THE IMPACT OF A COOPERATIVE LEARNING PROGRAM
ON THE ATTITUDES OF SIXTH GRADE STUDENTS TOWARD SCIENCE

MASTER'S PROJECT

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# TABLE OF CONTENTS

## CHAPTER:

**INTRODUCTION** .............................................................................................................. 1  
  Purpose for the Study ................................................................................................. 1  
  Problem Statement .................................................................................................... 3  
  Hypothesis ................................................................................................................ 3  
  Assumptions .............................................................................................................. 4  
  Limitations ................................................................................................................ 4  
  Definition of Terms .................................................................................................. 5  

**REVIEW OF THE RELATED LITERATURE** ............................................................... 6  
  Types of Cooperative Learning ................................................................................ 6  
  Classroom Organizaiton for Cooperative Learning ................................................. 8  
  Positive Effects of Cooperative Learning ............................................................... 12  
  Negative Effects of Cooperative Learning ............................................................... 15  
  Summary ................................................................................................................... 17  

**PROCEDURES** ............................................................................................................. 18  
  Subjects ..................................................................................................................... 18  
  Setting ......................................................................................................................... 18  
  Data Collection ......................................................................................................... 19  
  Design ......................................................................................................................... 20  
  Treatment .................................................................................................................... 20  

**RESULTS** .................................................................................................................... 24  
  Presentation of the Results ....................................................................................... 24  
  Discussion of the Results ......................................................................................... 26  

**SUMMARY, CONCLUSION, AND RECOMMENDATIONS** ........................................ 31  
  Summary ................................................................................................................... 31  
  Conclusion ................................................................................................................ 32  
  Recommendations .................................................................................................. 32  

**APPENDICES** ............................................................................................................. 34  

**BIBLIOGRAPHY** ........................................................................................................ 37
CHAPTER I

INTRODUCTION

Purpose for the Study

Throughout its history America has undergone many changes in the area of education. Disappearing are the rows of single desks separated by aisles in a classroom where one teacher controlled the learner's activities in a traditional manner. The traditional education with its pattern of teacher-directed recitation has given way to different models of teaching.

In order for students to learn the academic content and to prepare for a successful role in society, cooperative learning, one of the more current models, is an alternate approach used in contemporary education. Cooperative learning is a method of learning that will help prepare students for their role in a changing technological society where problems are solved by teams rather than independently (Johnson and Johnson, 1986).

Cooperative learning has a positive effect on students' attitudes toward subject matter and also on learning the basic skills. Children and adults learn more and achieve more when they work in groups and actually have more fun than if working alone. Students have a more positive attitude and are more relaxed toward the subject area and learning experiences. (Slavin 1990).

The role of the teacher in cooperative learning is different than the role of the teacher in a teacher-directed classroom. The teacher works as a facilitator or director and
the students work as research teams. This approach is “a great way to teach science”.
(Small and Petrek, 1992).

In response to a study that teachers and students spend more time learning science by using a science textbook than by using laboratory equipment and materials, Jones and Steinbrink (1989) developed cooperative learning models for use in the science classroom. Their study group approach, leaning science by reducing memorization and increasing student interaction, improved learning for all team members. At the same time students learn the social skills needed to cooperate in achieving academic and social goals.

How effective is cooperative learning in improving the student’s attitude toward science? Studies show a positive relationship between achievement of scores and attitudes towards science (Hough, 1982).

The writer believes that a student’s attitude toward science can reflect on his or her success in one subject. The writer also believes that students who have an active role in science can have positive experiences because the lessons are meaningful and enjoyable. Cooperative learning has a positive effect on the students’ attitudes toward the subject (Sharan, 1990). Students in an activity-centered classroom develop more positive attitudes about science that those who do not (Johnson, Ryan, and Schroeder, 1974).

Research shows that teaching science through cooperative learning methods has influenced several aspects of the learning environment: positive attitudes toward science,
student cooperation, an active involvement in learning, and individual self-motivation. The results of a study by Humphreys (1982) indicated that cooperative learning experiences promoted greater mastery and retention of the material being taught as well as more positive attitudes toward the experience than individual learning experiences.

In order to carry out this project, the researcher will use several different cooperative learning methods. The methods are Student Teams Achievements Division (STAD), Teams-Games-Tournaments (TGT), Group Investigation, Jigsaw and Jigsaw II, and Tutorial.

Problem Statement

The purpose of this study was to analyze the attitudes of sixth grade students after they have been taught specific science concepts by using the cooperative learning method.

Hypothesis

There will be no significant difference in pre and posttest mean scores of sixth grade students’ attitudes toward science after they have been exposed to a series of cooperative learning strategies.

There will be no significant difference in pre and posttest mean scores of sixth grade male attitudes toward science after they have been exposed to a series of cooperative learning strategies.
There will be no significant difference in pre and posttest mean scores of sixth grade female attitudes toward science after they have been exposed to a series of cooperative learning strategies.

Assumptions

In order to carry out this project the writer assumes that the semantic differential method of measuring attitudes is reliable (Osgood et al., 1957). The writer assumes that the subjects taking the semantic differential will answer honestly. The writer assumes that the sample size to be used in this project is large enough to make it valid.

Limitations

There may be several limitations to this study. The first limitation is that in using the T1 x T2 design there is no control group. A second limitation is the fact that this study will take place toward the end of the third quarter, Spring vacation, and proficiency testing when the students’ attention span is not focused. Several other limitations are factors which affect internal and external validity. One of these limitations of this study may be the maturation process of subjects who participated. Several other limitations are factors which affect internal and external validity. Experience outside the study may affect it, such as specific events occurring between the first and second measurement in addition to the experimental variable, cooperative learning. Measurement involves the processes within the subjects operating as a function of time and hunger, fatigue, attention span, and testing and its effects.
Definition of Terms

**Cooperative Learning** is an instructional approach that integrates social skills objectives with academic content objectives in education.

**Attitude** is the student’s positive or negative feelings toward a given topic.

**Learning Environment** refers to the social aspects of the classroom and the school where the learning process occurs, to the relations among teachers and among students, and between teachers and students.

**Student Learning Teams** are four-member teams working together to master material initially presented by the teacher.

**Heterogeneous Teams** are usually formed by having a high, two middle, and a low achieving student on each team; and attempting to make sure the team is composed of males and females as well as ethnic diversity.
CHAPTER II

REVIEW OF THE RELATED LITERATURE

The purpose of this chapter was to review the literature on cooperative learning. It is divided into the following four subsections: types of cooperative learning, organization for cooperative learning, positive effects of cooperative learning, and negative effects of cooperative learning.

Types of Cooperative Learning

One type of cooperative learning is Student Teams Achievement Divisions (STAD). Each team of four or five members is a microcosm of the entire class made up of boys and girls, all performance levels, and students of different racial backgrounds. Team members study together, sometimes in pairs, use worksheets, practice quizzes, and have discussions. Each student is on his own for the quiz and his contribution to the team is based on how much the quiz score improves. (Slavin, 1991).

Another form of cooperative learning similar to STAD is called the Home Team. The Home Team members work together for up to six weeks at a time. The goal is to improve learning for all team members by minimizing memorization and maximizing student interaction (Jones and Steinbrink, 1991).

Teams-Games-Tournaments (TGT) is another cooperative learning approach which involves competition. In TGT students play academic games to show their individual mastery of the subject matter (Slavin, 1988, 1991). Teams of three students
compete for about six weeks using weekly tournaments instead of tests. Equal competition makes it possible for students of all levels to contribute maximum points for their teams if they do their best.

Group Investigation is a type of cooperative learning that involves students working in a small heterogeneous group to create a specific end product (Johnson, Johnson, and Holubec, 1988). Diverse talents, skills, or viewpoints are needed to complete the project which can be as elaborate as a newspaper or as basic as a list of ideas to be developed later.

Two other types of cooperative learning that are similar to each other are Jigsaw and Jigsaw II. In the Jigsaw method students are assigned to six-member teams and the lesson divided into five sections. Each team is assigned a different section and members of the different teams meet in “expert groups” to discuss their section. The only way students can learn about the other sections is to listen to teammates so they are motivated to be interested in each other’s work. (Slavin, 1988). Jigsaw II is a modification of Jigsaw I and assigns students to four or five-member groups. Each student receives a topic on which he becomes an expert and returns to teach their teammates (Slavin, 1988). The collaboration requires a group processing of the information that is studied and exchanged. Students explain how they reach a conclusion (Davidson and Worsham, 1992; Presseisen, 1992).
An effective one-on-one type of cooperative learning is Tutorial. Tutorial is the pairing of younger and older students to individualize and reinforce lessons for younger students. It provides younger students with a review of the concepts they have been learning and supplementary activities to help them develop process skills. The older students received an excellent review of the concepts they are teaching (Blume, 1986). In his “Success for All” program design, Slavin said that one of the most important elements of its success was the use of tutors to support students’ studies. One-to-one tutoring is the most effective form of instruction known (Slavin, 1990).

There are several types of cooperative learning which have influenced methods of education. In order to understand how these types can be effective in the classroom it is necessary to understand how the classroom is organized for cooperative learning. That background is discussed in the next section.

**Classroom Organization for Cooperative Learning**

Organizing cooperative learning in a classroom requires that the room environment is constructed in a way to foster cooperative learning. Hyer and Eckhardt (1993) suggest that teachers put desks together to make laboratory tables or put in tables. In cooperative learning the authors state that there are many group-learning activities that can be done in an academic setting that will enable students to learn how to work together. Hyer and Eckhardt (1993) stated, “Doing science experiments is more fun in a group because students can share equipment and knowledge, learn how to make charts
and graphs together, discuss the outcomes of the experiments, and come to conclusions together."

A study by Johnson and Ryan (1993) showed that students who interacted with concrete materials such as batteries, bulbs, and answered questions about science developed more positive attitudes than sixth grade students studying similar subject matter from a textbook. The results of this study suggested that teachers interested in the positive attitudes of their students toward science should have concrete materials for their students to work with.

An environment that is perceived to be warm may support higher levels of student participation which had been identified as having a positive effect on academic achievement. (Voelkl, 1995). This type of learning environment refers to the social aspects of the classroom and the school where the learning process occurs. Sharan (1990) found that cooperative learning influenced certain aspects of the learning environment such as positive attitudes toward science and student cooperation.

Cooperative learning also provides an environment for mastering two of the most essential skills in learning to be an effective thinker: posing good questions and formulating significant problems. With properly designed tasks and with appropriate materials, cooperative learning can facilitate students’ group learning skills (Presseisen, 1992).
Organizing cooperative learning in a classroom requires the formation of learning teams. The way a teacher sets up classroom groups is an important determinant of attitudes. Creation of a democratic atmosphere and situations involving cooperation affects attitudes. Studies show that a group which was allowed to choose its own leader for its activities did a better job than a group for whom the leader was picked by the teacher, even though the teacher’s choice was intellectually superior. (Blair, Jones, and Simpson, 1967).

As important as heterogeneous teams are to cooperative learning, teachers should also use random groups, interest teams, and homogeneous teams. If heterogeneous teams are always used, the high achievers would never interact to be motivated by each other, and the low achievers would never be on the same team which would allow them to be leaders (Kagan, 1992).

Students need to be taught how to work in a learning team so they do not think in terms of “my project,” but view the experience as a group project or experiment. In a successful cooperative learning situation each student has a clear sense of purpose and respect for the other students (Martens, 1990).

Classroom organization for cooperative learning requires a supportive teacher who provides appropriate materials. The teacher must also encourage student initiative and encourage cooperative team effort for the cooperative learning activity to be successful. (Johnson and Ryan, 1974).
Organizing cooperative learning in a classroom requires the teacher’s role as a facilitator by providing students with activities that encourage cooperation and thinking skills. The teacher’s responsibility is to organize learning activities that lead to group achievement (Charles, 1989). Several studies focus on cooperative learning as a major approach to organizing the thinking classroom. One of the most important aspects of combining cooperative learning and teaching thinking in a classroom is that they provide a context in which many students can spend more school time actively engaged in learning and the solving of problems (Presseisen, 1992).

The teacher’s role in a cooperative learning classroom is to involve students so their cooperation has a positive effect on their learning as does adult action. Teachers can facilitate this process by serving as models and mediators (Atkinson & Green, 1990). The teacher’s task is to move around the classroom unobtrusively observing each group. If a group does not seem to be interacting well, the teacher should assume the role of questioner, doer, prober or summarizer until the group begins to get on with their task (Martens, 1990). The teacher creates opportunities for students to investigate and clarify their understanding by actively exchanging and using one another’s ideas. Teachers thereby lead children to value their own contributions and to appreciate peers as a learning resource. How well children use peer interaction to increase their learning depends upon teacher’s awareness of how task organization, learner contributions, the
reward system, and the teachers orientation can foster cooperative peer interaction and shared learning (Minuchin and Sharpiro, 1983).

In Johnson & Ryan's study (1973) of cooperative learning, the materials were readily available and students controlled their investigations for the most part. In the classroom organization for this study the teacher's role was one of asking questions to investigate or expand the actions of the students. The Elementary School Science experiment showed that students dealing with materials to answer questions in an activity-centered approach develop more positive attitudes about science than those who do not. The teacher planned group process activities to help the students learn to work together and used various models of cooperative learning (Sleeter & Grant, 1994).

Classroom organization is vital to the success of cooperative learning. The physical arrangements of the desks and tables for the work area of the teams, the materials provided, and the teacher's supportive attitude allows for positive effects on cooperative learning. The positive effects of cooperative learning are presented in the next section.

**Positive Effects of Cooperative Learning**

Cooperative learning has a positive effect on the students' attitudes toward the subject (Sharan, 1990). Schroeder's Elementary School Science project under the auspices of the National Science Foundation showed that students dealing with materials in order to answer questions in an activity-centered classroom develop more positive
attitudes about science than those who do not (Johnson, Ryan & Schroeder, 1974).

Cooperative learning has a positive effect on student attitudes toward the subject matter and on learning the basic skills (Slavin, 1989; Humphreys, 1982).

A study by Hough (1982) investigated the relationship between elementary pupils’ attitudes towards science and science achievement. Results showed that teachers can teach for both positive attitudes and achievement. Hough refers to studies that show a positive relationship between achievement, science scores, and attitudes toward science.

Cooperative learning improves students’ attitudes toward school and increases achievement. According to Slavin (1990, 1991) cooperative learning methods can and usually do have a positive effect on student achievement. Greater achievement is typically found in situations where peers work together than in situations where individuals work alone. (Johnson & Johnson, 1991). Evidence from studies on designing a cooperative classroom shows that cooperative learning does have a positive effect on student achievement (Ajose, 1990; Voelkl, 1995).

Comparisons of students’ performances in competitive individual learning settings with cooperative learning showed that children in cooperative learning settings appear to have advantages in gaining understanding of the subject matter (Atkinson and Green, 1990). The results of Humphrey’s research indicated that cooperative learning promoted greater mastery and retention of material being taught as well as a more positive attitude toward the experience than did the individual learning experience.
Cooperative learning has a positive effect on students’ attitudes toward peers and in social interactions. A positive aspect of cooperative learning is the support and encouragement the students freely give to each other. Treboniak and Jaworski (1995) reported that the students took pride in helping others who were having difficulty with precise measurement. Blume (1986) also reported that older students took pride in their responsibility as tutors in working with younger students.

Sharan (1990) found that students’ improved attitudes toward classmates particularly of different ethnic backgrounds extended to classmates who were not participating in the same groups. One study in a self-contained school found that some cooperative learning methods increased positive interactions and friendships among students (Slavin, 1991). When teachers are facilitators, peer interaction results with students appreciating their own and their team members efforts. (Atkinson & Green, 1990; Smith, 1987).

Cooperative learning has a positive effect on attitudes toward self. One of the most important aspects of a child’s personality is his or her self-esteem. Several researchers have found that cooperative learning techniques increase students’ esteem (Slavin, 1991). In a shared learning environment, working and talking together to solve problems are viewed as self-rewarding behaviors that help develop self-motivated learners (Atkinson & Green, 1990). The older students take pride in their responsibility as tutors and younger students feel good about their knowledge and this enhances their

In summary, studies show that cooperative learning methods have a positive effect on students’ attitudes in the learning process. Cooperative learning improves attitudes toward the subject and has a positive effect on student achievement and on students’ attitudes toward peers, social interactions, and themselves. Studies also show that negative effects can result from cooperative learning methods. Negative effects and problems resulting from cooperative learning are discussed in the next section.

**Negative Effects of Cooperative Learning**

Cooperative learning has negative effects on some students’ attitudes toward group assignments. Often not all students do the required work on cooperative learning projects. Lower achieving members of the group may become dependent on the more advanced students to carry out the group assignments (Willis, 1990). One student ends up doing most of the work. This can be alleviated by group rewards and individual accountability (Slavin, 1990).

Cooperative learning has a negative effect on students’ work habits in team situations. Students working together in a cooperative learning environment have trouble staying on task (Slavin, 1987). Goals need to be well defined to promote cooperative learning for both the cooperative learning group and the individuals (Johnson and
Johnson, 1987). Cooperative learning methods must be properly structured to significantly accelerate the learning of all children. (Slavin, 1986; Voelkl, 1995).

Higher level students in some cooperative learning situations are required to work at a slower pace than they usually do because some cooperative learning techniques require peer tutoring and materials at a lower level. Some gifted education specialist say that students are not sufficiently challenged in the regular classroom and that in heterogeneous cognitive learning groups, gifted students often either carry the group or get bored and tune out. (Willis, 1990; Slavin, 1991).

Many elementary teachers continue to favor teacher-centered large group instruction in which all student work on the same task and in which much of the work depends upon a textbook, workbook or ditto sheets rather than use cooperative learning methods. (Sleeter & Grant, 1994). Despite the fact that cooperative learning has had such a positive effect on learning many teachers still feel uncomfortable with anything other than whole-class activities (Martens, 1990).

In the cooperative classroom several groups frequently conduct discussions at the same time in different areas of the room. A traditional teacher, who does most of the talking, fears that the interactive talk is disturbing to others and perhaps the talk is unproductive (Kagan, 1992).

Studies show that cooperative learning methods have negative effects. In cooperative learning situations not all students do the required work but depend on team
CHAPTER III

PROCEDURE

Subjects

The subjects chosen for this study consisted of twenty-five sixth grade students in the researcher's self-contained classroom. Of this heterogeneous group, twenty-one are Caucasian, one is Hispanic, one is African-American, and two are Asian. The group of students contained twelve girls and thirteen boys. The students are eleven and twelve years of age. The achievement levels of students from this study range from low to above average. At the time of this study, the students were assigned to cooperative learning teams of four. Each group consisted of one student of high ability, two of average ability, and one of low ability.

Setting

School. This small neighborhood school in which these subjects are enrolled is located in a suburban area in the southwestern part of Ohio. It is one of six public elementary schools in the school district. The school consists of two rooms of each grade level, kindergarten through sixth grade. Classes are self-contained and grouped heterogeneously. There are approximately 350 students in the building, but due to the number of transient students within the district, this number is always subject to change.

Community. The schools in this district are located in a suburban area in southwestern Ohio. The school used in this study is located within an upper middle class
members. Some students have difficulty staying on task. Students’ abilities cover a wide range and the cooperative learning method must be set up to meeting their abilities. Slavin (1990), Johnson and Johnson (1987), and Voelkl, (1995) offer suggestions to teachers to overcome or to prevent the negative effects.

**Summary**

In this chapter the researcher established four major areas which supported the project: types of cooperative learning, classroom organization for cooperative learning, positive effects of cooperative learning, and negative effects of cooperative learning Each area was discussed in reference to the role of cooperative learning methods in education.

The work of Slavin has influenced cooperative learning. Other contributors were Johnson and Ryan, classroom organization; Hyer and Eckhardt, room environment; and Martens, the teacher’s role.

Several studies showed the positive effects on cooperative learning on students’ attitudes toward the subject, their classmates, and themselves. Hough investigated the relationship between attitudes towards science and science achievement. Slavin and Kagan addressed the negative effects of cooperative learning. The independent contributions of these cooperative learning when combined have an impact on contemporary education.
neighborhood. Many of the parents are employed at a nearby military installation and neighboring universities. They are education-oriented parents who support the school.

Data Collection

Construction of the Semantic Differential. The writer constructed a semantic differential method to measure subjects' attitudes toward science. Word pairs of polar adjectives were based on Osgood, Suci and Tennenbaum (1995). The pretest instrument consisted of nineteen bipolar adjective pairs which were relevant to Science attitudes. The pairs were arranged so that the positive adjectives were randomly placed in a right or left position. Each subject conveyed his feelings about science by placing an “x” on one of the seven spaces on a line between each pair of bipolar adjectives. The posttest was constructed in the same format with the exception that the bipolar adjective pairs were arranged in a different order from the pretest. (see Appendix A and Appendix B for a copy of each semantic differential.)

Administration of the Data Collecting Instrument. The semantic differential pretest to measure attitude was given to all subjects before expose to the independent variable, a cooperative learning program. The students’ experience of the cooperative learning treatment involved daily sessions of forty minutes for a six-week period. The sessions consisted of activity based science lessons of reading, answering worksheets, studying conceptual diagrams, reviewing focused study items, and taking a unit test. At the end of the treatment students were tested again using the semantic differential
posttest. The direction for the tests were read aloud to the students in a whole-group setting at approximately 12:30 p.m. All students completed the tests and returned to the researcher.

**Design**

The writer used a classical T1 X T2 design in which an independent variable was used. It was a one experimental group, non-randomizing pretest-posttest design (Isaac, 1995).

<table>
<thead>
<tr>
<th>Pretest</th>
<th>Treatment</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>X</td>
<td>T2</td>
</tr>
</tbody>
</table>

The T1 represents the pretest attitudes toward science. The X refers to the independent variable of cooperative learning. The T2 represents attitudes toward science. This design was used for all three hypothesis.

**Treatment**

The independent variable for the writer’s quasi-experimental study was a cooperative learning team approach, which primarily Student Teams Achievement Divisions. (Slavin, 1990). The dependent variable was the subjects’ attitude toward science. Prior to the study, students were given a pretest to determine their attitude toward science. From the twenty-ninth of January to the eighth of March, the subjects were exposed to cooperative learning while studying an elementary science unit on space.
The study consisted of activity based science lessons including reading the worksheets, studying conceptual diagrams, reviewing focused study items, and taking a unit test.

The class was divided into six heterogeneous mixed ability groups. Five groups had four members consisting of two females and two males with one high, one low and two average ability students. The sixth group had five members with two females and three males. They were comprised of one high, one low and two average ability students.

These teams worked together to complete the activity-based lessons and to master concepts presented by the teacher. To facilitate team learning, the desks were arranged in groups of four or five. Each team member selected a job title which was based on the study of space. Each of these jobs had specific functions within the group and each job was rotated on a weekly basis. One person of each group was a member of the Communications Team. This team member was responsible for reading all directions for any activity or worksheet. A second member of each group belong to the Data Team. This team was responsible for filling in a group worksheet or writing down group answers to quizzes, games or other activities. The third team called the Navigation Team was responsible for gathering and returning any materials needed for the daily science lesson. The fourth team was the Probe Team which was responsible for cleanup and making sure all members were on task. Each Thursday team members would meet and discuss results of activities and knowledge learned during the week. This lesson used STAD and Jigsaw II (Slavin, 1988).
Each Friday the groups competed in a tournament based on Slavin’s Teams-Games-Tournaments (Slavin, 1990). The researcher presented a question to all six groups. Each group discussed all possible solutions to determine the correct answer. After one minute the teacher would call time. One person from each group would bring up the group’s answer written on a piece of paper. If the answer was correct, the team would put a tally mark under it’s number. The team with the most points at the end of the tournament was declared the winner. Winning groups received a ticket for the class prize box.

On Friday, a ten question quiz was given to the entire class. The group with the highest test score average for that week received five points extra credit towards their science grade. Any student who scored a one hundred per cent received a ticket for the class prize box.

On three Wednesdays throughout the study, sixth grade students paired up with kindergartners to teach them about space. The first visit involved a lesson about the planets and the sun. Each sixth grader teamed with a kindergartner to teach him a song about the planets. On the second visit the sixth graders taught their partners about the importance of the spacesuit. Then each pair created its own spaceman out of tissue rolls, foil and a styrafoam ball. The final activity consisted of making paper airplanes, helicopters and flying saucers. After each pair of students completed the project the flying machines were tested on how fast, how far and how high they would go. The
posttest was given after the completion of the cooperative learning treatment. Scores of the pretest and posttest were compared.
CHAPTER IV

RESULTS

Presentation of the Results

Subjects were given a science attitude pretest which consisted of nineteen pairs of bipolar adjectives that reflected students’ attitudes toward Science. The semantic differential pretest and posttest that were administered to the researcher’s class are located in Appendix A and Appendix B. There are seven spaces between each pair of adjectives. Each of these lines have a point value between one and seven. The line space closest to the positive adjective has a value of seven and the one closest to the negative adjective has a value of one. The other values were assigned according to their position. Each student placed a checkmark on the line that best represented his feelings toward science. In order to make a comparison between the pretest and the same students’ posttest a numbering system was used. Each student was given a pretest and posttest with the same number on it. After a six week period, a posttest was given to each subject. The test had the same format as the pretest except that the adjective pairs were rearranged. Twenty-five subjects consisting of thirteen boys and twelve girls participated in the study. The achievement levels of these students ranged from low to above average.

The table below shows the means, standard deviation and t scores for the three groups in relationship to class attitudes toward science when using the cooperative learning method. The first row in table one shows the means, standard deviations and t
scores for the male attitudes toward science. The second row in table one shows the results to the semantic differential instrument in relationship to the female attitudes toward science when using cooperative learning methods of teaching.

Table 1

Means, Standard Deviation, and t Scores for Groups

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>df</th>
<th>Pretest Mean</th>
<th>Posttest mean</th>
<th>S</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOYS</td>
<td>13</td>
<td>12</td>
<td>97.38</td>
<td>112.08</td>
<td>4.71</td>
<td>3.105</td>
</tr>
<tr>
<td>GIRLS</td>
<td>12</td>
<td>11</td>
<td>90.83</td>
<td>101.50</td>
<td>4.44</td>
<td>2.330</td>
</tr>
<tr>
<td>CLASS</td>
<td>25</td>
<td>24</td>
<td>94.24</td>
<td>106.96</td>
<td>3.20</td>
<td>2.702</td>
</tr>
</tbody>
</table>

The total scores from each hypothesis are grouped together and a difference was computed. This difference was used in determining the t test value. The degree of freedom (df) is 24 with a sample size of 25. The mean of the pretest was 94.24 and the mean of the posttest was 106.96. These values used to compute the standard deviation which were then used to compute the value of t (see table above). The value of t computed for the class was 2.702 which exceeds the .05 level of significance for a two-tailed test where t is 2.064 with 24 degrees of freedom. (Issac, 1995). The results for the males hypothesis are shown in Table 1. With the sample size of 13, the degree of freedom is 12. The mean of the pretest was 97.38 and the mean of the posttest was 112.08.
The values for the males were used to complete the standard deviation which were then used to compute the value of t. (See Table 1 in text.) The value of t computed for the boys was 3.105 which does not exceed the .05 level of significance for a two-tailed test where t is 2.179 for 12 degrees of freedom. The result for the females hypothesis are shown in Table 1. With a sample size of 12 the degree of freedom is 11. The mean of the pretest was 90.83 and the mean of the posttest was 101.50.

The values found in Table 1 for the females were used to compute the standard deviation which were used to compute the value of t (See Table 1 in text.) The value of t computed for the females was 2.330 which exceeds the .05 level of significance for a two-tailed test where t is 2.201 for 11 degrees for freedom.

Discussion of the Results

The results of the pretest and the posttest scores have been categorized into three sections. The sections correspond to the hypothesis stated in Chapter 1. Research in this project indicates that there was a significant difference in the attitudes of the sixth grade students as a class and in the sixth grade males and in the sixth grade females toward science.

Hypothesis One. The first null hypothesis was that there will be no significant difference in pretest and posttest scores of sixth grade students after they have been exposed to a series of cooperative learning teaching methods. The hypothesis was rejected from the computations discussed in the presentation of results.
One reason for the rejection of the null hypothesis may be that the students enjoyed working together in groups. They were seated in groups facing each other instead of the traditional straight rows. The students discussed science lessons, worked the experiments as teams, and came to conclusions based on their team efforts. This reason is supported by Hyer and Eckhardt (1993) who state that doing science experiments is more fun in a group. Students who interact with specific materials in science have a more positive attitude than students studying science from a textbook, according to Johnson and Ryan (1993).

Another reason for the rejection of the null hypothesis may be that there was a higher level of student participation. The teacher researcher observed the positive interaction among the students throughout the cooperative learning study. Their comments of “good job” and “way to go” encouraged each other. Treboniak and Jaworski (1995) reported that the students took pride in helping each other on their group assignments.

**Hypothesis Two.** The second null hypothesis stated that there will be no significant difference in pretest and posttest scores of sixth grade male attitudes toward science after they have been exposed to a series of cooperative learning strategies. It can be concluded that the hypothesis is rejected. One of the reasons that the study was so successful with males may be that the males enjoyed the teams-games-tournament, which involved competition. The team scores were based on individual team members'
improvement and weekly scores showed that steadily improved their individual scores and therefore contributed more points to their team than the females. Four male students of below-average ability improved their scores and their study habits. They participated and shared in the team activities and responsibilities. This supports the findings of Slavin (1990, 1991) who stated that cooperative learning improves students’ attitudes toward school and increases achievement. Equal competition makes it possible for students of all levels to contribute maximum points for their teams if they do their best (Slavin, 1988, 1991). The research also supports Humphreys (1982) and Slavin (1989) that cooperative learning has a positive effect on student attitudes toward both the subject matter and in learning the basic skills.

The writer’s classroom experiences also confirmed findings of Johnson and Johnson (1991) that greater achievement is typically found in situations where peers work together rather than in situations where individuals work alone and Hough (1982) that studies show that groups that have a significantly high science achievement also have a significantly high positive test score. It further supports Smith (1987) that students who have cooperative learning skills enjoy their time together, care about other members of their group, and turn out a high-quality product.

**Hypothesis Three.** The third hypothesis was that there will be no significant difference in pretest and posttest mean scores of sixth grade female attitudes toward science after they have been exposed to a series of cooperative learning strategies. From
the results discussed earlier in this chapter, it can be concluded that the hypothesis is rejected. One of the reasons that the study was so successful with the female students may have been the increase of pair and small-group study. The females especially worked well in mixed ability groups and in pairs. The researcher observed that the females enjoyed the social aspect of cooperative learning. This supports Slavin (1991) who found that some cooperative learning methods increased positive interactions and friendships among students. The study also supports Atkinson and Green, (1990) and Smith (1987) that peer interaction in cooperative learning results with students appreciating their own and their team members’ efforts.

The female students also seemed to enjoy tutoring the kindergarten students. This one-on-one instruction benefited both the younger and the older students in reviewing science concepts. This can be supported by Blume (1986) and Johnson and Johnson (1985, 1988) that in the tutorial method the older students take pride in their responsibility as tutors. Younger students feel good about their knowledge and this enhances their self-confidence and enthusiasm for science.

The researcher determined that the scores of one female student may be interpreted as a dislike for science, although it did not appear to have an effect on the overall outcome of the scores. Female student, number nine, appeared to mark all answers with negative responses on both pretest and posttest. During the cooperative learning the researcher did not observe any student displaying negative attitudes.
As a group the students’ score showed the overall positive attitude was already present in the class. The students’ attitudes toward science in the adjective pairs of good/bad, fun/work, important/unimportant, valuable/worthless, and positive/negative were around six or more on the posttest. The treatment seemed to improve the students’ interest in science and increased self-esteem which lead to a more positive attitude toward the subject.

There was a significant increase in attitude scores in the adjective pairs of fun/work and clear/confusing after exposure to cooperative learning. The fun/work adjective pair went from a 4.6 on the pretest to a score of 6.3 on the posttest and the clear/confusing adjective pair went from a 3.9 on the pretest to a 5.2 on the posttest. These scores support Kagan’s study (1992) that students derive pleasure from cooperative learning experiences.
CHAPTER V

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary

The traditional education with its pattern of teacher-directed recitation has given way to different models of teaching. Cooperative learning is a method of learning that will help prepare students for their role in a changing technological society by teaching them to interact effectively. The research sought to facilitate cooperative learning in the classroom in order to instill in students positive attitudes toward science and to encourage student cooperation, an active involvement in learning, and individual self-motivation.

The purpose of this study was to analyze the attitudes of sixth grade students after they had been taught specific science concepts by using the cooperative learning method.

Three hypotheses were proposed from this statement. First, there will be no significant difference in pretest and posttest mean scores of class attitudes toward science after they have been exposed to a series of cooperative learning strategies. Secondly, there will be no significant difference in pretest and posttest mean scores of sixth grade male attitudes towards science after they have been exposed to a series of cooperative learning. Finally, there will be no significant difference in pretest and posttest mean scores of sixth grade female attitudes toward science after they have been exposed to a series of cooperative learning strategies.
Before beginning the study, the researcher administered a pretest to her class of sixth grader students. The test was designed in a semantic differential format (Issac and Michael, 1995). From the twenty-ninth of January to the eighth of March, the students were exposed to cooperative learning while studying an elementary science unit on space. Cooperative learning strategies were implemented including Student Teams Achievement Divisions (STAD), Teams-Games-Tournaments (TGT), Jigsaw and Tutorial.

After a six week period, a posttest was given. The scores of the pretest and posttest were compared. The t test for dependent samples was used to compute the value of t. The null hypothesis for the class, for the boys and girls were rejected at the .05 level.

**Conclusion**

The results of this study indicate that students’ attitudes toward science did improve after the implementation of cooperative learning strategies. Secondly, as a result of cooperative learning there was positive relationship between achievement in science scores and students’ attitudes toward science. Finally, cooperative learning had a positive effect on students’ attitudes toward peers and in social interactions.

**Recommendations**

One recommendation of this study is that cooperative learning strategies may be used as alternative approaches from traditional methods of teaching science. Cooperative learning is also effective as a teaching method in combination with other methods of
Another recommendation is to take adequate time to explain and implement the rules for cooperative learning. The teacher must provide the necessary materials for the cooperative learning project and must act as the facilitator to keep students on task.
APPENDIX A

Semantic differential for Elementary Science

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1. good ___; ___; ___; ___; ___; ___; ___ bad
2. fun ___; ___; ___; ___; ___; ___; ___ work
3. complex ___; ___; ___; ___; ___; ___; ___ simple
4. difficult ___; ___; ___; ___; ___; ___; ___ easy
5. unimportant ___; ___; ___; ___; ___; ___; ___ important
6. open ___; ___; ___; ___; ___; ___; ___ closed
7. interesting ___; ___; ___; ___; ___; ___; ___ boring
8. active ___; ___; ___; ___; ___; ___; ___ passive
9. worthless ___; ___; ___; ___; ___; ___; ___ valuable
10. pleasurable ___; ___; ___; ___; ___; ___; ___ painful
11. relaxed ___; ___; ___; ___; ___; ___; ___ tense
12. clear ___; ___; ___; ___; ___; ___; ___ confusing
13. rigid ___; ___; ___; ___; ___; ___; ___ flexible
14. positive ___; ___; ___; ___; ___; ___; ___ negative
15. strong ___; ___; ___; ___; ___; ___; ___ weak
16. sociable ___; ___; ___; ___; ___; ___; ___ unsociable
17. controlled ___; ___; ___; ___; ___; ___; ___ impulsive
18. calm ___; ___; ___; ___; ___; ___; ___ excitable
19. unsuccessful ___; ___; ___; ___; ___; ___; ___ successful
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Semantic differential for Elementary Science

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BIBLIOGRAPHY


Bell, Michael. “Among the Periodicals.” Childhood Education. 71 (Fall 1995) 50-51.


Blume, Stephen C. “Two Heads are Better Than One.” Science and Children. 23 (February 1986) 52-53.


Dick, Kelly A. “Cooperative Learning: Mastering the Bundle of Sticks.” Childhood Education. 67 (Spring 1991) 179.


