

7-2009

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**Cooperative Grouping Working on Mathematics Homework**

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Math in the Middle Institute Partnership  
Action Research Project Report

In partial fulfillment of the MAT Degree  
Department of Mathematics  
University of Nebraska-Lincoln  
July 2009

## **Cooperative Grouping Working on Mathematics Homework**

### **Abstract**

In this action research study of my classroom of sixth grade mathematics, I investigated the impact of cooperative grouping on mathematics homework completion, achievement, and attitude toward mathematics. I discovered that many students do benefit from cooperative grouping in the mathematics classroom; however, low-ability students tended not to benefit as much as other students. Also, homework completion and student attitude toward mathematics did not change with cooperative grouping. As a result of this research, I plan to continue to use cooperative groupings but will change the way cooperative learning is used in my mathematics classroom to see if there is a way to make it more beneficial for all students.

In the past, I found my classroom to be more teacher-led than student-led. I always wanted to change that but was frightened to give up too much control in the classroom. I teach in a room with a mix of student experiences and abilities. I always took it upon myself to help the lowest students during any practice time we had during class, and because of this, often the other students did not get the guidance they needed. There is much pressure as a teacher to make sure all students are succeeding academically, and frequently I am not able to meet all 25 students' needs in a class period and find that students who are struggling quickly learn to dislike the subject matter. I want to do something to help not only the struggling students but also incorporate new practices into my classroom that are beneficial to the academics and mathematical attitudes of all my students.

Another problem I experienced in my classroom was homework completion. It had been my practice to assign math homework nearly every day. I hoped that these assignments helped students know what questions they needed to ask in class the next day before I presented new material. However, many students did not even look at assignments. There could be many possible reasons for this. Maybe my students did not understand the material well enough to complete assignments or maybe they were simply not motivated. Perhaps students did not see the importance of homework assignments.

In my research, I hoped that using cooperative grouping for working on daily practice assignments would increase student achievement, student work completion, and student attitudes toward mathematics. Since students were helping each other, my role in the classroom changed. To give groups adequate class time to work out problems, the amount of direct teaching needed to decrease. As students became better leaders, I needed to step aside to let them take some control of their learning.

My research was conducted in a sixth grade classroom. My middle school's population included 837 students in grades 6 to 8. Demographics on the students were: 87% white, 17% special education, 35% gifted, and 38% got free or reduced lunches. My classroom included a mix of all students who were not labeled gifted. Several of my students received special services or were in a special math-interventions class. I had a paraprofessional in the classroom with me during the class in which my research took place.

### **Problem Statement**

This research project was a good opportunity for me to think through some routines and begin fostering more of a cooperative classroom during daily assignment work and assessment time. Teachers are often interested in the best practices to help all students succeed. I believe that creating cooperative learning opportunities in the mathematics classroom will improve students' confidence in their mathematical ability and perception of mathematics, increase homework completion, and raise student test scores.

One way this issue relates to the National Council of Teachers of Mathematics (NCTM) principles and standards is the principle of *equity*. Every student deserves a strong education. "Students who are having difficulty may benefit from such resources as after-school programs, peer mentoring, or cross-age tutoring" (NCTM, 2004, Equity Principle, para. 3). Also, the NCTM says, "Students learn more and better when they take control of their own learning" (NCTM, 2004, The Learning Principle, para. 3). The students who act as mentors are taking a role in their own learning because if one can teach someone, one develops greater understanding.

Another NCTM standard is *communication*. "As students are asked to communicate about the mathematics they are studying--to justify their reasoning to a classmate or to formulate a question about something that is puzzling--they gain insights into their thinking" (NCTM,

Communication, para. 1). Cooperative learning is one method that can be used to encourage students to communicate mathematics. Finally, working with peers enables students to make *connections*. As students are communicating, they are sharing ideas others might not have considered, including alternate methods for solving problems. Students are helping one another understand and connect mathematical knowledge. One student might be able to connect math to something they are learning in another class (or learned last year).

These issues are important to me because I want all students to succeed. I am realistic and realize that not all students at this level care about success in school. I feel it is extremely important for teachers to help students reach their goals. If a student does care and wants to learn, I should do everything in my power to help them succeed. I want my classroom to be a kind, caring environment where everyone works together to learn.

Most teachers, schools, and districts would agree that the fewer students failing classes (or squeaking by), the better. My school does not have many extra interventions in place to help students who are not being successful in classes. Several of my conversations with my Math in the Middle peers included talk about programs their schools have to help with these types of students. If I can learn more about interventions that work with these students, my school might be able to adapt them on a larger scale.

Additionally, it is important for me to not only teach my students academic skills but also how to work together. Years from now my students might not remember the bunnies and Fibonacci, but hopeful they will remember how to work with others to solve a difficult problem. Hopefully they will remember how hard work and how cooperation helped them to succeed. Any school would benefit from students learning to cooperate to help one another succeed in the classroom.

## Literature Review

Teachers are constantly searching for new strategies to meet all learners' needs, and cooperative learning is one strategy that can be considered. Researchers and co-directors of The Cooperative Learning Center at the University of Minnesota, Dr. Roger Johnson and Dr. David Johnson, along with their research partner Mary Beth Stanne (2000), define cooperative learning as "when students work together to accomplish shared learning goals. Each student can then achieve his or her learning goal if and only if the other group members achieve theirs" (para. 1). Three themes found in the literature regarding cooperative learning include the academic benefits of cooperative learning, the social benefits of cooperative learning, and implementing cooperative learning.

### Academic Benefits of Cooperative Learning

Much of the research regarding cooperative learning methods is concerned with how it benefits all students academically. Stevens and Slavin (1995) carried out a whole-school, two-year study using the cooperative elementary school model. Key components to their research included utilizing cooperative learning in a variety of content areas, mainstreaming academic strugglers, and teachers planning cooperatively. They found that "cooperative learning can be the primary mode of instruction" and "can be effective in producing higher student achievement" (p. 341). Results from the study also showed marked improvement for learning-disabled students mainstreamed into classrooms utilizing cooperative learning.

Ma (1996) also found that the majority of 182 high school students in China benefited they were allowed to build their own teams to work on similar mathematics homework in preparation for a standardized test. "Middle- and low-achieving students benefited significantly

from cooperative mathematics homework and made considerable progress in mathematics when they were in teams of high ability” (p. 384).

While Ma (1996) found that “high achievers did not (benefit) although they still maintained their top position in mathematics achievement” (p. 385), Stevens and Slavin (1995) found that “well-structured cooperative learning is not detrimental to the achievement of gifted students and, in fact, can produce significant and substantial positive effects on gifted students’ achievement” (p. 345). Taking a bit of a different approach, Bar-Eli, Bar-Eli, Tenenbaum, and Forlin (1998) focused their research more on a tutoring form of cooperative learning in which seventh graders taught mathematics to third grade students in place of the regular classroom teacher. They confirmed that, “tutoring seems to benefit not only the tutees, but also tutors” (p. 297).

Slavin is a co-director for Research on the Education of Students Placed At Risk at John Hopkins University and a national leader in the field of cooperative learning. In a review of the literature around cooperative learning, Slavin (1996) found that 63% of the studies he looked at found “significantly greater achievement in cooperative than in control classes” and “cooperative learning methods generally work equally well for all types of students” (p. 203). Overall, research shows positive academic gains for all types of learners in cooperative learning settings.

### Social Benefits of Cooperative Learning

While I have tended to shy away from using cooperative learning in my classroom because of the difficulty students seem to have working cooperatively, research showed that there were actually many social benefits to cooperative learning. Still many teachers are like me and often times overlook the social benefits. Kutnick, Blatchford, Clark, MacIntyre, and Baines (2005) completed a qualitative study of 20 secondary teachers from six schools and found that

many of them did not think about the positive social interactions between students but thought more about classroom control. Stevens and Slavin (1995) showed working with peers has positive effects on all involved in cooperative learning:

Unlike typical classroom instruction, during which students tend to have only casual and rather superficial contact, cooperative learning processes have students working together to achieve a common goal. This produces more meaningful interactions between the students and a sense of positive interdependence. As these work groups change over time, the students collaborate with a variety of students in the class, leading to better peer relations in the class and an increase in students' friendships. (p. 342)

Even grouping as dyads, Bar-Eli et al. (1998) found that both the tutors and tutees were noted to have "an increase in positive interaction and cooperation with classmates" (p. 298).

While the social and academic benefits of cooperative learning are enough to suggest its implementation, additional benefits of cooperative learning have been noted. These include: an increase in students' positive feelings about themselves, liking school, the acceptance of mainstreamed students, feeling more in control of their own fate in school, and fewer suspensions and expulsions (Slavin, 1996).

### Implementing Cooperative Learning

While the above research suggested many benefits from implementing cooperative learning, there were still many factors to consider, including group size, group members (heterogenous or homogeneous), group tasks, organization, and group expectations. There are several models of cooperative learning including Slavin's Student Team Learning, Student Teams-Achievement Divisions (STAD), Teams-Games-Tournament (TGT), Elliot Aronson's Jigsaw, Johnson and Johnson's Learning Together, Coehn's Complex Instructions, and Kagan's Cooperative Learning. As Johnson, Johnson, and Stanne (2000) suggest, "Almost any teacher

can find a way to use cooperative learning that is congruent with his or her philosophies and practices” (para. 7).

No matter what type of cooperative learning a teacher chooses to implement, Johnson and Johnson (2007) suggest five basic elements that cooperative learning in the classroom must include: positive group interdependence, face-to-face interaction/discussion, individual accountability, development of effective social skills, and communication about improving the group process (cited in Bassett, McWhirter, & Kitzmiller, 1999, p.46). Similarly, Slavin (1996) says that group goals and individual accountability must be present for cooperative learning to be successful.

Decisions regarding group size and type must be considered before beginning cooperative learning. Ma (1996) found that three-member groups are ideal for cooperative homework involving high-ability students, but for low- and middle-ability students, four-member heterogeneous teams were more effective. Other studies also found success using cooperative learning groups consisting of three to five students (Mueller, 2001; Yamaguchi, 2001). Ma (1996) also found that “heterogeneous teams are promising in arranging cooperative learning if the educational goal is to improve performance of a class as a group” (p. 385). Cohen (1994) and Stevens and Slavin (1995) also supported heterogeneous groups, especially when working with low-ability students.

The task assigned a cooperative learning group is also important to consider. In a study of fourth, fifth, and sixth graders working on mathematical problems in triads, Yamaguchi (2001) focused on the types of tasks assigned to groups. Yamaguchi found that groups that had a mastery goal were more successful than those given a performance goal. “This study shows that

the learning condition plays an important role in the emergence of leadership, dominance, and group effectiveness” (p. 692).

Also studying task assignment specifications, Mueller and Fleming (2001) studied sixth and seventh grade science students for five weeks as they worked together on a science project. The children in the study reported that they “learned better when they were able to ‘do something’ in contrast to ‘just reading the textbook’ and answering questions at the end of each chapter” (p. 265).

Dr. Elizabeth Cohen, past professor at Stanford University and leader in the fields of sociology and education, is well known in the field of cooperative learning. In her review of conditions for small-group work and cooperative learning, Cohen (1994) states, “Not all tasks assigned to cooperative groups are true group tasks. Some could be done as individuals and have the character of collaborative seatwork” (p. 3). She goes on to say that “ill-structured” problems, ones that do not have a clear-cut answer, are more beneficial for cooperative learning than problems that can be carried out by individuals, as more interaction is needed. Teachers must put thought into the task assigned to groups, as this can greatly determine the effects of cooperative learning.

The role the teacher has in a cooperative classroom has impact on the effectiveness of cooperative learning. Mueller and Fleming (2001) suggested that “the teacher plays a central role in setting up the conditions for collaborative learning” (p. 266). Cohen (1994) also found “One cannot neglect the role of the teacher in fostering interaction within productive small groups” (p. 30). However, it is not uncommon for teachers to have difficulty figuring out their role in cooperative learning.

Bassett et al. (1999) conducted a qualitative study of seventh and eighth grade teachers. They found that many teachers who had received cooperative learning training used the method in their teaching, and 39% believed that practicing cooperative learning was important in their training. Bassett et al. believed that teachers must be taught cooperative learning techniques. They state, “A teaching strategy such as cooperative learning cannot be effective if it is not being used or if it is being used incorrectly” (p. 49). There is much for teachers to be aware of before effectively implementing cooperative learning in the classroom, especially since “the management of cooperative learning requires the teacher to deal with instruction that has become quite complex; instead of the whole class working on the same task, there may be as many as six or seven groups working at their own pace, or, in some cases, each group may be working on a different task” (Cohen, 1994, p. 28).

Finally, before beginning cooperative learning techniques in the classroom, teachers must pre-teach expectations to the students. Laying out procedures and expectations can reduce interpersonal conflict, help group members take responsibility for each other, and increase behaviors connected to learning outcomes (Cohen, 1994). “Not only is training for cooperation necessary for effective groups, but the recommended behaviors should be specific and directly relevant to desired behaviors if cooperative interaction is desired” (Cohen, 1994, p. 30).

There are several considerations before implementing cooperative learning in a classroom. The types of groups, the tasks assigned to groups, the role of the teacher, and the training of group members to interact in an often new and different way of learning all must be considered before beginning cooperative learning.

### Concluding Statement

There is much research surrounding the use of cooperative learning in the classroom. While there are many different views on the various methods used in cooperative learning, it is evident that taking the time to utilize any method of cooperative learning can have positive benefits to many students in the classroom. However, the best method is still unclear.

My research investigated not only the academic benefits of cooperative learning but also addressed the issue of student attitudes toward mathematics and cooperative learning. Besides Slavin (1996), I did not find any other articles investigating how students viewed cooperative learning in the mathematics classroom or how it affected their beliefs regarding their own self-concept as a mathematician. One goal of my research was to see how students perceived cooperative learning and how their attitudes toward mathematics changed while working cooperatively in the classroom.

Ma's study (1996) was the only research that addressed the use of cooperative learning in mathematics homework. Her study took place in China, with high school students who all had a similar goal: to pass a standardized test. Unlike Ma, I wanted to use more structured groups instead of letting students work with anyone they chose. I also wanted to know how cooperatively working on homework in the sixth grade classroom impacted student daily work completion, academic success, and self-confidence.

### **Purpose**

The purpose of my research was to investigate the impact cooperative groups have on the mathematical confidence, homework completion, and achievement of students in the classroom. I sought to understand how best to use cooperative learning in my classroom while also seeking to answers the following research questions:

\*What happens to the quantity and quality of daily practice work when students work with a small learning community?

\*What happens to student achievement when students close the class time discussing new mathematical topics and working on daily assignments with each other?

\*How do student attitudes toward mathematics change when working in a small learning community?

\*What happens to my mathematics teaching when I take a step back and let students work cooperatively on daily mathematical learning?

### **Method**

After completing a table laying out my timeline, research questions and methods, I began collecting data on January 27, 2009. That day in class, 22 students took a pre-survey of their attitudes and beliefs toward mathematics (Appendix A). On February 2, 2009, seven randomly selected students participated in the pre-interview over their lunch time (Appendix B). The interview lasted about 15 minutes. These two forms of data were given before groups were formed, so I would have data to compare once I began using cooperative groups in the classroom.

On February 5, 2009, we began interventions by first talking about what the goal of working in groups was. We also discussed appropriate talk to use in groups (Appendix C) in an attempt to make sure that groups knew what expectations were. After this discussion, students broke into groups of three or four, which I had already decided on based upon homework completion and previous test scores. Each group had at least one student who consistently received A's, one student who struggled on tests, and one who consistently did not turn in assignments. On this day, students worked in their groups to explore the golden ratio (see

Appendix D for this group assignment) and then began their homework involving ratios. While they worked, I walked around the room taking notes, helping groups work together, and helping with academic issues that arose.

On February 6, we began class by reviewing group expectations and what was needed from all group members in order for their groups to be successful. Students then worked on an exploration assignment having to do with rates. It was at this point I began to realize some of the problems my research would encounter. Missing students were a hindrance to one group while another had a student crying. After some time, I discovered she did not feel well. Most of my time was spent dealing with these issues instead of observing and helping groups.

Groups worked together anywhere from two to four days a week. During the time groups worked together, I recorded on my observation sheet which students had homework completed (Appendix E). One problem I found was that my sheet was based on a scale of 1 to 5, and it was hard to score students on homework completion. What constituted a 1 or a 4? Should a student who had an answer for each problem but no work shown get a 5? I finally decided to enter homework grades into the grade book the same way I had before, using a 3 (assignment completed on time with work shown), 2 (assignment completed but may be late or does not have work shown), 1 (assignment late and work not shown) scale. In the long run, this worked well as it was something the kids and I were familiar with, and it helped me compare work completion from earlier in the year to completion rates at the end of my study.

On my observation sheet, I also observed the oral participation of students in groups, who was helping others and who was engaging in on-task behavior. I quickly found it was impossible to closely follow each of the six groups each day so I decided to pick one group to be my focus each day groups met. Recording scores on my observation chart was then a more achievable

task. I did struggle with analyzing what this data really told me. I found it was the stories from my observations, which I was able to record in my journals that were more telling than the observation chart numbers.

Over a few weeks, I found that groups were lacking motivation. On February 11, 2009, I tried something different with the groups. Part of my research of the literature surrounding cooperative learning included group competition. One day we did a review and each group member had to take a turn to solve a problem on a marker board. The first one to complete the problem, show work completely, and get the right answer won points for their group. Another day, students were given a five-question quiz. Ahead of time I let them know they would be having a quiz and each group's scores would be averaged to see which group learned the most by working together. They were encouraged to really check with each group member before the quiz to make sure their group could do well. Groups really seemed to enjoy working with each other in this way. However, since this had not been part of my original plan, I did not have any method in which to record these interactions besides my journal.

I kept track of my daily observation sheets and student assignments in my teacher journal binder. In my methods journal I tried to keep track of how much time students spent working in groups. I found that this was difficult as I often forgot to look at the clock!

Since I was due to have a baby any day, I ended data collection on March 16, 2009. The students took the post-survey, and the same group of students was interviewed. Unfortunately, my computer program was not working during the interview so I had to hand write notes as the students were talking. Originally, I had planned to do three interviews, but I ran into time constraints.

Analyzing my data was difficult. While I was able to use print outs of my Easy Grade Pro grade sheets to track student homework completion and District Math Cards to analyze student test scores, it was difficult to see any change numerically over such a short period of time. Not only was my research cut short by maternity leave, but time was also cut short because of snow days, Professional Learning Community days, conferences, school assemblies, and time I was absent for a funeral. I found my journal became a truer reflection of my research.

### **Findings**

A typical day in my classroom began with students working on a review independently while I took attendance and took care of beginning-of-the-day issues. Then students would work on an exploration assignment or go over the previous day's homework with their group. While they were working on those tasks, I would circulate around the classroom looking at which students had completed their homework. Next, I would lead the class in either a review or a lesson of new material. During presentations of new material, I often had students take notes in a steno notepad. On review days, students often worked problems on maker boards with their groups.

After a lesson was presented, students would then get into their groups to begin an activity that went with the lesson or begin their assignments. It was my hope that students would end the class time asking each other questions about the new material and leave the class confident to complete the homework.

During the time I was carrying out my research, I was also part of a sixth grade Professional Learning Community that was focusing on mathematics achievement. Our plan was to identify the essential objectives in our curriculum and at the end of instruction on these objectives, have the students complete a self-reflection and short quiz. I found these independent

reflections quite helpful in identifying which students I needed to make sure got help in their groups the next day. Had I known I would be doing these, I would have written the reflections into my research plan.

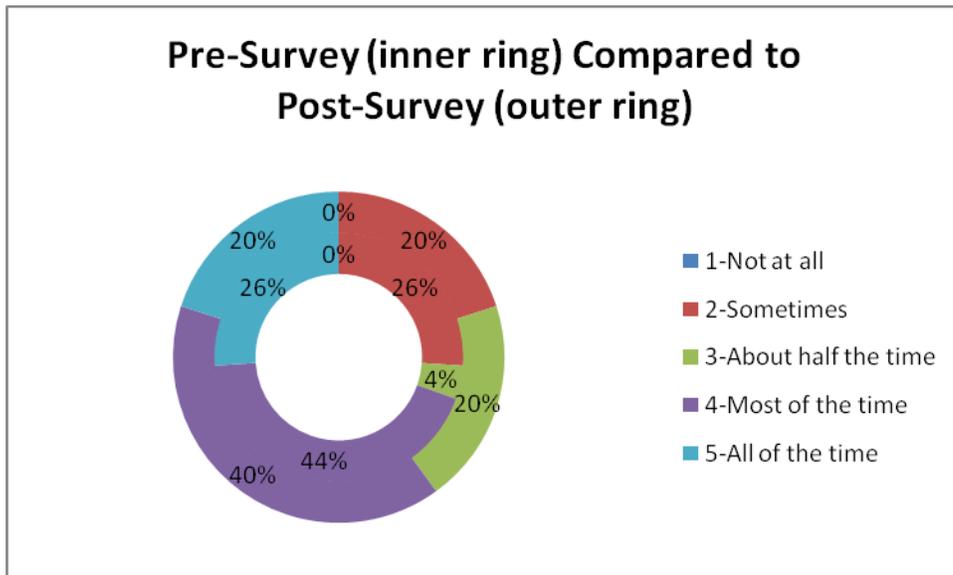
Overall, it is difficult to make any strong assertions regarding my research. My data does not seem to be complete, probably due to a short time frame, and does not show much change over time. My first research question was: What happens to the quantity and quality of daily practice work when students work with a small learning community? My assertion was that working with a group did not have a strong impact on work completion. I lacked sufficient data on work quality. After analyzing my Easy Grade Pro data, in the second quarter, 25% of assignments were not completed or turned in late. Third quarter, after interventions, just 22% of assignments were not completed or turned in late. While this suggested homework completion went up 3%, this small difference could be due to a student who consistently did not complete assignments moving away toward the end of second quarter. In my teacher journal, I noticed early on that not all students were motivated to complete assignments even though they had the extra help of working in a group. In my journal for week one (January 27-February 6), I noted,

Although I don't have a lot of data, it appears that the same kids that had problems with this before will continue to struggle. Maybe I'll need to change something else to see change here. Some motivation for groups to get the most assignments completed? Competitive cooperative learning was mentioned in my research. I'll give it more time to change before I make more changes!

After noticing this, I made some changes to cooperative grouping to involve more competition. Despite adding competition as part of my cooperative learning experiences, homework completion results at the end of my study were mixed. While several students stated in my last interview that they liked getting jolly ranchers if their group had their work done, others mentioned they did not like their group because they never got rewarded because one

person always ruined it. My Easy Grade Pro printout also showed that it was the same students who consistently turned in work late who still did not complete it even with a motivator. On my pre- and post-test survey, responses to “I complete my daily work on time,” seemed to suggest some students feeling that they were improving at getting daily assignments completed while others thought their work completion decreased (Figure 1).

Figure 1: “I complete my daily math work on time”



None of my data showed a negative impact on student work completion and quality from working with cooperative groups. I wonder if I allowed students to choose their groups if there would be a change in my findings as they might encourage each other more.

In terms of work quality, my original research plan included grading each student’s homework on a rubric. I soon realized that, in the context of time I had, that this was not something I was able to complete. The student work I collected was their chapter tests. I do not believe I can come to any conclusion on work quality based solely on chapter tests. More research will need to be done regarding work quality before any assertions can be made.

My second research question asked: What happens to student achievement when students close the class time discussing new mathematical topics and working on daily assignments with each other? When I was originally thinking about this question, I was curious mostly about the impact on lower-achieving students. I was hoping to find that when students worked in cooperative groups, their mathematics achievement would increase but my data were inconclusive. After analyzing test scores, 10 individual students did raise their test averages after implementation by an average of 6.9% each. Four were students I considered to be middle-ability students, and two were students I consider to be low ability. Out of the 10, four were students who consistently had homework completion problems. However, while 10 students improved, the overall class average of 11 students decreased by an average of 5.9% each, while three students showed no change. One of my extremely low students, Emma<sup>1</sup>, actually dropped her test average 23 percentage points after implementation. I noted her situation in my journal for the weeks of February 9-February 20,

One group I'm really interested in includes a bright, on-task student named Jackie, an average student with a tough home life and lots of pressure to do well on her named Carrie, and a VERY low student named Emma. I really wanted Emma to be with these girls because I could see Jackie really being a good teacher to her. However, Emma seems to be on the outside of this small group. She hardly talks and often is just copying or doing nothing at all. I wonder if this group will evolve as Emma gets to know Jackie and Carrie better or if Emma will not succeed in math using cooperative grouping.

The data was inconclusive. I really cannot say that cooperative grouping had any effect on student achievement. Some students may have improved because of cooperative work, while others may have improved based upon the content being taught during my research period. I do believe that the four students with homework completion increased their scores because they were forced to think and talk about the mathematics daily with their peers rather than stick the

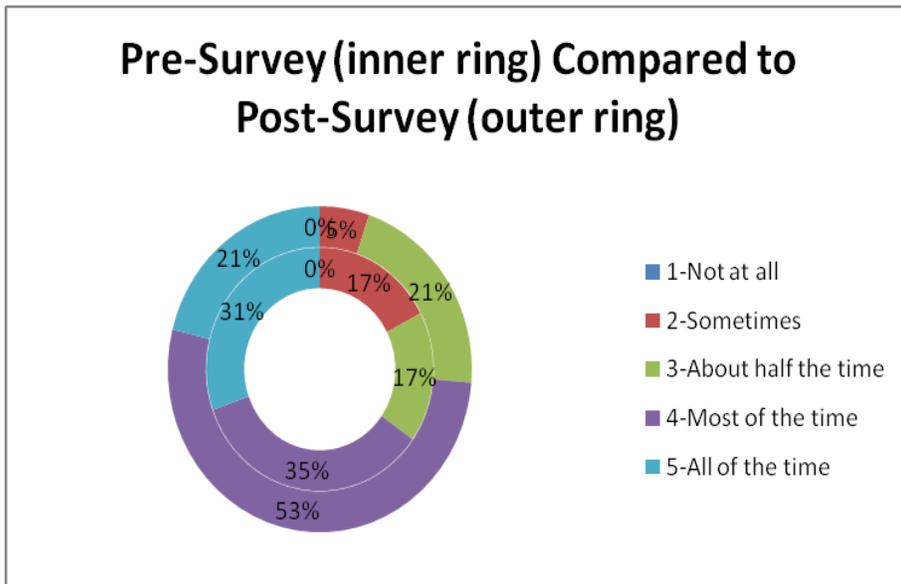
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<sup>1</sup> All names are pseudonyms.

homework in their folder and not look at it again. Emma was the only student who appeared to be negatively affected by cooperative learning. I believe that this was because she was not the type of learner who was willing to ask questions or contribute to a group. I believe that she became more frustrated when working with a group and thus put even less work into the mathematics involved.

I was hoping my surveys would show students found mathematics work easier after implementing cooperative groups. However, my survey could be evidence of little academic gain. One statement is “math tests are easy for me.” The results are almost exactly the same for the pre- and post-survey. For the statement “math daily work is easy for me,” fewer students gave “Not at all” responses on the post-survey (Figure 2). Based on these surveys responses, there is no strong evidence that math work and tests are easier for students after working in groups.

Figure 2: “Math daily work is easy for me”



I also questioned the effect of a resource teacher and paraprofessional in the class with me. While one was with me the whole class time, she often seemed confused as to the subject

matter being taught. However, I found her very helpful in keeping students on task. The other came in during the last 10-15 minutes of class and often times could not be counted on. She almost always worked exclusively with one student, Maddy, who really struggled. This separated this girl from her group. I did wonder if having a group of really low students would be more beneficial if there was another teacher to work with them. That way the low students would not feel so left out of their groups. Maybe their test scores and confidence would grow more in working with this type of group.

My third research question asked: How do student attitudes toward mathematics change when working in a small learning community? I asserted that students who already had a positive attitude toward mathematics would enjoy working in a group while those who struggled and had a more negative attitude toward mathematics would not experience a change in attitude toward mathematics when working in small learning communities.

Evidence for this assertion included student interviews. Many of the students who said in the interviews that they liked working in groups were those who also said that they were good at math. The students who felt they were not good at math did not have favorable remarks regarding group work. Sharron, a student who does not have a favorable attitude toward mathematics, said, "I don't like math - groups don't help either because I just don't get the way they explain it." Another student, Aaron, who had always been an A-student, became a leader in his group and stated, "I like helping others. Of course, they have to want to get help before I can help them. I think that I really can help others. Plus, it also helps me understand better."

Looking at the number of *Not at all* and *Sometimes* versus *Most of the time* and *All of the time* ratings on the statements *I feel I am good at math* and *I enjoy working with others in math class*, there is little difference between the pre- and post-surveys. In fact, there were no *Not at all*

responses for either question in the pre-survey and one *Not at all* for each question on the post, suggesting that at least one student was negatively affected by groups

Simply by observing group dynamics and using my observation chart, those students who did poorly in math before my research and had a more negative view on math were not active participants in their groups. During work time on February 10, Sharron was not working and when prompted told me, “My group won’t help me.” She was one who was fine to sit off to the side and never say a word or even try the mathematics. I was hoping that by working with a steady, well-thought-out group, students like this would be helped, but out of the three students I really had in mind at the beginning of my research, none of them worked with their groups, turned in their work, improved their math grades, or showed more mathematics confidence.

On the other hand, I observed that students who already perceived themselves to be good at math took over as leaders in their groups. I also observed that several students who were very good at the mathematics but were very quiet in the classroom appeared to gain self-confidence while working in groups. In my observation note on February 6, I noted a situation between Nate, a very bright and outgoing student, and Bobby, a bright yet quiet student. While walking around, I noticed that Nate had missed number 10 on his assignment. I prompted the group to compare answers. After looking at the problem, Nate still believed he had the correct answer. Bobby, who had the correct answer, finally spoke up and was able to share his work with his group. It was neat to see a student with lower confidence speak up and help others. I noticed these two boys working more as a team of equals after this point in the research project.

My hypothesis was that it was too difficult for the higher-ability students in the class to take over the responsibility of helping students who really did not want help and struggled in many ways. I hypothesized that if I would have had a resource teacher or myself in a group with

the lower-ability students, they would have experienced more success in math class, as would the rest of the students, as they would not be held back as much by the very low students.

My final research question asked: what happens to my mathematics teaching when I take a step back and let students work cooperatively on daily mathematical learning? I believe that in order to make change, I needed to be willing to give up even more control and time to allow groups to be successful. One piece of evidence I had that showed that I did not do enough to change my teaching was my plan book. It looked almost exactly the same as before interventions. This shows I did not truly change the way in which I was teaching. Unfortunately I did not have access to my plan book as my long-term substitute used and discarded it. I still had listed the warm-up, new lesson topic or activity, and assignment just as I had before implementing cooperative learning. On a few days, you might have noticed notes to make sure students were given extra time to work in their groups. That is the only change noted from before beginning this project.

My journal also showed signs that I was frustrated with the way my teaching was going. I was feeling pulled in many different directions and was scared to change too much in my classroom. In my last journal I stated, "I wonder if I should even count this week and next week in my research. I don't feel as if I'm really doing it justice any more. In fact, their last test scores were lower than what I expected on this test." In an earlier journal I said,

I must admit that the one day I sent Emma, Sharron, and Maddy to work with Mrs. Pfeiffer (the resource teacher) the last 15 minutes of class was nice (two of them had been gone the day before so she was going to work on trying to catch them up). I felt their groups were relieved when they were gone because they weren't slowed down by them. I still see no improvement in these types of students I really set out to help. I notice those that were the middle level students are doing better which is good! (Teacher Journal, February 9-20).

I found that I cannot be as effective of a teacher in this cooperative environment all by myself, and I must be willing to make more changes to my planning and teaching in order for cooperative grouping to be effective.

### **Conclusions**

While the results of my inquiry into cooperative grouping in mathematics did not have the results I was hoping to see, there were many positive benefits to the interventions. Academically, very few students in my classroom appeared to be negatively affected by working in cooperative groups. Like Ma (1996), I found that high achievers did not benefit greatly from cooperative work but did remain at the top of the class. Stevens and Slavin (1995) also determined that working in cooperative groups was not detrimental to gifted students; however, they also found improvement for Learning Disabled students. While I was hoping to see this same effect, I found that the lowest of my students did not benefit enough academically during my research.

I did not find that my students' attitude towards mathematics and their self-confidence were altered from their work with cooperative groups. While Stevens and Slavin (1995) found students had more meaningful interactions in cooperative settings and Slavin found that students' positive feelings about themselves increased working in a cooperative setting, my inquiry did not concur with either of these results. This lack of results could be attributed to the fact that I had less time overall to see change in the students.

While Cohen (1994) and Stevens and Slavin (1995) found that heterogeneous groups worked well for low-ability students, I now tend to question this. I did not find that mixing low-ability students with higher-ability students was helpful to any of the group members. If anything, I found that the low students were on the outside of the group more often than not. As

Johnson, Johnson, and Stanne (2000) said, “Almost any teacher can find a way to use cooperative learning that is congruent with his or her philosophies and practices” (para. 7). I hope to keep working on the cooperative learning techniques that work best for me and my students.

I definitely can agree with Cohen (1994) when she stated,

the management of cooperative learning requires the teacher to deal with instruction that has become quite complex; instead of the whole class working on the same task, there may be as many as six or seven groups working at their own pace, or, in some cases, each group may be working on a different task. (p. 28)

I found that I had trouble meeting all student needs since I not only was I trying to keep track of what each group was working on, but I also was coping with individual student problems.

However, one of the most difficult parts of my inquiry was dealing with my changing role in the classroom along with my new role as a researcher.

After completing my research, I still believe cooperative grouping on mathematics homework could have great benefits on student homework completion. I need to continue to look specifically at types of groups, tasks assigned to groups, and how to motivate individuals within groups along with the group as a whole.

### **Implications**

While my inquiry into cooperative learning did not lead me to any strong data showing its effectiveness, I do believe that there are many other small changes I can make to increase cooperative grouping’s effectiveness. Next year I plan to start the year using cooperative groups. Before even beginning mathematics, I would like to do more with building good group-work habits so all students will better know the expectations and feel involved. I would like to change how I group students and utilize other teachers in the room better. I also would like to explore how the different tasks I give the groups impact their success in math class.

Personally, I believe that implementing groups will be easier next year. I had many stressors in my personal life during the time I was collecting data. For example, I was in my third trimester of pregnancy and being on my feet, circulating the room, was often a challenge. It will be nice to just be able to focus on my role as a teacher and let the researcher side be secondary.

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**APPENDIX A**

## Survey (Pre/Post)

Please rate yourself for math on the following scale

1	2	3	4	5
Not at all	Sometimes	About half the time	Most of the time	All of the time

1. \_\_\_\_\_ I enjoy math class.
2. \_\_\_\_\_ I feel I am good at math.
3. \_\_\_\_\_ I enjoy working with others in math class.
4. \_\_\_\_\_ I understand math better when working with others.
5. \_\_\_\_\_ I am happy with my grades in math class.
6. \_\_\_\_\_ I get frustrated in math class.
7. \_\_\_\_\_ Math practice assignments are difficult.
8. \_\_\_\_\_ I complete my daily math work on time.
9. \_\_\_\_\_ Math daily work is easy for me.
10. \_\_\_\_\_ Math tests are easy for me.

**APPENDIX B**

## Pre implementation Interview Questions:

- A: What do you like most about math class right now?
- B: What would you change about math class right now?
- C: What helps you learn the best in math class?
- D: How do you feel about work in small groups?
- E: How do you feel about the type and amount of daily practice work assigned?
- F: Do you like math? Why or why not?
- G: Do you feel you are good at math? Why or why not?
- H: What do you do if you get stuck on a math problem or don't understand something that was discussed in class?

## Middle Questions:

- A: What do you like most about math class right now?
- B: What would you change about math class right now?
- C: What is going well in your learning community?
- D: What is not going well in your learning community?
- E: How do you feel about the type and amount of daily practice work assigned?
- F: Do you like math? Why or why not?
- G: Do you feel you are good at math? Why or why not?
- H: What do you do if you get stuck on a math problem or don't understand something that was discussed in class?
- I: Did you ask any of your learning community members a math question this week? What was it? Were they able to help you understand the concept? Why or why not?
- J: Did any of your learning community members ask you a math question this week? What was it? Were you able to help him or her understand the concept? Why or why not?

## End Questions:

- A: What do you like most about math class right now?
- B: What would you change about math class right now?
- C: What is going well in your learning community?
- D: What is not going well in your learning community?
- E: How do you feel about the type and amount of daily practice work assigned?
- F: Do you like math? Why or why not?
- G: Do you feel you are good at math? Why or why not?
- H: If you had a choice, would you continue learning communities?
- I: How did learning communities help or hurt your learning in math class?
- J: What do you do if you get stuck on a math problem or don't understand something that was discussed in class?
- K: Did you ask any of your learning community members a math question this week? What was it? Were they able to help you understand the concept? Why or why not?
- L: Did any of your learning community members ask you a math question this week? What was it? Were you able to help him or her understand the concept? Why or why not?

**APPENDIX C****Table Talk****Group Goals**

**LISTEN! STAY FOCUSED!  
BE PRODUCTIVE!**

**Acceptable comments**

- \* Good job!
- \* Your explanation really helped.
- \* You are good at this... thanks.
- \* Thanks for helping me.
- \* Let's work together.
- \* We can do it.
- \* Let's look at a similar example.
- \* Please....
- \* Great idea.
- \* Let's not give up!
- \* I'm glad that I work with you.
- \* You're a great teacher!
- \* That's a great question.

**Acceptable questions**

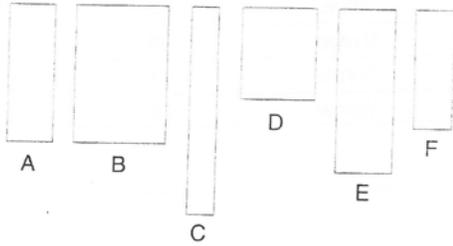
- \* How did you know....?
- \* What do you think?
- \* Will you help me?
- \* Can you explain it another way?
- \* Why did you do that step?
- \* How did you get that answer?
- \* How did you know to do that?
- \* Could you also do...?
- \* Can I help you?

# APPENDIX D

Name \_\_\_\_\_ Date Feb. 5 Class \_\_\_\_\_

## LESSON **8-1** Challenge **The Golden Ratio**

For centuries, people all over the world have considered a certain rectangle to be one of the most beautiful shapes. Which of these rectangles do you find the most attractive?



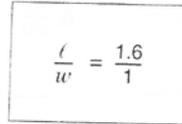
If you are like most people, you chose rectangle B. Why? It's a golden rectangle, of course! In a golden rectangle, the ratio of the length to the width is called the **golden ratio**—about 1.6 to 1.

The golden ratio pops up all over the place—in music, sculptures, the Egyptian pyramids, seashells, paintings, pinecones, and of course in rectangles.

To create your own golden rectangle, just write a ratio equivalent to the golden ratio. This will give you the length and width of another golden rectangle.

**Use a ruler to draw a new golden rectangle in the space below. Then draw several non-golden rectangles around it. Now conduct a survey of your family and friends to see if they choose the golden rectangle as their favorite.**

### Golden Ratio



$w = 1 \text{ in.}$

$l = 1.6 \text{ in.}$

APPENDIX E

Date \_\_\_\_\_

Group 1                    1-never   2-rarely   3-sometimes   4-often   5-always

	Has Materials	Participates Orally	Helps others	On Task

Date \_\_\_\_\_

Group 2                    1-never   2-rarely   3-sometimes   4-often   5-always

	Has Materials	Participates Orally	Helps others	On Task

Date \_\_\_\_\_

Group 3                    1-never   2-rarely   3-sometimes   4-often   5-always

	Has Materials	Participates Orally	Helps others	On Task