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Student Attitudes on Cooperative Learning and Individual Learning in my Mathematics
Classroom

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ACTION Research Project

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Abstract

The main purpose of this research is to see which learning style, individual or cooperative, is better for student attitudes in my classroom when implemented correctly. When students work within cooperative learning groups, research has found that they have more positive attitudes as well as higher performance levels. However, the students in my classroom did not have a significant change in attitude when in cooperative learning groups versus learning individually.

Introduction

The purpose of this research is to compare the effects of structured cooperative learning and individualized learning on student attitudes in my mathematics classroom. It is hypothesized that structured cooperative learning will have the greatest benefit on student attitudes because students have a greater chance to have their voice heard which increases student satisfaction in the classroom. Teachers try numerous ways to keep the morale high within the classroom setting, but oftentimes forget that cooperative learning has an important impact on student attitudes.

When making observations of a mathematics classroom, it is easy to see that most students are used to working on mathematics individually even though mathematical discussion is so needed within a mathematics classroom. I have seen countless mathematics classrooms set up where the desks are in rows, which is not conducive to cooperative learning. When mathematics students are able to work in groups the students appear to enjoy the mathematics and the socialization, which is apparent through the looks on their faces. But, all too often mathematics students usually work on their own, which is not what is expected in a mathematics classroom. In fact, Common Core came out with a list of eight Standards of Mathematical Practice and the third standard states that students should be able to “construct viable arguments and critique the reasoning of others” (CCSSM, 2010). Without being placed in cooperative learning groups, students struggle with finding opportunities to have their voices heard. These standards were written to push students to think more critically and creatively. When students understand why they are doing something, they are more inclined to enjoy the subject. In order to best engage students and to keep morale high, students should be able to engage in mathematical discourse. Numerous researchers have concluded that students are more satisfied in classrooms where they are able to discuss and, in a way, be in charge of their own learning (Mohammadjani

& Tonkaboni, 2015). While this still can happen when students work individually, it is easier for students to reach this standard when working within cooperative groups.

In order to understand what this research aims to do, it is important to understand the meaning of the terms that will be used throughout this study. Structured cooperative learning will be defined as students working together to solve a common goal. The following elements will be a part of these collaborative learning groups: positive interdependence, face-to-face promotive interaction, individual accountability, interpersonal and small group skills, and group processing (Johnson et al., 1991). All of these elements work together to make sure all students are involved in their groups and to ensure that cooperative learning is being implemented in the most productive way. Individual learning will be defined as students working on their own to complete tasks. develop a better understanding of whether cooperative learning styles or individual learning provide the most positive impact on student attitudes in the classroom.

Overall, individual learning and cooperative learning can both come with positive and negative impacts within a mathematics classroom. This study aims to see which learning style, individualized or cooperative, is better for student attitudes in my classroom when implemented correctly. I believe cooperative learning will come with the most benefits within my mathematics classroom because all students will have a chance to explain their thinking and be heard.

Review of Literature

Cooperative learning techniques have been implemented and researched in classrooms around the world and across grade levels. Countless academic journals have examined the effects of cooperative learning in many different ways including the its effect on achievement and attitudes. While these studies do examine different content areas, the mathematics classroom is the focus of my study. The interdisciplinary nature of this study will focus on mathematics and education like many of the studies other researchers have conducted. These studies have all reached the same conclusion that cooperative learning is necessary within classrooms. While these studies range from elementary school students to high school students and come from places across the world, the same conclusion is reached. While my research has differences compared to these journals, it is necessary to see the impact of cooperative learning in various classrooms. The research reviewed that focuses on cooperative learning sometimes uses terms such as group work or collaborative learning, but the definitions are so similar that they will be easy to compare in my study.

Zakaria and fellow researchers looked at the effects of cooperative learning on attitudes and achievement in the mathematics classroom. They define cooperative learning as students working together to complete the same task in a social environment. This study examined how cooperative learning impacted student achievement and attitudes in a mathematics classroom. This study looked at 82 students at a Malaysian school that were all around the age of 14 (Zakaria et al., 2010). These students were either placed into an experimental group or a control group. In order to test achievement, researchers had the students take a pre- and post-test and to test attitudes, and researchers had the students fill out a questionnaire. When looking at

achievement levels, researchers found that the students in cooperative learning groups outperformed their peers.

Cooperative learning also brings more positive attitudes and views of math. Zakaria believed this is because students feel more connected to the math when they are working through it together with peers and they feel more engaged when they can constantly be having mathematical discussions. Teachers need to make the classroom more student-centered rather than teacher-centered, meaning the students should be engaged in cooperative learning rather than traditional styles such as lectures. This research looked into the effects of cooperative learning on achievement and attitudes. In order to further this study, more research should be conducted on how student attitudes are impacted and what this impact actually is rather than just an overview on how student attitudes are impacted.

Classrooms today have more students with varying educational abilities than those that were known of in past classes. Eissa and Mostafa use this information to drive their study on cooperative learning and how different learning abilities and styles may affect cooperative learning groups. They define cooperative learning as students being able to collaborate with each other. The specifically focused on the effects of cooperative learning on students with learning disabilities. In order to research this, 60 male participants identified with having a learning disability were split into a control group and an experimental group (Eissa & Mostafa, 2013). The experimental group was taught with differentiated instruction, which included a lot of cooperative learning. In order to gain results from this study, the researchers used pre-tests and post-tests and an attitude scale. Overall, the achievement from the experimental group was higher than that of students that received traditional instruction. Also, student attitudes increased in the experimental groups because they were able to engage in the mathematics and engage with

each other. Overall, cooperative learning increases student achievement and creates a more positive environment that promotes more positive attitudes. This study focused primarily on the effects of differentiated learning, including cooperative learning, on students with learning disabilities. While this study does focus on achievement as well, more research needs to be done on how cooperative learning affects the attitudes of all students.

While the previous study revealed the positive impact of cooperative learning on students with learning disabilities, this next study examines how high-ability students fare with cooperative learning. Johnson and fellow researchers look at the effects of cooperative and individualistic learning styles on high-achieving students. In order to see which learning style was best for these students, 34 high-ability students were randomly assigned to be in a cooperative learning group or learn the information individually (Johnson et al, 1993). The students were then asked to examine a science lesson in these groups and were observed by research assistants in order to see their performance in the different style classrooms. After this lesson was finished researchers were able to come to two conclusions. The first conclusion being that students in cooperative learning groups are better able to retain information than their peers in an individualistic learning environment. The second conclusion is that the students in the cooperative learning groups left the lesson feeling a higher sense of pride and self-esteem improved. Overall, this study found that students in cooperative learning groups benefit more than their peers. This study is very similar to what my research aims to find. The main difference being that I will only be looking at the attitudes of the students in cooperative learning and individualistic learning.

While many studies focus on the overall implementation of cooperative learning, Dwiyana's study looked at the effect of this learning style on realistic mathematics. This journal

looked at a junior high school in Indonesia. In this study, students in an eighth-grade classroom were observed in a classroom that utilized a learning technique that aimed to have the students learn realistic mathematics through cooperative learning (Dwiyana, 2015). Dwiyana led this research and defines cooperative learning as students working within groups where they are able to share ideas and problem solve with each other. In order to see the effect of the cooperative learning strategy, Dwiyana examined the effects on student achievement. Overall, it was found that student achievement is higher when in a classroom that implements learning realistic mathematics through cooperative learning. While Dwiyana's study examines only realistic mathematics with cooperative learning, my study will research the effects of cooperative learning on all types of mathematics learning. Also, my study will focus on student attitudes rather than student achievement as student attitudes have an impact on achievement in the classroom.

Structured cooperative learning is key in many classrooms as without the structure, the impact on students will not be as great. Cooperative learning is a learning technique that can be beneficial to students as it creates an opportunity for students to discuss and explain problems to each other. Gillies examines the effects of cooperative learning through her study that involves looking at structured and unstructured forms of cooperative learning. Her study consists of 223 9th grade students, where 99 are in structured groups and 124 in unstructured groups (Gillies, 2004). The students then worked within these cooperative groups in order to complete different problem-solving activities. In order to see the effects of structured and unstructured forms of cooperative learning, Gillies used observations and two types of questionnaires to see the impact of the two different types of cooperative learning groups. From these questionnaires and observations, the results showed that with structured groups came less interruptions and more

discussions that were on topic. The results also found that students had much more positive attitudes about math and about each other. The students became very supportive of each other and were very engaged with the mathematics. Overall, the questionnaires were able to show how the students felt about being in a structured or unstructured group. While this study looks at structured and unstructured cooperative learning groups, I plan on comparing a structured cooperative learning group to individual learning because individual learning seems to occur most frequently in mathematics classrooms.

While it is important to focus on the effects of structured and unstructured cooperative learning, it is also necessary to see what other types of instruction are effective in the classroom. Corcoran and Silander examine different types of instruction in high schools in order to reach a conclusion on what type should be used in classroom settings in order to gain the highest achievement levels. Cooperative learning is one of the types of instruction reviewed in this article. The authors state that cooperative learning comes with many benefits but only when properly executed (Corcoran & Silander, 2009). They also look into Project-Based learning and then further look into these instructional strategies as which one may be more beneficial in different subject areas. After all of their research they conclude that cooperative learning should be the 'norm' in the classroom and needs to be properly implemented in order to benefit student discussion.

Similar to the Corcoran and Silander study, this researcher looked at different types of instruction. There are many different ways to engage students when using a mathematics game in the classroom. Plass and fellow researchers aimed their study towards seeing the effects of individual work, collaborative work, and competition and how they related to students' success in the classroom, including motivation and learning. In order to determine which method is

better, researchers randomly assigned students in an after-school program to one of the three types of playing: individual, collaborative, and competitive (Plass et al., 2013). Overall, the results seemed to point to collaborative and competitive learning as producing the best results for the students. Also, collaborative learning through game play made students feel the most motivated but the level of their work tended to be sub-par compared to that of the competitive group. However, the researchers stress that this is something that can easily be fixed.

While many studies focus on whether cooperative learning is the best instructional study, this study is geared towards the idea that there are times where cooperative learning may not be the most effective. Cooperative learning is oftentimes seen as the go-to strategy in classrooms. Mullins, Rummel, and Spada look at how this instructional strategy may not always be the most beneficial to students depending on what type of work is being done in that classroom. These researchers used female students who volunteered to be a part of the study in order to measure performance (Mullins et al., 2011). They originally had the students start off with a pretest that was completed individually and then the students were split into groups where they would either have to work individually or with a partner. At the end of either the collaboration or individual work, the students took an individual posttest to see if working individually or with partners was more beneficial towards the students' success. Collaboration is seen to be most beneficial with conceptual instruction, meaning the students are using concepts in different questions, and procedural, meaning that students are following a step-by-step procedure, such as solving for x . Both individual work and collaboration can be positive in the mathematics classroom depending on the type of work students are being asked to complete.

Cooperative learning is seen as one of the most effective learning strategies; especially when compared to lecture style and individual learning. Researchers Mohammadjani and

Tonkaboni compare cooperative learning and lecture-based learning in their study that looks at 120 fifth grade students in Iran (Mohammadjani & Tonkaboni, 2015). Half of these students were exposed to a classroom that was lecture-based and the other half were in a classroom that was cooperative learning based. The students were tested and answered a questionnaire in order for researchers to see which style worked best for these students. Cooperative learning was found to increase student satisfaction with the lesson and increase the amount of mathematical discourse in the classrooms. Overall, all of these studies came to the same conclusion that cooperative learning promotes positive student attitudes and higher achievement levels. My study aims to continue on with these results and show that my students will have a more positive attitude when placed in cooperative learning groups rather than working individually. While my study will not be looking at achievement levels, it is important to note that the research reviewed above has discussed how higher achievement levels and positive student attitudes go hand in hand. In fact, by students engaging in more mathematical discussion, they are able to encourage each other which raises attitudes and also helps the students develop a deeper understanding. Another researcher came to this same conclusion as students feel more positive attitudes when working in group settings which, at the same time, encourages students to be engaged in learning in order to complete the goals at hand (Gillies, 2004). Overall, it has been found that achievement and attitudes go hand-in-hand. While my research will focus on student attitudes, it will be important to note that higher levels of student achievement will also be seen in my classroom.

Methodology

This research was conducted in an Algebra 1 classroom at Lake High School in Millbury, Ohio. There were around 20 students in each classroom and there was an even split of boys and girls. The research took place during the first 2 weeks of November 2017. Before beginning the research, the students took a survey on their attitudes about working in cooperative learning groups and working individually. This survey was modified from the Student Attitude, Motivation, Engagement, and Success Survey Instrument, SAMES, by Dr. Jodi Haney (2014). The survey helped show the effects of cooperative learning and individual learning on student attitudes, emotional engagement, and cognitive engagement. This survey was administered at two more times throughout the research period in order to see if the students views on this cooperative learning and individual learning changed. Throughout the research period, random students were interviewed in order to receive more detailed responses. Lastly, teacher observations were made to see whether cooperative learning or individual learning is best for raising student attitudes. These three data sources offered triangulation meaning that the validity of the data gained through this research was increased.

In order to test this, my morning class and afternoon class were on an 'alternate' schedule throughout the unit. The morning class started with more individualized work for the first half of the unit and the afternoon class started in cooperative learning groups. I used Numbered Heads Together, Think-Pair-Share, and 10-2 throughout the unit as my structures for cooperative learning. Think-Pair-Share was my most utilized form of cooperative learning as my students typically sit in pairs. The students had time to think on their own about a problem at hand before coming together with a partner to discuss the problem. This structure promoted all elements of cooperative learning groups because the students were responsible for completing their own

work before discussing and working with a partner. These pairs then discussed the problem together in order to make sure they are prepared for sharing their thoughts in front of the class. The next structure I utilized is Numbered Heads Together. The students were each assigned a number when placed in groups and they will work with their group members to complete a task or problem. All students in the group had to understand how to do the task or problem because I would choose a random number and the groupmate that was assigned that number had to present their findings. This ensured that all students are learning when in groups and that everyone was responsible for assisting the group. Lastly, the students were in 10-2 partner groups. The 10 represents the number of minutes that I gave a mini-lecture during class and the 2 represents the number of minutes that students had to ask their partner questions about notes or questions about what was just taught. This promoted face-to-face promotive interactions as the students were sitting together and helping each other figure out what was missed or where any confusion may be. The students supported each other as well as helping each other in this structured cooperative learning group. Halfway through the unit, the classes switched learning styles meaning the morning class was in cooperative learning groups and the afternoon class was in a more individualized classroom. Surveys were distributed in the beginning of the unit, the middle of the unit, and the end of the unit in order to see if student attitudes improved throughout. The data was analyzed using both quantitative and qualitative methods. For the quantitative analysis, pre-test scores were compared to post-test scores to determine if any differences are statistically significant. The qualitative analysis of the open-ended questions and teacher observation notes provided contextual information to help make better sense of the quantitative data.

At the end of the learning unit in which this research was conducted, the results were analyzed. Through the analysis, it was found that there was an outlier within the data. This

outlier caused the data to be skewed. With further analysis, the outlier in the data was caused by a foreign exchange student within the classroom. Throughout the results section that features the data analysis, the outlier will not be included when examining the data. The foreign exchange student within this learning segment did not understand the importance of the survey and struggled to understand what was being asked of them during the survey. This caused the data to be inaccurate which is why the analysis continued without the outlier score. In order to analyze the data, there were multiple statistical tests that were ran, which included: Chi Squared Test, T-Tests, One-Way ANOVA tests, and a comparison of average survey scores. The results of the observations as well as the short interviews will be used to support the findings of the surveys.

Results

Students were administered three surveys over the course of this research period. The results and comparisons of these surveys will be discussed within the section below. The surveys administered had questions addressing student attitudes, student emotional engagement, and student cognitive engagement.

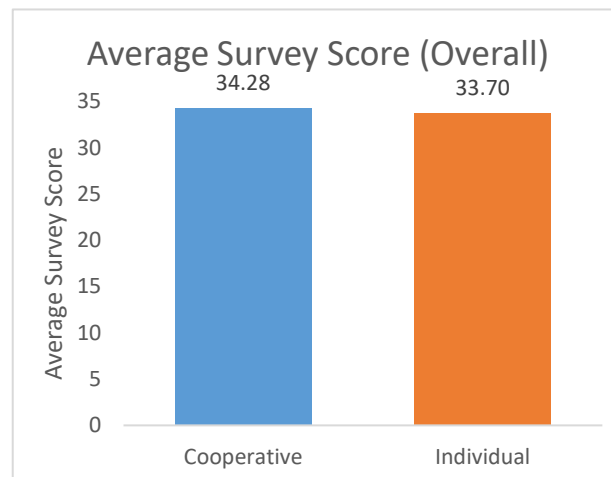
The table below shows a summary of the results through the data analysis. For the overall survey, the lowest score could be a 10 and the highest score could be a 50. For the Attitude and Emotional Engagement Results, the lowest score reported could be a 3 and the highest could be a 15. For the Cognitive Engagement results, the lowest score reported could be a 4 and the highest could be a 20. The table bellows shows the average, standard deviation, and sample size for each of the categories for both cooperative and individual learning.

Survey Results	Average Score	Standard Deviation	Sample Size (n)
Cooperative: Overall	34.28 (range: 10-50)	5.42	29
Individual: Overall	33.70 (range: 10-50)	5.12	27
Cooperative: Attitudes	10.90 (range: 3-15)	2.43	29
Individual: Attitudes	10.78 (range: 3-15)	1.99	27
Cooperative: Emotional Engagement	9.48 (range: 3-15)	2.81	29
Individual: Emotional Engagement	9.52 (range: 3-15)	2.87	27
Cooperative: Cognitive Engagement	13.90 (range: 4-20)	1.32	29
Individual: Cognitive Engagement	13.41 (range: 4-20)	1.45	27

As shown in the table above, the were differences in the average survey scores administered after cooperative learning and after individual learning. These differences will be discussed in further detail.

Overall Survey Results

The survey administered addressed three main points: Attitude, Cognitive Engagement, and Emotional Engagement. There were 10 Likert Scale questions on the survey in which the students rated their responses with a 1-5, where 1 was the most negative response and 5 was the most positive response. For the analysis of the overall survey, students could have reported a score as low as 10 and as high as 50. The average score for the surveys can be seen in the graph below.

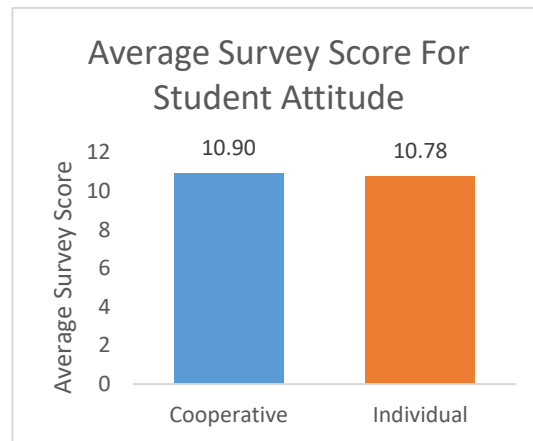


While the average survey score is higher after the students engaged in cooperative learning as compared to individual learning, this difference is not statistically different. After running a T-Test to compare the results, it was found that the P value was equal to .69, which reveals that this difference is not statistically significant. While the average scores for the overall survey were not statistically significant, which is needed to draw conclusions, the observations and interviews did reveal results in favor of cooperative learning. Within the student interviews, students stated that they 'liked having group members to help explain the math' and the students would ask 'when are we working in groups again'. These statements showed that the students were favoring the use of cooperative learning as they were given chances to learn within social situations. Observations did reveal that some students favored cooperative learning but also

showed other students that preferred individual learning. Through the use of triangulation (interviews, surveys, and observations), the results of the surveys can be further explored.

Student Attitude Survey Results

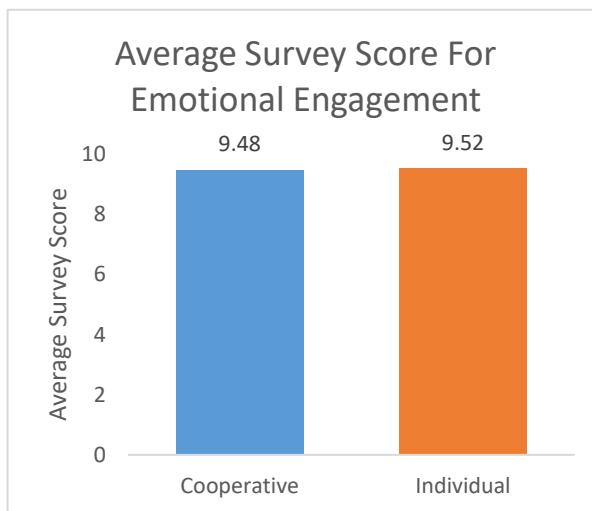
The first three questions on the survey administered to the class addressed the students' attitudes within the classroom. These three questions were rated on a Likert Scale and could receive a score of a 1 to a 5. This meant that for the Attitudes section overall, the students could have rated their attitudes with an overall score of 3 to 15. The average scores can be found in the graph below.



In order to test the significance of the results, a T-Test was utilized. The P value found was equal to .84, which reveals that the difference in the averages was not statistically significant. While the survey scores did not reveal statistical significance, the interviews did show an overall favor for cooperative learning. One student interviewed stated that they enjoyed when I picked the groups in the class. When the groups were structured by the teacher, the students viewed the activity as fair as the groups did not only contain friends. During this experience, the students enjoyed the fairness of the groups created using cooperative learning techniques as each group had students of varying abilities.

Emotional Engagement Survey Results

Three questions on the survey administered to the class addressed the students' emotional engagement within the classroom. These three questions were rated on a Likert Scale and could receive a score of a 1 to a 5. This meant that for the Emotional Engagement section overall, the students could have rated their emotional engagement with an overall score of 3 to 15. The average scores can be found in the graph below.

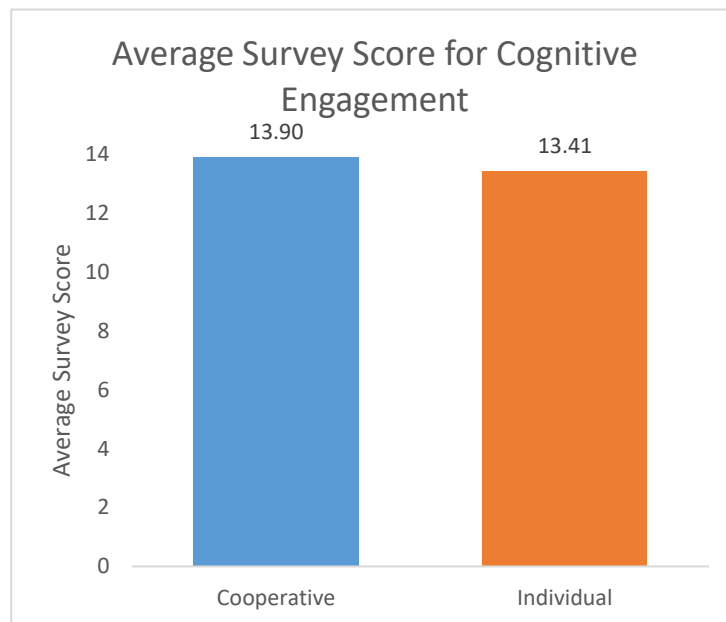


As seen in the graph above, the average score reported for emotional engagement was higher for individual learning compared to cooperative learning. When running a T-Test over these averages, the P value was equal to .96, which reveals that this difference was not statistically significant. Through the use of interviews, I found that this difference could have been a result of the number of students in my class with social anxiety. Many of my students preferred working individually as working with others made the students feel anxious. But, while this was the case, students were also asking to be placed within their cooperative learning groups again as well as asking to do the different techniques of working together that were utilized throughout the unit. While individual learning seems to have been favored when it came to

emotional engagement, this difference in ratings is so minute that it cannot be considered significant.

Cognitive Engagement Survey Score

Four questions on the survey administered to the class addressed the students' cognitive engagement within the classroom. These four questions were rated on a Likert Scale and could receive a score of a 1 to a 5. This meant that for the Cognitive Engagement section overall, the students could have rated their cognitive engagement with an overall score of 4 to 20. The average scores can be found in the graph below.



As seen in the graph above, the average results of the survey in the cognitive engagement section were higher for cooperative learning compared to individual learning. After running a T-Test to compare these results, the P value was found to be equal to .19, which is still not statistically significant but does reveal that the results were nearing significance. Students stated that they enjoyed working within their cooperative learning groups as they were able to hear

explanations from their peers that helped them better comprehend the information presented to them. Through my observations, I noticed that students were discussing math content and trying to find new ways to solve problems presented to them. I also noticed that students that typically lack motivation began working hard as they knew their work would affect their group members. Through the use of triangulation (interviews, observations, and surveys, the results of this section appear to be more significant as there was a positive change in work ethic and understanding that was evident through the student's time in cooperative learning groups.

Chi-Squared Results

Chi-Squared Test	Chi-Squared Value
Pre-Survey	0.6
After Coop.	4.17
After Ind.	2.66

On the survey administered, students were also given four short response questions to answer. The students were asked to choose which method of learning they preferred: cooperative or individual. In order to compare these results, a Chi-Squared test was used with the null hypothesis being that cooperative learning does not impact student attitudes. The Chi-Squared test was used on the Pre-survey, the mid-survey, and the post-survey. The Chi-Squared value for the Pre-Survey was a .6, which reveals that the null hypothesis could not be disproven. After the students were engaged in cooperative learning, the students were given another survey. The Chi-Squared value for this survey was a 4.17. This value did show significance if looking at a P-value of .1 or less. This allows me to be able to disprove my null hypothesis and accept my alternative hypothesis which states: Cooperative learning does have an effect on student attitudes. But, the results were compared to a P-value of .05 or less meaning that these results

were not statistically significant. These results show that student attitudes are increasing with the using of cooperative learning but this difference between attitudes cannot be stated to be statistically significant.

Conclusion

While the results found through my research did not prove to be statistically significant, there still were differences in student attitudes when looking at cooperative learning compared to individual learning. Through the use of observations and short interviews, it was found that many students did prefer working cooperatively and this created a positive impact on their attitudes within the mathematics classroom. The results found through this research were similar to results found by other researchers. After implementing cooperative learning, I found that my students did have more positive attitudes in the classroom about each other and about the mathematics, as did numerous other researchers when looking at cooperative learning.

The research completed provided beneficial information, but there were limitations with the study. One of these limitations being that my sample size was very small. In both classes used to conduct this research, there were less than 20 students per class. With absences occurring, I was unable to get a big sample size that would have helped reveal more significance within my data. If I were to do this research again, I would try to have a larger sample size to help create a better comparison of the data. Another limitation was the time period in which the data took place over. During this research, I was teaching a 10-day lesson plan. The students within this classroom were not accustomed to learning within cooperative learning groups so 5-days was not enough time for the students to gain a better understanding on cooperative learning and its effectiveness.

Throughout the course of this research, I was able to learn more about my students. I found that many of my students focus with social interactions and become anxious when asked to cooperate with others. In order to reduce this anxiety, I have to think of ways to get the students to cooperate while also helping the students feel comfortable. The cooperative learning groups were structured in a way to best reduce this anxiety in my students. For myself, this research made me more aware of the numerous different ways a student's attitude can be affected within a classroom setting. The content, the group members, and just the overall day all influence a students' attitude in the classroom.

Even though the results of this research do not show statistically significant differences, this research is one that I would like to continue in my own classroom. By seeing the effects of students not using the cooperative learning structures on a regular basis before this research, I want to have a classroom in which the students are aware of the structures that will be used in the classroom. I was able to see the beginnings of a positive impact on student attitudes within my classroom. I hope to continue the use of cooperative learning within my mathematics classroom to create a positive learning environment. Students enjoy opportunities to have a voice within the classroom and the use of cooperative learning allows students to use this voice to benefit themselves and each other.

Annotated Bibliography

Corcoran, T. & Silander, M. (2009). Instruction in High Schools: The evidence and the challenge. *Future of Children, 19*(1), 157-183.

Corcoran and Silander explore different types of instruction in high schools. One of their focuses is on cooperative learning and its implementation as well as impact in high school classrooms. Through their research of different instructional styles, these researchers were able to conclude that cooperative learning should be in all classrooms as it has a positive impact on student learning. While these researchers did find other effective methods of instruction, cooperative learning is one of the most beneficial instructional strategies.

Dwiyana. (2015). Realistic mathematics learning using cooperative strategy model in junior high school. *Journal of Education and Practice, 6*(29), 124-130.

Dwiyana's research focused mainly on realistic mathematics but also looked at different instructional styles. Throughout this study, he finds that cooperative learning has a positive impact on student achievement. This study was conducted in Indonesia in a junior high school where students learned the mathematics through a specific model. While teachers tended to prefer the traditional teaching model, meaning lecture-based, the students wanted and the curriculum called for a more student-centered model. When cooperative learning methods and other student centered instructional activities are utilized, Dwiyana notes that this has a positive impact on student achievement.

Eissa, M. A., & Mostafa, A. A. (2013). Integrating multiple intelligences and learning styles on solving problems, achievement in, and attitudes towards math in six graders with learning

disabilities in cooperative groups. *International Journal of Psycho-Educational Sciences*, 2(2), 32-45.

Researchers Eissa and Mostafa examine the effects of using differentiated instructional methods through the integration of different learning styles. This is done to ensure that the needs of all students are met. In order to research the effect, researchers have 60 participants who were identified as having a learning disability. The students were split into two different groups; one being the control and the other being the experimental group. The researchers were able to find that these differentiated instructional techniques have improved both achievements in and attitudes towards math. One of the techniques was to put students in cooperative learning groups. This study shows how cooperative learning has a positive impact on student attitudes.

Gillies, R. M. (2004). The effects of cooperative learning on junior high school students during small group learning. *Learning and instruction*, 14(2), 197-213.

Gilles examines the effects of structured and unstructured cooperative learning groups in the mathematics classroom. There are 223 high school participants where 99 students are placed in structured groups and 124 are in unstructured groups. Structure cooperative learning groups are when students know what is expected of them when they work in group settings. The results of this study showed that cooperative learning groups have a positive impact on students. Students feel more comfortable with each other meaning there is more student participation. Overall, attitudes became more positive when students working in cooperative learning groups.

Haney, J. J. (2014, June). *Motivation Matters: Designing Learning Environments to Ignite, Excite, & Engage Learners*. Research paper presented at the 2014 Hawaii Education STEM Conference on Honolulu, HI.

This source is what my survey is based on. Dr. Haney created this survey to examine student attitudes in different ways. Since my study aims to examine attitudes as well, I adapted this survey to fit the needs of my research study. Overall, I hope to gain valuable information from this survey that will help me see the effects of cooperative learning.

Johnson, D. W., Johnson R. T., & Holubec E. J. (1991). Basic elements of cooperative learning. *Cooperation in the Classroom*.

This source was used to see what the elements of a cooperative learning group should be. I plan on creating structured cooperative learning groups in during my research and it is necessary to know the elements that I should including in the groups I create. These elements are positive interdependence, face-to-face promotive interaction, individual accountability, interpersonal and small group skills, and group processing. By knowing these elements I will easily be able to make structured cooperative learning groups in my mathematics classroom.

Johnson, D. W., Johnson, R. T., & Taylor, B. (1993). Impact of Cooperative and Individualistic Learning on High-Ability Students' Achievement, Self-Esteem, and Social Acceptance. *Journal of Social Psychology, 133*(6), 839-844.

The researchers in this study aim to see the impact of cooperative learning and individualistic learning on student achievement and attitudes. The students in this research study were 34 'high-ability' students at an elementary school. While this study examined a science lesson, the results are still something that I can compare to my own

study that I will conduct. This study concluded that the achievement and self-esteem of the students in the cooperative learning group was higher than that of the students in the individual learning groups. The rise in self-esteem was easily seen in these high ability students as the study stated that high ability students find it difficult to find their place in the classroom. I hope to find that self-esteem in my students also rises in my study.

Mullins, D., Rummel, N., & Spada, H. (2011). Are two heads always better than one?

Differential effects of collaboration on students' computer-supported learning in mathematics. *International Journal of Computer-Supported Collaborative Learning*, 6(3), 421-443.

The researchers in this study aimed to view the impacts of cooperative learning in the mathematics classroom. This study included 79 female students in an eighth-grade classroom where the students were to learn individually and the other half were to learn the material in cooperative learning groups. This study examined the impact of the different learning styles when the students were on computers. The study concluded that students in cooperative learning groups had higher levels of achievement and less errors in their work than their peers in the individual learning classroom. This positive impact is something that I hope to see in my own study.

Mohammadjani, F., & Tonkaboni, F. (2015). A Comparison between the Effect of Cooperative Learning Teaching Method and Lecture Teaching Method on Students' Learning and Satisfaction Level. *International Education Studies*, 8(9), 107-112.

Researchers Mohammadjani and Tonkaboni compared lectures and cooperative learning groups. In order to research this, they examined two classes of all male students where one class was left to be the control and the other group was the experimental group. The

researchers were able to conclude that cooperative learning groups had a more positive impact. Cooperative learning groups gave the students opportunities to share their ideas as well as learning to defend their own ideas and critique the reasoning of others. Overall, cooperative learning groups had a positive impact on student attitudes,

National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards for Mathematics*. Washington, DC.

This is the Common Core State Standards which also include the Standards of Mathematical Practice (SMP). The SMPs are what is expected of every student in a mathematics classroom. There are eight practices that every student should utilize during lessons. One of these involves critiquing the reasoning of others which is easily done with the students are working in cooperative learning groups.

Plass, J. L., O'Keefe, P. A., Homer, B. D., Case, J., Hayward, E. O., Stein, M., & Perlin, K. (2013). The impact of individual, competitive, and collaborative mathematics game play on learning, performance, and motivation. *Journal of Educational Psychology*, *105*(4), 1050-1066.

Researchers examined the impact of individual, collaborative, and competitive learning styles in a mathematics classroom. They first define each learning style and use 58 students from sixth, seventh, and eighth grade classes. Students were then split into one of the three learning style groups. The students in the competitive learning groups as well as collaborative learning groups enjoyed the game more compared to the students who were working individually. However, the student who were working collaboratively seemed to have lower performance than the other two groups. But, as my study will only

look at student attitudes, I hope to see that enjoyment increases in my students when they are working in collaborative learning groups.

Zakaria, E., Chin, L. C., & Daud, M. Y. (2010). The effects of cooperative learning on students' mathematics achievement and attitude towards mathematics. *Journal of social sciences, 6*(2), 272-275.

The researchers in this study aimed to look at the effects of cooperative learning on student achievement and attitudes towards mathematics. The participants in this study were 82 students where half were placed into a control group and the other half were placed in an experimental group. This study concluded that the students in the cooperative learning groups had higher achievement than those who were not in the cooperative learning classroom. Also, they found that cooperative learning led to a more positive attitude in the students towards mathematics and each other. This is due to their increased confidence and social interactions. I hope to find a similar impact of cooperative learning on student attitudes.

Classroom Survey

Attitude Scale: Mark the best response to each item regarding your attitudes about this class.

1. This class is good.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2. This class is valuable.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

3. This class is fair.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Emotional Engagement Scale: Mark the best response to each item below regarding your beliefs about this class

4. I am eager to share my answers or ideas in this class.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

5. I am happy in this class.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

6. I am excited by the work in this class.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Cognitive Engagement Scale: Mark the best response to each item below regarding your beliefs about this class

7. I pay attention in class.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

8. When I'm in class, I just act as if I am working, but I am really off task.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

9. I learn more when working in cooperative learning groups.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

10. I learn more when working on my own

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Questionnaire

11. Working in cooperative learning groups makes me feel... because...

12. Working individually makes me feel... because...

13. I would prefer to work in groups / individually (circle one). Why?

14. How did you feel about this class before participating in group work? How did you feel about this class after participating in group work?