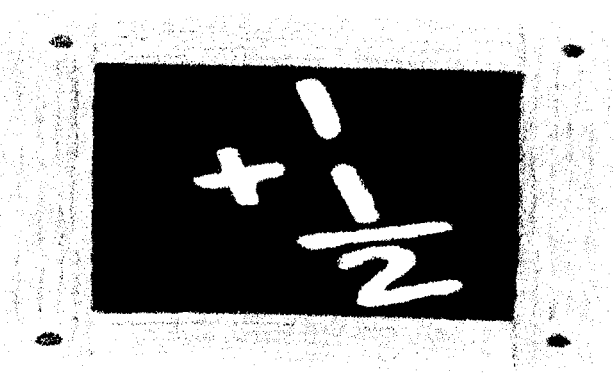
Please mark on the scale what best describes your feelings for the following question.

When I think of Math, I think.....

A.	Very Interesting	Interesting	Neutral	Boring	Very Boring
	1	2	3	4	5
B.	Very Happy	Happy	Neutral	Sad	Very Sad
	1	2	3	4	5
C.	Very Easy	Easy	Neutral	Hard	Very Hard
	1	2	3	4	5
D.	Very Important	Important	Neutral	Useless	Very Useless
	1	2	3	4	5
E.	Very Excited	Excited	Neutral	Nervous	Very Nervous
	1	2	3	4	5
F.	Very Good Grades	Good Grades	Average Grades	Bad Grades	Very Bad Grades
	1	2	3	4	5

Please circle

When doing math I like to work (**alone** **with a group**).



Appendix C

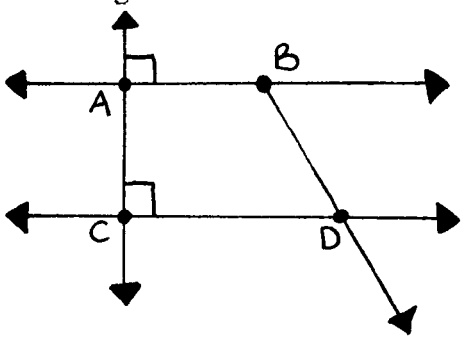
Pretest 2 and Posttest 2

Pretest 2

Name_____ Date_____

Write the correct answer for each.

Use the figure below to answer 1 - 3.



1. Name two lines that are parallel.

_____

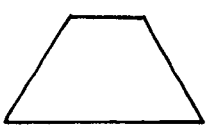
2. Name two lines that are perpendicular.

_____

3. Name a right angle.

_____

Name each figure. Be as specific as possible.

4. 

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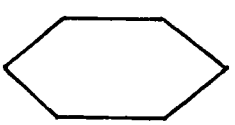
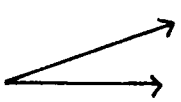
5. 

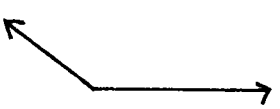
_____

6. What type of angle is this?



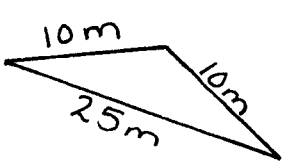
_____

What type of angle is this?



_____

7. Classify each triangle by it ***angles and sides***.



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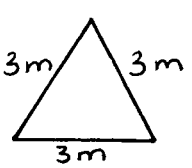
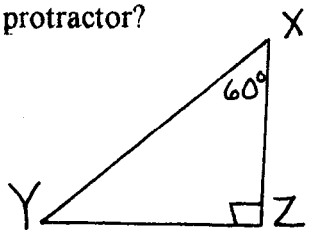


_____

8. What is the measure of $\angle$ Y in $\triangle$ XYZ, without using a protractor?



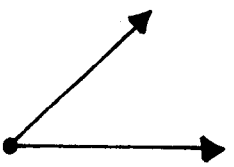
_____

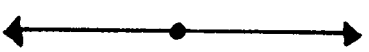
9. How many sides does a pentagon have?

_____

Using a protractor measure each angle and write the name of each angle.

10. 

11. 

12. 

Using a protractor draw each angle and write the name of each angle.

13. 180°

14. 50°

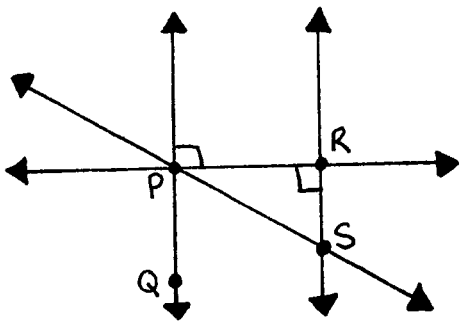
15. Draw an acute triangle.

Posttest 2

Name_____ Date_____

Write the correct answer for each.

Use the figure below to answer 1 - 3.



1. Name two lines that are parallel.

_____

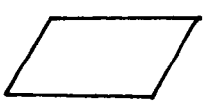
2. Name two lines that are perpendicular.

_____

3. Name a right angle.

_____

Name each figure. Be as specific as possible.

4. 

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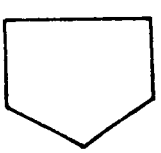
5. 

_____

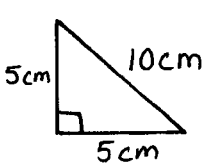
6. What type of angle is this?

_____

What type of angle is this?

_____

7. Classify each triangle by it ***angles and sides***.



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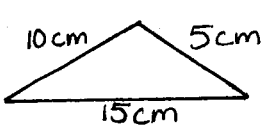

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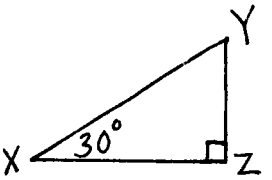
Posttest 2

8. What is the measure of $\angle Y$ in $\triangle XYZ$, without using a protractor?



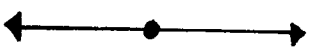
_____

9. How many sides does a hexagon have?

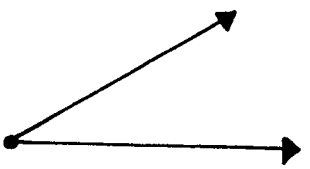
_____

Using a protractor measure each angle and write the name of each angle.

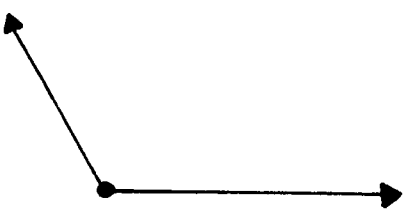
10.



11.



12.



Using a protractor draw each angle and write the name of each angle.

13. 90°

14. 150°

15. Draw an obtuse triangle.

Appendix D

Anderson Apples

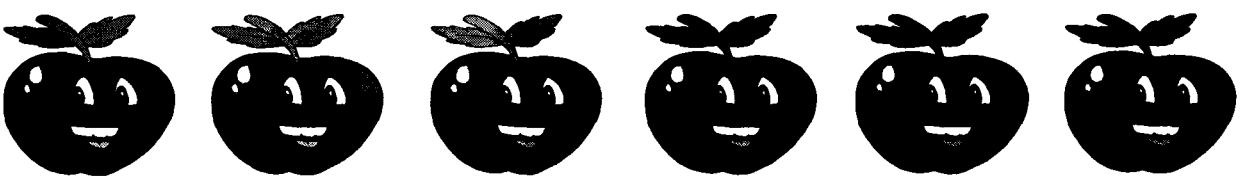
For the next few weeks you will be working with your team to learn and study geometry. Your team will be learning together. It is going to be important for you to help each other learn chapter 7 which is on geometry. For the next few weeks you will be receiving your individual grade for tests but your team will also receive a group score, which will be determined by how much your whole group improves from one test to the next. When teams show improvement, apples will be rewarded.

The Anderson Apples chart shows the way you and your team can earn apples. Your teams are NOT in competition with each other. Every group has an equal opportunity to earn apples.

Your team has made rules and each teammate has signed and agreed to these rules. This means you must follow them.

Read the Anderson Apples chart. Notice that you could earn 1 apple just by having everyone on your team turn in his or her homework. My suggestion is that your team choose one person to be in charge of making sure each teammate is doing their homework.

Each member is responsible for keeping his or her apples. These apples may be turned in every Friday for prizes.



Anderson Apples

Team has 100% homework participation
each member receives..... 

Team has 100% homework participation for
entire week - each member receives ..... 

Exceptional cooperation among team members
each member receives ..... 

An "A" on any quiz or test
you receive..... 

Any improvement in graded score
you receive ..... 

For every improvement of 10 points on a test or quiz
you receive ..... 

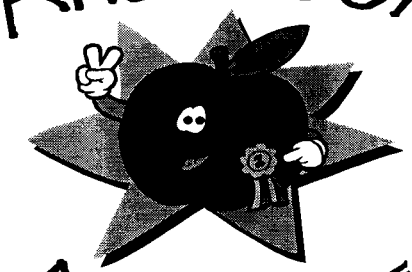
If the team average score increases
each member receives ..... 

For every 10 point improvement to team average
each member receives ..... 

If the team average is an "A"
each member receives ..... 

Tickets may be turned in for rewards every Friday.

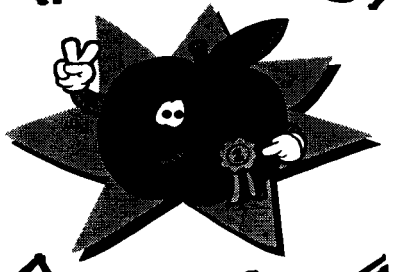
Anderson



1 1

Apples

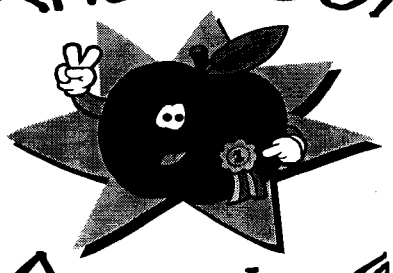
Anderson



1 1

Apples

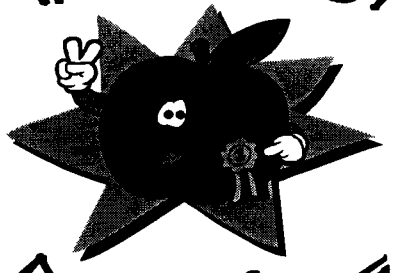
Anderson



1 1

Apples

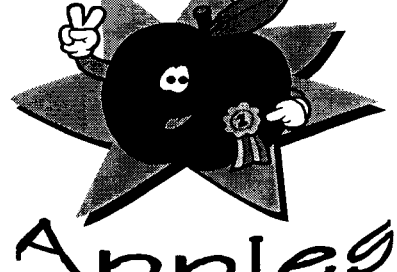
Anderson



1 1

Apples

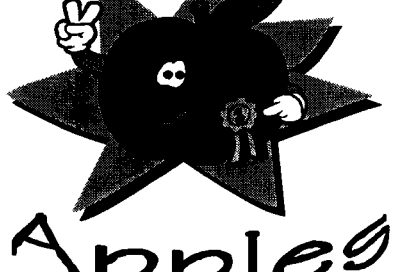
Anderson



1 1

Apples

Anderson



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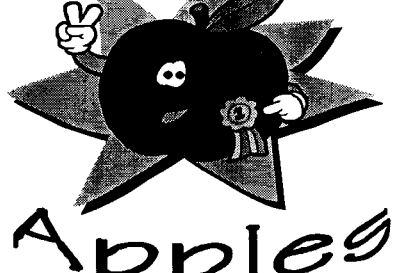
Apples

Anderson



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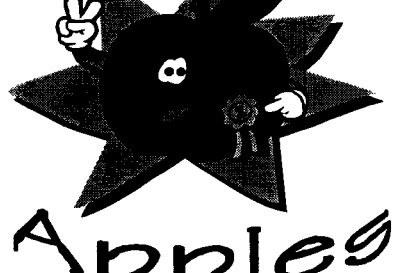
Apples

Anderson



1 1

Apples

VITA

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