

THE EFFECTS OF COOPERATING LEARNING STRATEGIES ON
UNDERSTANDING ELEMENTARY SCIENCE CONCEPTS

by

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DEDICATION

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ABSTRACT

The study implemented cooperative learning, an educational approach which organizes activities into academic and social experiences, into the classroom experience of third grade students. These students were originally accustomed to the conventional methods of teaching, in which the teacher lectures while the students take notes. In the implementation, various techniques, such as Jigsaw II, Three-Step Interview, and Round Robin, were used. Results proposed that the techniques positively impacted the students' understanding of elementary school science concepts, their motivation to participate and learn, and their relationships with one another.

INTRODUCTION AND BACKGROUND

As a science teacher, I have been open to learning and implementing new strategies to improve my students' learning. I have encountered many challenges in being an effective teacher. It is difficult to help my students develop problem-solving skills and positive attitudes, figure out how these skills inhibit or enhance their growth, and challenge them to best achieve their goals. I wish to see students understand science concepts and processes through an environment that enables them to participate equally. I reflected on my teaching practices and noticed that science labs require the use of cooperative learning strategies. Cooperative learning strategies nurture a motivating environment for students. I discovered that there is a correlation between using cooperative learning strategies and my students' understanding of elementary science concepts.

According to Kagan (1989), "Teachers who are well versed in using team strategies can create skillful lessons that engage and enlighten their students"(p.12). My project addressed issues of unmotivated and disengaged students. Through the use of cooperative learning, a teacher creates a positive learning environment which yields both social and academic gains. Students build knowledge and self-esteem by interacting with each other. When students are engaged in supporting each other's efforts to achieve a common goal, they create a learning environment that maximizes their potential.

My project focuses on the effects of cooperative learning on students' understanding of elementary science concepts. What are the effects of cooperative learning strategies on the students' understanding of elementary science concepts during

the instruction of a unit? My project considered the following subquestions: What are the effects of cooperative learning strategies on student performance; what are the effects of cooperative learning strategies on the students' motivation to learn; and what are the effects of cooperative learning strategies on interpersonal relations?

I teach science to Kindergarten through fourth grade students at an elementary public school in Pasadena ISD, Pasadena, Texas, with a current enrollment of 541 students. I teach the laboratory content and the homeroom teachers are responsible for teaching the main content. My study will include a class of third grade students. The class consists of students with identified specific needs, special education students, second language learners, and students that are gifted and talented. The concept at hand will be a three-week study in life science and three-week study of earth science. The project provides implementation of cooperative learning strategies that will encourage student engagement and motivation in understanding the science concepts. Many of these cooperative learning strategies can also be applied at other grade levels and in various subjects. Essentially, I want my students to have a learning experience that relies on positive interdependence.

CONCEPTUAL FRAMEWORK

In order to teach effectively, a teacher needs to have an understanding of concepts being taught and have sufficient knowledge of the strategies being used in the classroom. Cooperative learning has been recognized through a considerable body of research as a beneficial teaching strategy for all subjects. The literature indicates that cooperative learning promotes positive and effective learning environment. Cooperative learning does not only impact success, motivation, and attitudes of an individual student, but also

creates positive relationships between students (Brandt, 1989). Cooperative learning is strongly influenced by the social constructivist theory, which states that students receiving guidance from their peers helps build cognitive processes. The theory also supports that children should be encouraged to do all the activities, formulating their own ideas and hence fostering achievement (Dotson, 2001). According to the cooperative learning theory of Vygotsky (2010), social interactions are crucial for development from the very beginning of a child's life. Vygotsky asserted that any mental function must go through an external stage before becoming a truly internal mental function. Thus, the function is initially social and the process through which it becomes an internal function is known as internalization (Kausar, 2010). Students' behaviors and attitudes can be noticed through their social skills, communication skills, and emotions such as tolerance, care, and affection. Therefore, a student must be encouraged to form a social relationship with other students, which enables them to build a positive attitude and a positive community. Social skills are important for effective and productive cooperation (Slavin, 2005, Elias). The cooperative learning strategies in this context include listening, sharing, and giving encouragement through verbal and non-verbal interactions.

As explained by Gallenstein (2005), many discovery teaching models implemented in science and math instruction can result in both content knowledge instruction as well as social interaction between students and teachers. When students interact, they develop a close relationship with one another. They foster their ability to form a group identity. Teachers should be responsible for facilitating the opportunity to engage in these group activities.

Upper level Bloom achievement measures such as conceptualization and problem-solving (analysis) seem to be especially amplified by peer interactive dialog, peer social support, and assistance (Vermette, Harper, DiMillo , 2004). Kagan's studies describe specific structures in which four students work together to solve problems and cooperatively work to achieve crucial life skills (Lemme, 1998; Kagan). To direct specific tasks and cooperative group lessons, the four members are usually labeled A, B, C, and D. These activities provide a quick check and challenge for the students to determine which student of the team will perform the task. This strategy keeps the student engaged and serves as a control for listening and thinking skills. Another cooperative learning strategy is Jigsaw II, which is a modification of the Arson's Jigsaw method. In the Jigsaw II method, the students are divided into teams of four to five. They read short narrative materials like short stories, biographies, and each team member is given a topic to be an expert at. The student becomes an expert on that topic for that group and in return they teach their teammates. The students take a quiz and the scores are used to form individual and team scores (Slavin, 1981).

Through writing, students can increase their comfort and success in understanding complex material, unfamiliar concepts, and subject-specific vocabulary. When students write, they must think, forcing them to be active learners. Writing about newly-acquired content strengthens understanding, while allowing students to make connections with prior learning. Writing increases retention, and enhances development of science vocabulary. With appropriate teacher feedback and interaction, student writing skills improve as their science knowledge increases (Brandt, 1989). Findings from a study conducted by Nesbit (1997) in which several Kagan strategies like Round Robin and

Three-Step Interview were used were adapted to practice reading and writing skills integrated with science.

In the Round Robin technique, students express their ideas about the topic with their teammates. This leads to equal participation and collaboration with their teammates. In the Three-Step Interview method, students are paired. One student interviews the other student on a given topic. Then, they switch roles. They join another pair and then share what they have learned from their interview.

Siegel (2005) reviewed the 1983 model of Johnson & Johnson, which showed how the implementation of cooperative learning instruction has been recommended to improve student achievement and social development. In the 1983 Learning Together (LT) model given by Johnson & Johnson, there are five advantages given of cooperative learning. These advantages are increases in reflection and planning, small group or interpersonal learning skills, individual responsibility, simultaneous interaction, and positive interdependence.

One challenge in teaching science is to ensure that students acquire the process skills along with the scientific concepts. This can be achieved by having students work on hands-on activities in context with cooperative learning. In the Chin-Min Hsiung study (2012), the students were assigned to individualistic and cooperative learning conditions respectively. They attended both regular classes and homework sessions. When the results were compared on the impact of cooperative learning and individualistic learning, the students which were assigned to cooperative learning performed substantially better in both homework and unit tests. Chin-Min Hsiung concluded that cooperative learning

results in a higher level of academic performance and is more effective than individualistic learning.

Along the same lines, Lavasani, Masoud Gholamali, Leila Afzali, Shahrzad Borhanzadeh, Farokhlaga Afzali, and Maryam Davoodi (2011) conducted a study to determine effectiveness of cooperative learning on social skills of first grade students. Findings from the study showed that the social skills in the experimental group were higher than the control group. Lavasani et al. concluded that cooperative learning a positive impact on the students' social skills than a more traditional, non-collaborative approach.

Jodi Van Wetering (2009) studied the impact of Kagan cooperative structures on high school students. The study was based on test scores and student surveys of 114 students in five classes. Her findings showed that there was a consistent improvement in the students across the board when cooperative strategies were used. On the student surveys, more than ninety percent of the students stated that they were comfortable asking their group member questions.

Using Kagan strategies to implement cooperative learning motivates students to interact with their teams and increases their feedback, which then expands their understanding. The literature indicates that activities need to be designed by using cooperative learning strategies. In summary, lessons using cooperative learning strategies need to be well-structured in order for students to be motivated to share their ideas and collectively construct a deeper understanding of the relevant concepts.

METHODOLOGY

The purpose of this study was to examine whether student participation increased when cooperative learning strategies adapted with Kagan structures were used.

Cooperative learning is the instructional use of small groups so that students can work together to maximize their learning (Falcao, 2000). The Kagan structures were applied to see the difference in my students' motivation to learn the scientific concepts.

Participants

The study will include two classes of third grade students. Most of the students are from low socioeconomic backgrounds and are Hispanic, leading to roughly more than 90% qualifying for free and reduced lunches. Many students are economically disadvantaged. My third grade classes consist of approximately 20-25 students attending science labs twice a week for an hour. The study was focused on the following areas of student participation: contributing ideas to understand the science concepts, being on task, helping each other, and asking for help. Data was collected throughout the six-week study to observe whether student participation and attitude improved as more cooperative Kagan structures were introduced.

Implementation of study

To determine the best outcomes in the class based on the changes implemented, data was collected from nontreatment and treatment units for comparison. Both units involved a third grade class of 20 students. In the nontreatment unit, the lessons were taught in an uncompetitive and unstructured environment where there was unequal student participation. Some students sat back and did not say a word during small group discussions.

The nontreatment unit involved hands-on activities on life cycles. At the beginning of the unit, the students took the pretest. During the life cycle activity, they worked in a group to play a game. The students were then asked to draw the life cycle in their notebook. During this nontreatment unit, the students were exposed to a more traditional method of teaching. The question and answer technique was used frequently, in which the students raised their hand and were called upon to answer questions.

The next nontreatment unit was on inherited traits; the students started with a pretest. They were instructed to create a poster of inherited traits by using picture cards. The students worked in groups of four and were called upon to interact with their team. Here, the objective was to understand that students who were extroverted would take over from students who did not want to participate. The students were then allowed to work independently to provide examples in their notebooks. They were given posttests to measure their understanding of the concepts on life cycle and inherited traits. The remaining time was spent in peer evaluation of the posters. This approach caused students to work passively with other students in an environment where there was no need to compete. Thus, there was unequal participation and lack of motivation in learning new content.

The treatment unit also started with a pretest. Prior to the start of the treatment unit, the students also took an initial survey about their attitude towards science and engagement in lessons. For the treatment unit, cooperative learning was applied with Kagan strategies. These strategies were applied as the students worked on an activity on ecosystems. For this, the Round Robin strategy was used. In the Round Robin strategy, the teacher poses a question that has multiple answers. In the next step, the first student in

each group writes one response on a paper and passes the paper to another student. In the final step, the team with the greatest number of responses receives recognition. For this activity, a picture of an ecosystem was shown. One of the students writes anything related to that ecosystem and passes the paper to another student. For example, a student writes ‘food chain’ on a piece of paper and passes it to the other student. The other student draws a picture. This was repeated until the task was finished and everyone from the team had participated. The students checked their answers. The students who got the most accurate answers were the winners and there was a celebration.

For the treatment unit on landforms, a Kagan cooperative learning strategy known as Jigsaw II was used. The Jigsaw II method has been found more effective if used in conjunction with writing, as it helps students to retain information efficiently and involves narrative material. Each team member is responsible for learning a specific part of the topic. The members of the class are organized into “jigsaw” groups. The students are then reorganized into “expert” group, which contain one member from each jigsaw group. The members of the expert group work together to learn the material, then return to the jigsaw group to share their learning. In the landform unit, students devised a plan to work on their research projects. Each team member was responsible for learning a specific part of the topic. The students presented their findings to their team. The team members were quizzed on that topic. Individual and Group rubrics were used after each activity. The same survey was also given after the treatment unit. Each student in the group was numbered and the numbers were called upon to explain their part of the final product. Using this strategy provided a quick check and challenge for the students to determine if all the students were able to perform the task.

Three-step interview was the last strategy used for both of the units for the treatment group. The students were numbered one through four. Number one and number two interviewed each other. Number three and four interviewed each other. This was an effective way to encourage the students to share their thinking and ask questions.

For all of the activities implemented, cooperative grading of group work was used after commencing the activities. The students used a team evaluation form. The Team Evaluation Form can be found in Appendix F. The students evaluated the participation of individual team members. The final grades were given by me, based on the team work and the quality of the product. From the assignments, interviews, surveys, and rubrics, I received feedback on the efficiency of the strategy, used any other strategies as needed, and proceeded.

Using Kagan strategies as a tool to implement cooperative learning motivates students to interact with their teams and increases their feedback. The students are aware of their learning and are encouraged to participate in their learning to help them better understand the concepts. The students who were still hesitant to participate can be told that they will not be criticized by their peers if they are incorrect. Based on the interviews and student surveys, the students can be categorized in terms of which students need one-on-one assistance and which can be asked higher order questions.

Data Collection Instruments

I chose a third grade class because of the broad range of learning styles and abilities. I was able to sample students who were of low, middle, and high abilities and I was able to get perspectives of how my intervention affected all abilities. There were

teachers who were there to help the students and assist in classroom management and Spanish translation when needed.

I collected eight types of data during this project in order to form a conclusion. These are shown in Table 1 as a triangulation matrix. The triangulation matrix helped me to understand each focus question and how multiple data can support each question.

I collected data about student understanding through the use of pre and post assessments, classroom journals, and my notes. The pre and post assessment provided data about what level of understanding students had of the concepts. The classroom journals were reflective on the activities completed in class.

For the effects of cooperative learning on student performance, the pretests, the posttests, and the classroom journals were used. Similarly, to determine the effect of cooperative learning on motivation to learn, cooperative group grading, individual student surveys, and my notes were used. The teacher student survey can be found in Appendix A.

I used journaling, personal observations, and critical friend observations in my notes. I maintained a journal every day during the project to maintain a record of the progress of the project. I also included any observations on how my attitudes, motivation, and time management changed. I met with my critical friend every Friday on a weekly basis. I asked her to keep track of my attitudes and motivation. The Teacher Interview can be found in Appendix B.

The cooperative group grading, the team evaluation, and the teacher-student survey were used to determine the effect of cooperative learning on interpersonal relationships in the classroom. The Individual Student Survey can be found in Appendix

C. The Cooperative Group Grading (Survey) can be found in Appendix D. The Team Evaluation can be found in Appendix E.

During the project, I collected the data for each of my project questions to allow for triangulation. Table 1 shows the triangulation matrix.

Table 1
Triangulation Matrix of Data Sources by Project Question

Project Question	Date Source 1	Date Source 2	Date Source 3
<i>Primary Question</i> 1. What are the effects of cooperative learning strategies on the students' understanding of elementary science concepts during the instruction of a unit?	Pretests and Posttests	Classroom Journals	Teacher Notes
<i>Secondary questions</i> 2. What are the effects of cooperative learning strategies on student performance?	Pretests	Classroom Journals	Posttests
3. What are the effects of cooperative learning strategies on the students' motivation to learn?	Cooperative Group Grading	Individual Student Surveys	Teacher Notes
4. What are the effects of cooperative learning strategies on interpersonal relations?	Cooperative Group Grading	Team Evaluation	Teacher-Student Survey

DATA AND ANALYSIS

The results presented are an examination of the qualitative and quantitative data acquired during the action research project. The results indicated that cooperative learning strategies enhanced student understanding of elementary science concepts, thus increasing motivation to learn and positively impacting interpersonal relations between students.

Effects of Cooperative Learning on Students' Understanding

In order to determine the effect of cooperative learning strategies on student understanding of elementary science concepts, the students were assessed on their knowledge of the specific concepts through pretests, posttests, and classroom journals. For the nontreatment unit, a class of twenty students completed a pretest on life cycles and inherited vs. learned traits. The average score on the life cycles pretest was 54 out of 100 possible points ($SD = 20.10$), while the average score on the inherited vs. learned traits was 59 ($SD = 24.04$). Likewise, the students in the treatment unit completed pretests on ecosystems and landforms. The average scores on these assessments were 56 ($SD = 17.44$) and 54 ($SD = 18.00$) respectively.

After incorporating cooperative learning strategies into the lessons, the students were given a posttest, which was identical to the pretest. The majority of the students improved in their knowledge of the topics. The scores improved in all topics; however, the scores in the treatment section were more improved than the ones in the nontreatment section. In the nontreatment section, the mean scores for the life cycles and inherited vs. learned traits units were 68 ($SD = 18.33$) and 72 ($SD = 21.35$) respectively. The average

scores in the treatment section for the ecosystems and landforms units were 83 ($SD = 15.84$) and 80 ($SD = 16.73$). These scores are summarized in Figure 1.

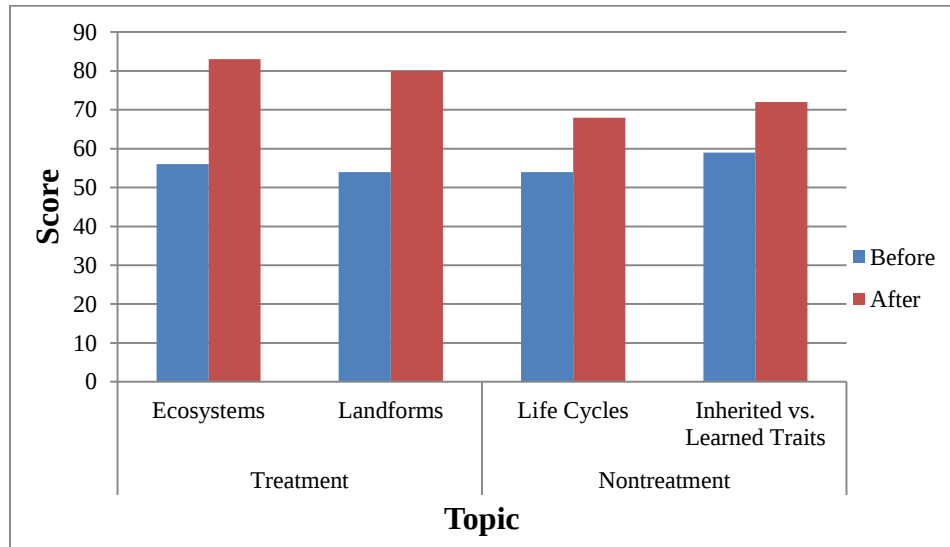


Figure 1. Comparison of average pretest and posttest scores, ($N = 20$).

The improvement in the students' understanding of the science concepts can be seen through the normalized gain, which is the fraction of the available improvement that is achieved. Since the pretests scores were approximately 56 among all topics, the number of points the students could earn were approximately the same. The amount of points that were earned was significantly distinct between the treatment groups and the nontreatment groups. The treatment groups, with units about ecosystems and landforms, obtained normalized gains of 60% and 50% respectively. The nontreatment groups, with units about life cycles and inherited vs. learned traits, obtained normalized gains of 30% and 32% respectively. The treatment group improved in their knowledge, according to the normalized gains. Figure 2 summarizes the normalized gain for these assessments.

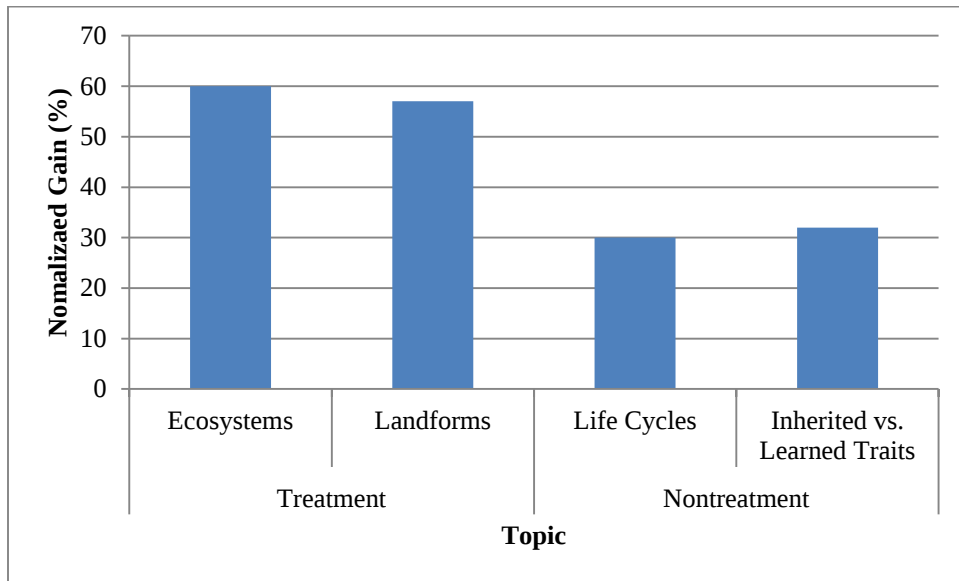


Figure 2. Average normalized gain, expressed as a percentage, ($N = 20$).

A thorough record of the students' progress was kept in the students' classroom journals, which were used for warmups, reflections on classroom assignments, notes, and other activities. The students in the groups documented any pertinent information. In the treatment group, the journal was primarily used to record information from interactive discussions and work from the assigned group. On the contrary, the students in the nontreatment group primarily recorded information from lectures and took notes. Individual assignments were completed in the journals. Figures 3 to 4 represent grades in completion and overall accuracy over the action research project.

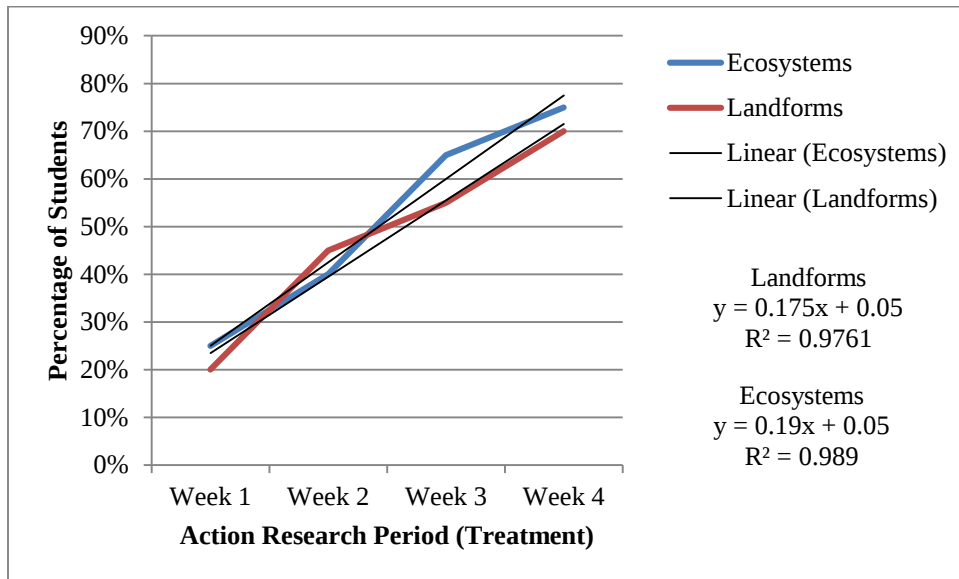


Figure 3. Completion and accuracy of classroom journals (treatment unit, $N= 20$).

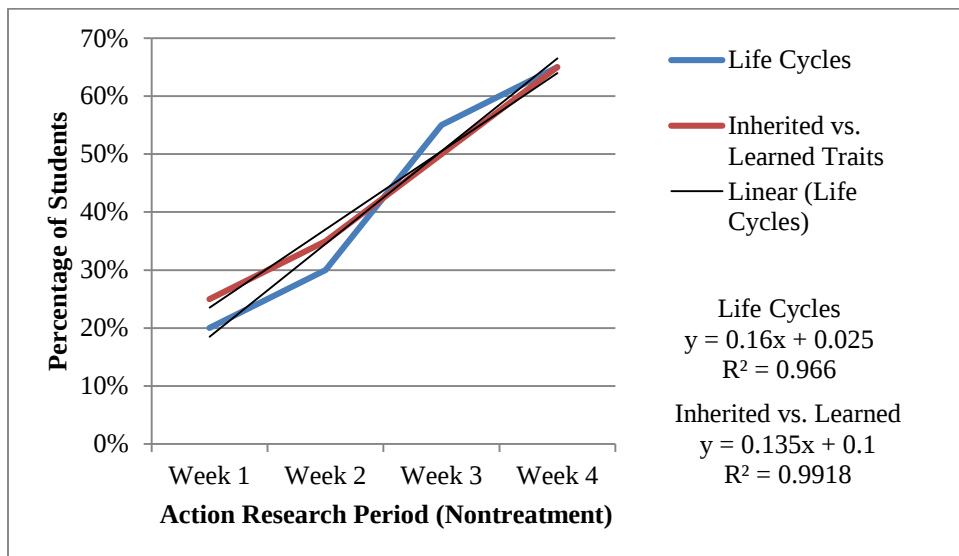


Figure 4. Completion and accuracy of classroom journals (nontreatment unit, $N= 20$).

The slopes of the trend lines of the graphs show the improvement in the quality and accuracy of the journals. The higher the slope, or m in $y=mx+b$, the greater the improvement. The slopes of the treatment graphs were higher than the slopes of the nontreatment graphs, showing that the treatment groups improved more in terms of accuracy and information absorption.

Overall, the students' understanding improved efficiently due to cooperative learning strategies, applied to the treatment group. The students' posttests showed more improvement than those of the nontreatment group. Also, the student journals showed greater understanding and accurate depictions of the content in the treatment group.

Effects of Cooperative Learning on Students' Motivation to Learn and Participate

Cooperative learning strategies heavily impacted the students' motivation to learn, as can be seen through cooperative grading in the students' groups and their individual student surveys (before and after the treatment). Also, the teacher notes revealed that the students preferred the treatment unit over the nontreatment unit.

During the treatment, a thorough record of the students' progress in terms of completing the assigned tasks and daily performance was kept through the teacher's notes. The students were more engaged with adapting to the new system in the first few weeks of the treatment unit. The majority of the tasks assigned were not completed due to various conflicts. The students did not like to share resources with others. Numerous students complained that they were not receiving a chance to work with the materials provided (i.e. markers, cards, etc.). Other students criticized others when working, lowering self-esteem and the motivation to achieve the common goal. Since the groups were random, the students often did not know their group members. Differences in opinion and preference resulted in conflict. Thus, their attention was primarily towards these conflicts and not the task at hand. One student commented, "We never have the chance to finish our work since we're so busy trying to cooperate with each other. I don't think we're learning as much as we used to."

However, the students gradually learned to complete the tasks. They learned each other's strengths and weaknesses and applied them to the task. Once they realized that proper communication was necessary for success, the students began to converse and create a plan of action. The students compromised for one another in order to complete the task. They began to enjoy the class, since it was distinct from the others. They enjoyed learning science. One student remarked, "I feel like I am learning a lot more with my classmates, since I'm enjoying it." Enjoyment had a direct relation to motivation.

On the other hand, during the nontreatment unit, the students did not feel motivated to learn. They were not interactive, and they often did not pay attention. I had to repeatedly ask the students to sit up, pay attention, or stop having side conversations. Since the class was required to listen and take notes while I taught every day, the class did not feel enthusiastic to learn. They did not absorb the information and retain it. "Although I love science," claimed one student, "I do not enjoy having to do the same thing every day. I like to experiment with new things. I find just listening boring." The students wanted to have fun while learning, and thus had trouble learning using conventional methods.

The cooperative group grading also represented that the students' motivation to learn increased as cooperative learning strategies were applied and the students adjusted to them. As they adjusted to the cooperative learning strategies, the students worked more cooperatively and listened to one another. They appreciated working with one another and were gradually more motivated to learn. More students participated, thus receiving better ratings from their peers. Figure 5 shows the results from Question 2 on the group grading (see Appendix D). The weekly average was taken for each group.

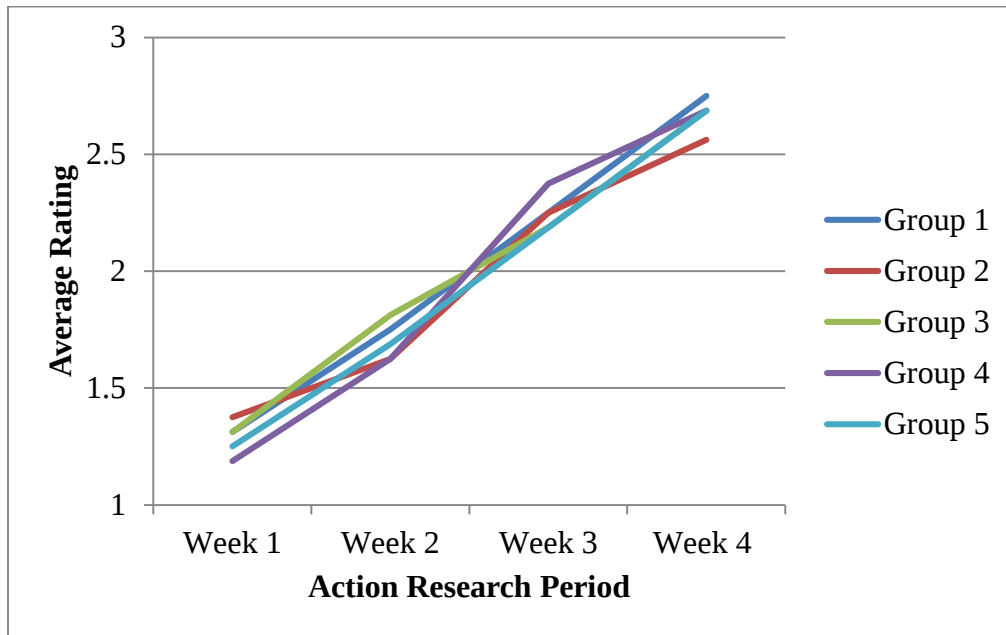


Figure 5. Average rating of the four groups of members in their group, based on participation, motivation, and cooperation, ($N=20$).

According to the data, the students gave one another higher ratings as the weeks progressed. They enjoyed working with one another, and thus participated and were motivated.

The independent surveys also indicate that the students were more motivated when using cooperative learning strategies. Approximately 65% claimed that they preferred to work individually as opposed to working in a group. In the school, the students have been exposed to conventional methods of learning, in which the teacher presents while the students observe and take notes if they wish. At the end of the unit, they may have a unit test. By using conventional methods, the students have little to no communication amongst them and are not accustomed to engaging in conversation in the classroom. Thus, the students naturally chose the learning style that they were most familiar with: learning and working alone. Working cooperatively posed new challenges,

such as communicating with others and solving conflicts with one another, which the students did not want to face. Thus, participation at the beginning of the intervention was minimal.

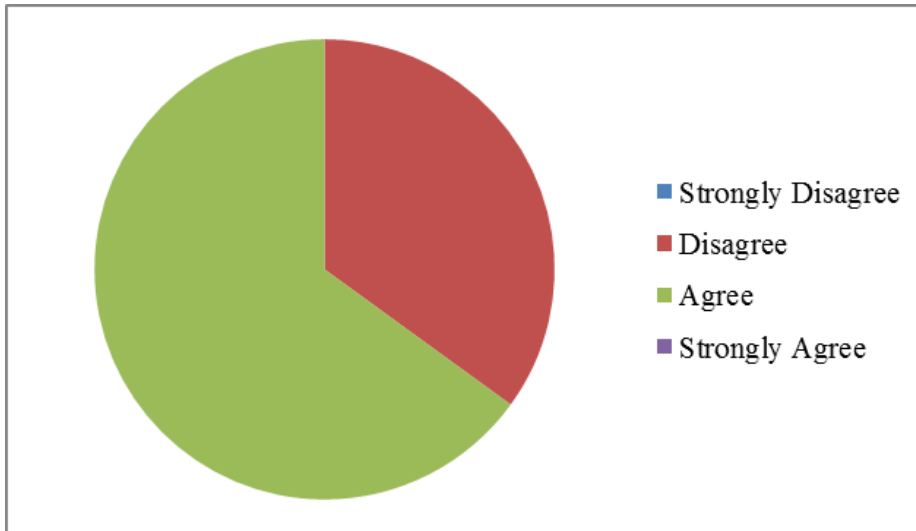


Figure 6. Results from Question 6 on if the students prefer to work alone, ($N=20$), based on options that were provided on the independent survey before intervention (listed in the key).

Following the intervention, the students were asked to retake the student survey. The students claimed that they preferred to work in a group as opposed to working alone. Working in a group to achieve a common goal gave them confidence and motivation to learn and thus, they were able to retain the information. According to Dr. Bruce Perry, M.D., Ph.D., “We learn best when we are having fun” (Perry, n.d.). The students agreed that it was beneficial to learn from one another, input from all of their team members was necessary, they had to share materials, they learn significant facts from one another, they enjoy sharing information with one another, they like to work in groups, and everyone should participate. Figure 7 shows the results on if the students prefer to work alone.

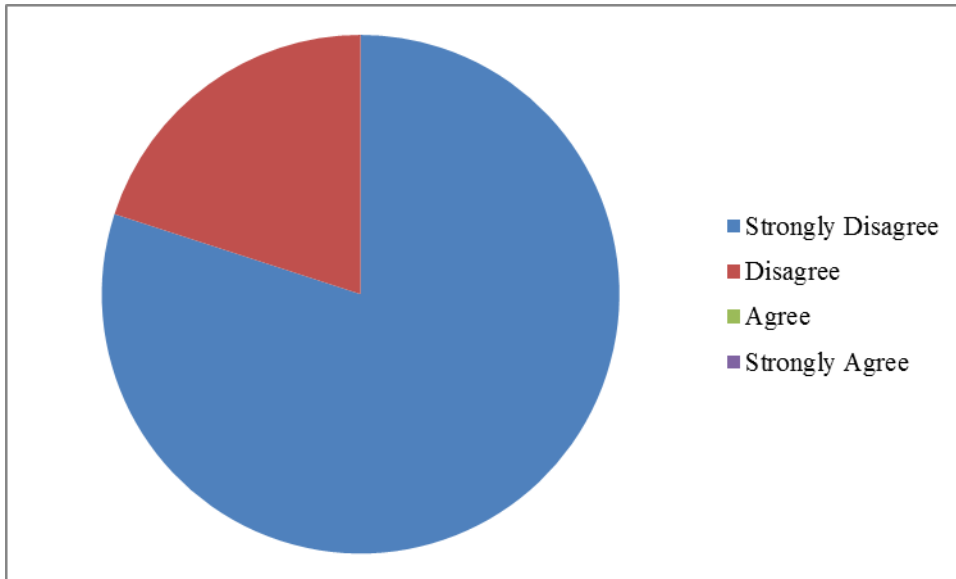


Figure 7. Results from Question 6 on if the students prefer to work alone, (N=20), based on options that were provided on the independent survey following intervention (listed in the key).

Using cooperative learning strategies increased motivation and participation in the classroom once the students adapted to them. This can be seen through their independent surveys, their group grading, and the teacher's notes.

Effect of Cooperative Learning on Interpersonal Relationships

Cooperative learning strategies also affected interpersonal relationship between students. This can be represented through the cooperative group grading, as well as the team evaluation and the teacher-student survey.

The cooperative group grading (see Appendix D) represents the increase in understanding between the groups' members, thus improving relationships in the classroom. As the weeks passed, the students learned of one another's likes and dislikes, and used them to their advantage. Their ratings of one another increased. Through the cooperative grouping, their relationships with one another increased.

The team evaluation improved as relationships improved. The students contributed more as they formed relationships with their peers. When they wrote about their contributions to the individual project, their group members began to agree with them. The transition was gradual, but revolutionizing. The team evaluation can be found in Appendix E. A summary from each prompt is in Table 2 for the treatment unit.

Table 2
Excerpts from the Peers for Team Evaluation (N=1)

Description of Data	Student Responses
Nontreatment summaries	“My partner does not want to share materials.” “I do not want to work with him/her.” “I want to sit with my friends.” “Why am I not getting a chance to work on fun stuff?”
Treatment unit summaries	“We had fun today.” “I worked effectively with my partner.” “We were a great team today.” “We shared our materials.” “Everyone on our team participated.”

The teacher-student interview provided insight on how the student was performing in the group and how the student felt as an individual. In the treatment group, the students were enjoying working as a group. The majority of the students claimed, “It is fun to work in groups. We get to figure things out by ourselves. I have more friends.”

On the other hand, the groups in the nontreatment unit were not conversing with one another, and were not forming relationships. One student claimed, “Although we are sitting in groups, it feels like it’s pointless because we never do anything with each other. I don’t even know the person next to me after so many weeks.” Since the students were

required to listen to all instruction and lectures without interaction, the students did not form relationships with one another.

In conclusion, cooperative learning strategies affected the students' understanding of elementary school science concepts, their motivation to participate and learn, and their relationships with one another.

INTERPRETATION AND CONCLUSIONS

The data was analyzed to answer the focus question on the effect of cooperative learning on students' understanding of the elementary science concepts. My study consisted of twenty third grade students. Cooperative learning structures were implemented throughout the science curriculum. The students were observed throughout the study on the following areas of participation: being on task, contributing ideas, and working as a team. When evaluated, the data collected from both units suggested that the use of cooperative learning assisted the students in communicating with each other and the students were able to resolve numerous conflicts.

The students were motivated to participate, and therefore were able to retain the knowledge. However, the traditional teaching methods did not support the students in preserving the knowledge. The triangulation of the data proposed that cooperative learning enabled a positive environment which increased self-esteem, explored concepts, and constructed knowledge. Kagan (1989) states that when students are engaged in helping, assisting, supporting, and raising each other's efforts to achieve a common goal, they create a learning environment that maximizes their potential.

According to Gallenstein (2005), many discovery teaching models implemented in science and math instruction can result in both content knowledge instruction as well

as social interaction between students and teachers. The students' deeper understanding was also seen in the students' journals during the treatment unit. The data collected from the posttest in the unit indicated a greater understanding of the concept.

Due to the group discussions, the students developed accurate schema in order to assist them in the assignments that followed. They also helped the students model each other throughout the activity. The students were actively engaged in the classroom during the discussions. They realized that cooperative learning builds a mutual trust through peer encouragement.

As an educator, this project has improved my teaching styles, attitude, and motivation. I was able to create group assignments that helped the students to participate equally. Prior to the intervention, some students worked while others were consistently off task. However, during the intervention, the students were assigned roles, ensuring the equal participation of each student. This method was helping my students to thoroughly comprehend the concepts while working with their peers. Seeing my students succeed motivates me to explore more types of learning strategies and share my experience with others.

There were some issues with the data collection for this project and can be improved in the future. First, the timing in implementing the cooperative learning was a minor setback. The students attended science class twice a week, which was not enough to accurately determine if the strategies were beneficial or not. Thus, the data needed to be collected over a long period of time. As the cooperative learning strategies were conducted using one class, the data represented part of the population instead of the entire population.

In the future, the student survey questions and interview can be modified to focus on the unit that was recently completed. It was often difficult for my students to comprehend the survey questions and had to be given additional assistance. Based on this, I would shift the survey questions and the interview questions for each treatment unit to improve the collection of data.

Altering the questions and the timings will improve the quality of the data collected in order to better assess the impact of cooperative learning on understanding the science concepts. The students were excited to attend the science class and did not want to leave at the end. Cooperative learning promoted leadership skills and teamwork. The students were interacting with each other and learning from their peers. More advanced students used academic language to explain the concept to their peers.

VALUE

The capstone project has given me the opportunity to explore teaching strategies that have helped me to grow professionally as an educator. The project has allowed me to change the environment of my classroom. My students are now challenged to work together. The project provided a meaningful educational experience. As a result, I have begun to understand the concept of a student centered classroom, in which my students are doing the work and I am the facilitator.

Incorporating cooperative learning strategies in the classroom has given me the opportunity to use an instructional strategy to meet the needs of my students. My students were having difficulty with the concepts due to the lack of student support and interaction between one another. It was essential to change the strategy to ensure that all of the students were involved in the process of learning.

Cooperative learning benefits the growth of my students. During the classroom activities, the students had the opportunity to interact socially with each other, and thus were able to excel academically. A positive environment was created that helped my students to learn the skills that are required for the future.

I believe that the use of cooperative learning can be adopted by other classes, regardless of the grade level and subject being taught. I have shared my experiences of cooperative learning strategies with my colleagues and plan to present my findings with teachers at other schools in the district.

I plan to pursue the concept of cooperative learning because I feel that I am becoming a stronger educator than I was before. I am able to create a positive environment for my students. I also plan to use these strategies to further develop my curriculum and classroom activities. I also plan to continue exploring more cooperative learning strategies that will suit the needs of my students.

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APPENDICES

APPENDIX A
TEACHER STUDENT SURVEY

Questionnaire to address student attitude and motivation to learn:

Why do you think you are learning about this unit?

What makes you excited to come to the science lab? Explain in one or two sentences.

What is the least thing you like about the science lab? Explain in one or two sentences.

What can I change about my teaching to enhance learning? Explain in one or two sentences.

Questionnaire to address student engagement and decision making:

Do you like to work in groups or by yourself? Explain in one or more sentences.

Do you like to work with the same group every time you come in or you want to work with different team members? Explain in one or two sentences.

Do like to use the strategies while working in team? Explain in one or two sentences.

APPENDIX B
TEACHER INTERVIEW

Questionnaire to address teacher motivation and enthusiasm:

Did you anytime seem to get bored with a lesson or any activity?

Is there anything you might want to add to what we have been learning in the class?

Explain

APPENDIX C
INDEPENDENT STUDENT SURVEY

As you complete the following survey, please think about the experience in this class ONLY. Circle the answer which most reflects how true each statement is true for you.

1. I like to come to the science lab.

0- strongly disagree 1- disagree 2- agree 3- strongly agree

2. When we work in small groups, we need to share materials in order to be successful.

0- strongly disagree 1- disagree 2- agree 3- strongly agree

3. When we work in small groups, we need to have input from each team member in order to be successful.

0- strongly disagree 1- disagree 2- agree 3- strongly agree

4. In the science lab students learn important things from each other.

0- strongly disagree 1- disagree 2- agree 3- strongly agree

5. In the science lab, it is a good idea to help each other to learn.

0- strongly disagree 1- disagree 2- agree 3- strongly agree

6. I would rather work alone, than work in small group.

0- strongly disagree 1- disagree 2- agree 3- strongly agree

7. When we work together in small groups we cannot complete an assignment unless everyone participates.

0- strongly disagree 1- disagree 2- agree 3- strongly agree

APPENDIX D
GROUP SURVEY

1. Beginning/developing: Students did not work as a team. Accomplished: Could have worked more for the group. Had success while working independently but struggled when it came to working cooperatively as a team.
2. Exemplary: Had a positive attitude and should respect to the other member of the team, Contribute to a lot of group.

Circle that best describes you a team member.

1. Was your group successful in working as a team? 1 2 3
2. Rate each member of your team by choosing from the category.
Member 1: 1 2 3
Member 2: 1 2 3
Member 3: 1 2 3
Member 4: 1 2 3
3. How did your group perform to complete the activity?

APPENDIX E
TEAM EVALUATION

Team Evaluation

Each member of the team should complete their own team evaluation sheet like this

Project topic/Title: _____

Briefly describe your contribution to the project.

All team member sign to the above agreement:

APPENDIX F
TIMELINE

Project Dates: January 5, 2015 to February 25, 2015

Non-Treatment

Week of: (note: labs are either on Tuesdays and Wednesday)

January 2nd

- Introduction and overview of the AR project
- Sign forms
- Pre assessment quiz on food chains and Life cycles
- Food chain Treatment 1

January 7th

- Food chain activity Treatment 1
- Review and student journal
- Teacher journal

January 14th

- Life Cycle Non treatment 1
- Review and student journal
- Teacher journal

January 21st

- Student surveys
- Post assessments on Food chain and Life cycles
- Student Interviews
- Pre assessment on Inherited traits and landforms

Treatment

January 28th

- Landform Research activity
- Using strategy free pair and Rally robin

February 4th

- Landform center activity
- Coop and Jigsaw II strategy
- Student Journal

February 11th

- Post assessments on landforms
- Interview student
- Student Journal

February 18th

- Stations on Inherited traits
- Student journals
- Using Talking chips
- Using the numbered head strategy

February 25th

- Student Assessments
- Interviews
- Student surveys

March 1st

- Teacher survey
- Teacher Reflective Journal