

The Effects of Cooperative Learning Groups on Communication Skills

A Collaborative Action Research Study

By

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Approval

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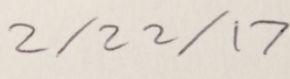
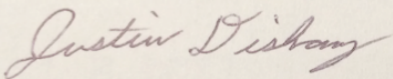
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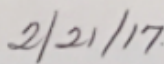
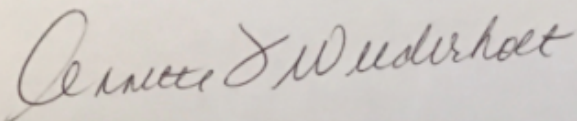
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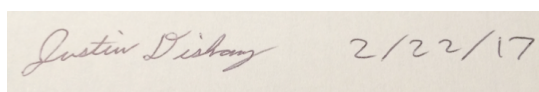
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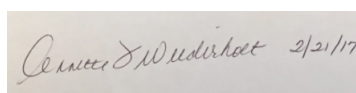
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Abstract

The purpose of this action research study was to analyze and explore the impact cooperative learning groups would have on students' communication skills and confidence with speaking in front of others in an 8th-grade math classroom. For three weeks, students worked in cooperative learning groups completing various tasks that required communication amongst group members. During these activities, the teacher collected data and supported the cooperative learning groups by reminding them of group expectations as well as prompting them with questions when they did not know what to say or do. At the end of the intervention, the data revealed that cooperative learning groups had worked effectively to improve students' communication skills as well as their confidence with speaking in front of others in an 8th-grade math classroom.

Table of Contents

	Page
Approval	2
School of Education Citation and Permission	2
Library Copyright Permission Agreement.....	3
Acknowledgements.....	4
Abstract.....	5
Table of Contents.....	6
Chapter	
1 Problem.....	8
Purpose of the Study	10
Definitions of Terms	12
Conclusion	12
2 Review of Relevant Literature (minimum of 30 citations).....	13
Background	14
Main Features of CCSS Math	15
Innovative Strategies	16
21 st Century Job Skills	18
Teaching 21 st Century Job Skills	19
Collaborative Learning Strategies	21
Intervention	24
Common Mistakes	24
Successful Implementation	25
Conclusion	28
3 Methods.....	30
Setting.....	30
Participants.....	31
Roles of the Researchers.....	31
Intervention Plan.....	32
Data Collection Methods	34
Ethical Research Practices	37
Plan for increasing validity.	38
Confidentiality and informed consent.	39
Conclusion	40

4	Findings and Discussion	41
	Conclusions	67
	Recommendations for Further Research.....	68
	References.....	70
	Appendices.....	73

Chapter 1

Problem

The number one skill that employers desire in college graduates is the ability to communicate effectively (Casner-Lotto & Barrington, 2006). Communication is a key foundation to living a successful life. The decisions made after an interview are largely dependent upon an individual's ability to communicate their qualifications in a convincing way. The decision to go out on a date is based on the pursuer's ability to communicate his or her own favorable qualities. The morale and productivity in a workplace are at their highest when staff are communicating and working together in harmony (Casner-Lotto & Barrington, 2006). Communication has the power to build a happier and more fulfilling life by fostering positive human relationships.

Businesses have made it known that they believe the current population of young people entering the workforce are not adequately prepared to communicate effectively in a team-oriented job (Casner-Lotto & Barrington, 2006). This is concerning as the global workforce has been steadily shifting towards a culture that values communication and teamwork (Casner-Lotto & Barrington, 2006). In the past and present, many jobs in manufacturing and labor have been outsourced to other countries because the low cost of employment took away America's competitive edge in these fields (Casner-Lotto & Barrington, 2006). With the turn of the century, many countries are becoming more educated and have the potential to start pulling jobs away from areas of the US economy that were once thought to be immune to outsourcing (Casner-Lotto & Barrington, 2006).

To remain competitive in the global market current students need to be experts in all types of communication and teamwork (Casner-Lotto & Barrington, 2006).

Traditionally, math courses have not incorporated large amounts of discourse into the curriculum, and have instead opted for procedures, steps, and shortcuts to solving problems (Hossain, Tarmizi, & Ayud, 2012). Procedures play an important part in all students' mathematical development, but they do not offer opportunities for students to practice any communication skills (Singer, 2007). This strong focus on procedural knowledge has done a disservice to students by not teaching them more life-applicable skills (Casner-Lotto & Barrington, 2006). The Common Core Standards have sought to remedy this problem by incorporating math standards and practices that require higher levels of literacy and communication than previous standards (Dale & Scherrer, 2015). With the new standards have come a flood of ideas and theories about the best ways to incorporate classroom discussion into mathematics courses (Dale & Scherrer, 2015). This study examines the use of cooperative learning groups and their effect on the quality of academic discourse amongst students in an 8th grade math class.

The intervention took place in a middle school math classroom with seventeen student participants. The class consisted of eleven males and six females between the ages of twelve and fourteen. The classroom was comprised of nine Hispanic students and eight Asian students. The intervention plan required students to work together in cooperative learning groups to complete a variety of assigned tasks or problems. Students' conversation and writing skills were measured throughout the process in order to see if the cooperative learning groups had any positive effect upon their communication skills. The hope of this study was to see an increase in the quantity and

quality of their spoken and written communication. This was demonstrated through pre-intervention and post-intervention data collected from written lesson summaries, conversation logs, observational data, and surveys. The Intervention Expert implemented the cooperative learning groups as well as collected data. The Data Analysis Expert reviewed the collected data and drew conclusions about the effectiveness of cooperative learning groups. At the time of this study, the Intervention Expert had been teaching middle school mathematics for five years and had been teaching at the intervention site for two of those years. The Data Analyst had been teaching for over twenty-four years in a multitude of different settings and districts. The Data Analyst's primary experience was with math, but also had significant experience with literacy programs, special education, and many different community education classes.

Purpose of the Study

Studying cooperative learning groups and their effectiveness in promoting communication in math classrooms has great potential to improve the current educational setting in America. Using reflexive inquiry, the Intervention Expert and Data Analyst considered their own experiences in math education and how those experiences support their belief that cooperative learning groups will benefit students (Hendricks, 2017). Upon reflecting, both researchers came to the conclusion that life skills such as responsibility, communication, and teamwork were the most important skills they were taught in their own math education. It is important for all teachers to realize that their course's content is not the sole priority of instructional time (Rotherham & Willingham, 2009). A student with a head full of facts is far less beneficial to the world than one who can communicate and utilize those facts effectively. Cooperative learning groups have

been frequently studied to measure their effects on academic achievement in specific course content, but less time has been spent looking at how they influence communication skills in general (Slavin, 2013). Therefore, the purpose of this research was to explore the effectiveness of cooperative learning groups in bringing this important life skill of communication into the math classroom.

The cooperative learning groups provided the perfect environment to learn communication skills in (Singer, 2007). They forced students to communicate their own ideas, consider the ideas of others, and synthesize both into a working solution (Slavin, 2013). They also forced students to deal with issues of respect, fairness, accountability, and time management (Slavin, 2013). All of these attributes commonly arose from the cooperative learning groups, which allowed experiences that were truly preparing students for their future job and other life situations. These experiences were promoted further by challenging students with rigorous tasks and thought provoking error analysis questions that sparked debate and discussion within the cooperative learning groups (Boaler, 2008). Accountability was built into the structure of the intervention to help ensure that all students were participating in the groups (Slavin, 2013). The hope was that the students would feel more confident in themselves as well as display higher levels of conversation skills than they did at the start of the study.

This research project sought to address the following questions:

1. Primary Question: How might the regular and consistent use of academic discourse through cooperative learning groups impact 8th grade math students' ability to communicate effectively about academic content as measured by written lesson summaries and conversation logs?

2. Secondary Question: How will the implementation of cooperative learning groups affect 8th grade math students' confidence in communicating academically with their peers as measured by observational data and surveys?

Definitions of Terms

Academic Discourse. The thoughtful and clear communication of subject matter that is considered to be academic (Dale & Scherrer, 2015).

Cooperative Learning Groups. Teacher designed activity that involves placing students into groups of 3 or 4 to solve a task or problem in order to provide them with opportunities to practice their communication and teamwork skills (Hossain, Tarmizi, & Ayud, 2012).

Conclusion

As the global market turns more towards collaboration and teamwork it is essential for US schools to respond by aiming to prepare students for this type of environment (Rotherham & Willingham, 2009). For the American education system to be successful in this, it is important that all subject areas strive to teach communication skills alongside course content (Casner-Lotto & Barrington, 2006). This study is important because it aimed to identify a potential tool that could increase students' communication skills in a subject like math that has been neglectful of speaking and writing for many generations (Hossain, Tarmizi, & Ayud, 2012). Chapter 1 described the problem, purpose, and research questions that were the foundation of this study. Chapter 2 will review relevant research on the topic of cooperative learning groups.

Chapter 2

Review of Relevant Literature

As we progress through the 21st century, there is an array of changes on the horizon that are going to directly affect the American Education System (Casner-Lotto & Barrington, 2006). These changes do not diminish the importance of teaching basic core classes, but the skills required of the 21st century workforce demand attention beyond what conventional classrooms have to offer (Hossain, Tarmizi, & Ayud, 2012). 21st century skills include collaboration, communication, creativity, critical thinking and cooperative learning, also known as the five C's (McGuire, 2015). Due to the influence of the Common Core Standards, many districts all over the United States have begun working towards the goal of effectively teaching 21st century skills (Dale & Scherrer, 2015). These skills are essential to meeting the needs of a future society that is interconnected and globally conscious (Casner-Lotto & Barrington, 2006). This change is being accomplished by moving away from the conventional lecture format of instruction and progressing towards the skills of the 21st-century (Hossain, Tarmizi, & Ayud, 2012). It is still important that 21st-century learners develop core academic knowledge from topics such as Math, English, and Science, but knowledge alone is no longer enough. Students need to learn how to use, interact with, and communicate that knowledge in order to be successful in the modern workforce (Casner-Lotto & Barrington, 2006). Only then can students apply their knowledge in a meaningful way and have a positive impact on the world. This research study explored the ideas and issues surrounding

communication in math classrooms and how improving that communication could have a lasting effect upon students. It discusses the background of how the Common Core Standards have encouraged the development of communication skills, the importance of 21st century skills, the benefits and disadvantages of cooperative learning groups, and the thorough examinations of the research on cooperative learning groups.

Background

The Common Core State Standards (CCSS) are an important piece to the puzzle of improving communication in math classrooms. The CCSS were developed in 2010 by the National Governors Association, the Council of Chief State School Officers and strongly supported by the U. S. Department of Education (McShane, 2014). The CCSS included a complete collection of standards that would enhance learning. It was also implemented to help prepare students for success in college and career pathways (McShane, 2014). The collection of standards was designed to guarantee that all students graduate with the necessary skills and knowledge to succeed in school, career, and life, regardless of where they lived (Akkus, 2016). One primary focus of the CCSS was to better prepare students to be able to communicate effectively in the workforce (Dale & Scherrer, 2015). This should have given teachers the freedom to devote time to communication skills, but unfortunately, the CCSS have faced many unforeseen challenges and debates around the country that still continue to this day (Akkus, 2016). Across the United States, there is agreement that there is a serious need for reform in our Education System (Casner-Lotto & Barrington, 2006). When compared with other countries, mathematics taught in America is lacking depth, quality, and connection to real life skills such as communication (Akkus, 2016). The CCSS's focus on communication

skills could be a solution to all of this, but unfortunately, all of the debate and backlash surrounding the new standards has caused a lack of *buy-in* amongst teachers, students, and parents (Akkus, 2016). This disruptive debate has been most heavily felt in math education (Hossain, Tarmizi, & Ayud, 2012). Many veteran math teachers are resistant to Common Core because of the challenge to change their traditional pedagogy (Hossain, Tarmizi, & Ayud, 2012). One method to easing this transition could be to focus professional development on Common Core strategies that teachers are already comfortable with such as cooperative learning groups (Slavin, 2013). Cooperative learning groups are commonly found in all subjects, including math, but rarely are they purposefully planned with the goal of developing communication skills alongside the course content (Singer, 2007). Cooperative learning groups have the potential to be a bridge for math teachers to enter the world of teaching communication and mathematics together (Slavin, 2013).

Main Features of CCSS Math

The Math Content Standards, found within the CCSS, include three main features: rigor, focus, and coherence (Akkus, 2016). To implement these three main features, a teacher must create a curriculum that enhances higher order thinking skills, create an application process that promotes the understanding of a complex, real-life situation, and improve cognitive processes (Marchitello & Wilhelm, 2014). There are numerous strategies that a teacher can use to facilitate these three essential features. However, implementing rigor, focus, and coherence is a complex process and must be made relevant to the students to ensure engagement (Akkus, 2016). One possible solution to facilitating the instruction of the Math Content Standards is to incorporate collaborative

teaching procedures and strategies, such as cooperative learning groups (Farrell & Jacobs, 2016). Traditional direct instruction is not viewed as an effective method for incorporating rigor, focus, and coherence (Akkus, 2016). This is because direct instruction causes the students to become passive learners where the teacher does all of the thinking and discovering for them (Singer, 2007). Cooperative learning provides more opportunities for students to be the ones exploring, discovering, and thinking deeply about content (Singer, 2007). Learning in a cooperative environment allows more opportunities for students to experience rigor, focus, and coherence (Akkus, 2016).

Innovative Strategies

There are many innovative strategies that a teacher can use to implement the Common Core Standards. From these strategies, students will begin the development of critical thinking and communication skills so that they can be successful in real life situations (Alismail & McGuire, 2015). The most important and efficient strategies that are woven into the framework of the Common Core Standards are called Project Based Learning and Cooperative Learning (Marchitello & Wilhelm, 2014). Both meet the intent of the Common Core State Math Standards and efficiently prepare students for the 21st Century. With Problem-Based Learning, students are asked to discuss and analyze different real-life situations or topics (Alismail & McGuire, 2015). In this type of learning, students are moving away from teacher directed instruction to a method of inquiry where students are exploring and discovering independent from the teacher. This kind of strategy provides a significant challenge to students who are not accustomed to working without the constant guidance of a teacher stepping in and telling them how to proceed for each step (Alismail & McGuire, 2015). Problem-based learning, when

implemented properly, has been proven to increase student engagement in class activities, which leads to a deeper understanding of the material and greater confidence when attempting to communicate it (Alismail & McGuire, 2015). Also, with Problem-based learning, an effective teacher enhances their students' critical thinking skills as they begin to learn how to investigate problems, provide explanations, generate ideas, analyze data, and make judgments to find appropriate solutions (Alismail & McGuire, 2015). As students begin to master 21st-century skills, they will demonstrate the ability to collaborate with other students, engage in teamwork, and be able to demonstrate their learning (Farrell & Jacobs, 2016). The capacity and experience to work as a team player and commit to finding solutions to real-life situations is a very profound skill that students need for the 21st century (Casner-Lotto & Barrington, 2006).

The other commonly suggested strategy to be used with the Common Core State Standards is called Cooperative Learning (McGuire, 2015). Cooperative learning promotes critical thinking skills, social interaction, self-directed learning, and cooperation (Hossain, Tarmizi, & Ayud, 2012). With Cooperative Learning, students are divided into different groups with diverse abilities and interests. As students collaborate with their peers, they find enjoyment as they teach and learn from one another (Farrell & Jacobs, 2016). It is important for teachers to apply different types of strategies or methods, depending on the demographics of their classroom, that will better prepare students for 21st Century college or career pathways. There simply is not one type of strategy that will fit all situations (Alismail & McGuire, 2015).

Student centered learning, whether project based or cooperative, is not perfect and has difficulties that keep many teachers from exploring them (Souvignier &

Kronenberger, 2007). One of the main reasons why teachers often do not embrace these strategies is that they take up more time in pacing than traditional methods of teaching (Casner-Lotto & Barrington, 2006). Teachers are often under great pressure from their administrators to adhere to a strict pacing in order to cover every topic that will show up on high stakes testing (Casner-Lotto & Barrington, 2006). There are so many concepts to cover in such a short amount of time that it can sometimes feel necessary to teachers to just use direct instruction in order to move through the curriculum quickly (Casner-Lotto & Barrington, 2006). For this reason, experimenting with student centered learning strategies could be risky for some teachers that do not have supportive administration (Rotherham & Willingham, 2009). This brings up another obstacle that is similar, administrator support. Trying out new ideas that challenge old methods can be difficult on a campus where the administrator does not understand or support the ideas (Rotherham & Willingham, 2009). Finally, a significant obstacle for teachers is training. Teachers tend to teach the way they were taught, which for most of the current population of math teachers this implies a large amount of teacher led direct instruction (Hossain, Tarmizi, & Ayud, 2012). Teaching with student centered activities does not come naturally to most math teachers and requires time and training to feel comfortable with these strategies (Hossain, Tarmizi, & Ayud, 2012). Professional development for both administrators and math teachers could be a solution to these hindrances to widespread use of student centered learning activities such as cooperative learning groups (Slavin, 2013).

21st Century Job Skills

Collaboration, critical thinking, creativity, and problem solving are quickly becoming the essential skills of the 21st century workforce (Gasser, 2011). The majority of business and education leaders are united in their belief that these applicable techniques will be a key factor in remaining employable and competitive in the global market (Rotherham & Willingham, 2009). The number one skill that employers are looking for in graduate students is the ability to communicate in effective and clear ways (Casner-Lotto & Barrington, 2006). The number two skill they are seeking is a college graduate's ability to work in teams and collaborate on projects (Casner-Lotto & Barrington, 2006). Even though these 21st century skills are gaining lots of attention they are actually not new ideas (Rotherham & Willingham, 2009). 21st century skills have been crucial components of many positive changes throughout history, but the difference now is that these skills are being required of the majority of people for employment, not just a small minority of elite academics (Rotherham & Willingham, 2009). For a country to remain competitive in the global market it is not enough to simply assume teachers will effectively teach these skills, but rather, 21st century skills need to be deliberately taught (Dale & Scherrer, 2015). The new Common Core Standards have sought to mandate the instruction of 21st century skills in the form of putting extra focus on literacy and communication (Dale & Scherrer, 2015). Following this new focus on literacy and communication, there has been an increase in research on what pedagogy would most appropriately teach 21st century skills (Rotherham & Willingham, 2009).

Teaching 21st Century Job Skills

One of the most common methods suggested for teaching 21st century skills are cooperative learning groups (Rotherham & Willingham, 2009). Cooperative learning allows students to practice a number of 21st century skills while simultaneously improving in their content knowledge (Hossain, Tarmizi, & Ayud, 2012). Collaboration is considered an essential skill of the future's workforce (Casner-Lotto & Barrington, 2006). Students need to have opportunities to work together in small groups in order for them to be able to enhance their collaboration skills (Hossain, Tarmizi, & Ayud, 2012). In these groups, it is common for students to be forced to learn how to negotiate disagreements and have a diversity of ideas, just like they would in a real workplace (Hossain, Tarmizi, & Ayud, 2012). For students to reap the benefits of cooperative learning, it is important that teachers do not dominate class time (Gasser, 2011). Teachers need to allow students the freedom to struggle and collaborate with each other because in the real workforce, a boss would rarely, if ever, step in and complete a task that was assigned to an employee (Gasser, 2011). This freedom encourages students to use their own critical thinking skills in order to become problem solvers, which is exactly what employers are looking for in potential hires (Hossain, Tarmizi, & Ayud, 2012).

Integrating collaboration time also encourages the solutions to be student-led (Rotherham & Willingham, 2009). Student-led solutions allows for students to become more independent and able to work effectively without needing constant guidance from a facilitator, such as the teacher or a supervisor (Gasser, 2011). This is an important skill to have in any job position because employers want to feel confident in their employee's capacity to independently complete delegated tasks (Hossain, Tarmizi, & Ayud, 2012).

Cooperative learning groups also provide many opportunities for trial and error, which implies that mistakes will happen (Gasser, 2011). This is a prime opportunity for students to realize that mistakes are a common part of life and that it is important to learn from them (Gasser, 2011). Most employers do not expect perfection, but they at least expect to see growth as their constituent learns from mistakes (Gasser, 2011). Cooperative learning groups have great potential to play an effective role in teaching students the necessary job skills and content knowledge to be prepared for the 21st century workforce (Hossain, Tarmizi, & Ayud, 2012).

Collaborative Learning Strategies

For the last thirty years, there have been a plethora of studies conducted with regards to the implementation of the Collaborative Learning Strategy and its effectiveness in American classrooms (Kimberly, 1996). This approach persuades all students with diverse abilities to be able to *bring something to the table*, stay motivated, and increase performance (Knowlton, 2003). Collaborative learning is being used with Common Core Standards because of its rich student engagement (Siegel, 2005). The success of teachers who have used the Collaborative Learning Strategy have shown that students have gained a better understanding of their education, have improved their grades, and have become more likely to successfully obtain their college diplomas if they have chosen to enter college (Burke, 2011). These students have also been found to take great strides towards their development of 21st century job skills (Hossain, Tarmizi, & Ayud, 2012). More important than ever, Collaborative Learning links the knowledge and academia that is taught within the classroom to the outside world, therefore enabling students to compete effectively within the global market (Alismail & McGuire, 2015).

Collaborative learning and all of its strategies focus on one important concept. This concept merely states that the abilities of all students should be challenged and actively engaged in the learning process (Halley, Heiserman, Felix, & Eshleman, 2015). With that being said, there can be both advantages and disadvantages when teachers implement Collaborative Learning Strategies in their classrooms.

As with any instructional strategy, the benefits rely heavily on the effectiveness of the teacher. The teacher must have a thorough knowledge of the subject matter and be able to predict potential struggles that students might have as they work together (Rickard, 2014). When implemented by effective teachers, cooperative learning groups have been found to increase student success in remedial math classes at the college level (Hooker, 2011). Surveys revealed that these remedial math students actually enjoyed cooperative learning groups significantly more than working alone (Hooker, 2011). Working collaboratively in groups stimulates creativity as they gather more information from each other due to the diversity of the participants (Rickard, 2014). Students were also found to have much higher levels of perseverance when working in cooperative learning groups (Hooker, 2011). Many students have displayed higher levels of self-esteem from the success they experienced due to having group partners to consult with (Hooker, 2011). The greatest advantage of student collaboration is that they gain a better understanding of the kind of student that they are becoming due to the constant feedback they receive from their peers during these activities (Burke, 2011).

Unfortunately, cooperative learning is not perfect and does have disadvantages. No matter how effective and efficient the teacher is, how well the lesson plan is developed, or how organized the groups are, there can still be problems that arise. One

major frustration is the lack of quality conversations that actually occur (Souvignier & Kronenberger, 2007). Students will not automatically have high-level conversations just because they are in groups (Slavin, 2013). Purposeful planning of prompts and scaffolds are essential to keeping the students engaged with the discussion (Souvignier & Kronenberger, 2007). A similar problem is with the poor quality of instruction that can happen with peer teaching (Souvignier & Kronenberger, 2007). The idea of students teaching each other sounds great, and it can be, but often the peer instructor either lacks the patience or knowledge necessary to effectively answer questions (Souvignier & Kronenberger, 2007). In the group settings, inevitably there will be one student who will dominate the discussion, and this may intimidate the others and cause them to not engage or participate with their groups (Burke, 2011). Another problem with a dominating student is that the others may sit back and rely on the self-proclaimed *leader* to complete all of the work (Slavin, 2013). Another disadvantage is found in the struggle to balance high-achieving and low-achieving students in collaborative learning groups (Souvignier & Kronenberger, 2007). Low-achieving students may feel somewhat lost, overwhelmed with anxiety, develop a loss of interest, become inattentive, and feel that they cannot participate (Lack, Swars, & Meyers, 2014). High-achieving students will tend to work collaboratively together in their groups, but they tend to show levels of frustration towards low-achieving students that they are forced to work with (Souvignier & Kronenberger, 2007). High-achieving students find greater enjoyment with participation, except when it comes to collaboratively discussing mathematical content to a low-achieving student (Lack, Swars, & Meyers, 2014). A common disadvantage to cooperative group work is with class management (Souvignier & Kronenberger, 2007).

Group work needs to be carefully planned in order to ensure that all transitions and activities do not just turn into noisy chaos (Slavin, 2013). Collaborative learning strategies such as cooperative learning groups should be a frequently used strategy in every teacher's arsenal of lesson ideas.

Intervention

Cooperative learning is a lesson activity designed by the teacher for the purpose of allowing students the chance to improve their communication skills as they work together with other students to complete the given task (Hossain, Tarmizi, & Ayud, 2012). Cooperative learning has been gaining attention over the years due to its consistent link to improved academic success for students when compared with traditional education methods (Hossain, Tarmizi, & Ayud, 2012). This success has been largely attributed to cooperative learning groups' potential to effectively incorporate debate and discussion, which have been shown to increase engagement and achievement in all subject areas including math (Singer, 2007). For this reason, many math teachers are eager to implement these groups into their classroom, but all too often, mistakes are made that lead to frustration and a chaotic classroom (Slavin, 2013). The chaos is the result of students being given the opportunity to practice communication skills with no structure or expectations given for the activity (Slavin, 2013). Cooperative learning groups cannot be implemented successfully without well thought out structure that helps students understand the fine line between productive group work and chaotic socializing (Slavin, 2013). Avoiding common mistakes will help math teachers to be far more successful and satisfied with the results of cooperative learning groups (Souvignier & Kronenberger, 2007).

Common Mistakes

Teachers often expect their students will get along and be productive just because they are told to, rather than having to work on and develop their cooperative attitudes to the point that the activity can be successful (White & Dinos, 2010). Some teachers are uncomfortable with the unpredictability that comes from students finding multiple approaches to solving a problem, when this is actually a prime opportunity for an engaging discussion (Singer, 2007). Another complication can be when teachers do not consider the level of background knowledge students need in order to be successful with their group (Singer, 2007). Teachers end up grouping students with extremely different levels of background knowledge, which creates barriers in the communication that should be happening (Eissa & Mostafa, 2013). Similarly, teachers often do not consider their students' English proficiency and how the purposeful choice of a partner can make a tremendous difference in the quality of conversation for these students (Souvignier & Kronenberger, 2007). Often, teachers give far too much support to the groups for fear that they will not come to a correct solution, when it is actually beneficial for the groups to productively struggle with the content as it promotes engagement and discussion (Dale & Scherrer, 2015). Equally common is the teacher who, in an effort to avoid the previous problem of offering too much support, does not give any support and ends up making their students feel helpless (Souvignier & Kronenberger, 2007). Fortunately, there is much guidance to be found in the research on cooperative learning groups to help teachers be more effective in their implementation.

Successful Implementation

To be successful, teachers need to create an atmosphere of cooperation and respect between students, not just during group activities (White & Dinos, 2010). Cooperative learning needs to become the norm in a day's lesson rather than the rarity to create this classroom culture (Souvignier & Kronenberger, 2007). Cooperative learning groups could easily be incorporated into a math classroom on a daily basis by replacing individual practice time with group practice time (Slavin, 2013). Group practice accomplishes the same goal as individual practice but has been shown through research to be more effective in teaching both content and communication skills (Slavin, 2013). Also, instructional time needs to be taken from the course content in order to teach general conversational skills to help enrich collaboration and discussion (White & Dinos, 2010). Students cannot be expected to immediately understand how to communicate with each other appropriately in a math class (White & Dinos, 2010). For maximum benefit, they need to be trained on respect, turn taking, listening, and what it means to build on another's ideas (White & Dinos, 2010).

An effective way of doing this is to design an activity based on the interests of the students and not the course content, such as their favorite sport or hobby (Slavin, 2013). This will allow students to become more comfortable with each other, which in turn, should foster more confidence in their conversations with each other (Slavin, 2013). Posting sentence frames on the wall can also help with teaching students these skills by giving them more confidence with a starting point to begin their statements to each other (Souvignier & Kronenberger, 2007). Sentence frames are especially helpful in a math class as students typically struggle with understanding how to communicate about math

(Souvignier & Kronenberger, 2007). Students also need a goal to work towards in order for them to feel motivated and engaged (Slavin, 2013). Having a purpose or target in mind is motivating for the same reason that a point system is motivating to a sports team (Slavin, 2013). One way to motivate students is to utilize complex math tasks that are based in the real world and would be difficult for a student to solve alone (Boaler, 2008). These tasks should allow multiple approaches to solving so that students can feel a sense of autonomy as they make choices about the best way to find a solution (Eissa & Mostafa, 2013). The real world connection helps to bring math to life for students that typically see math as being disconnected from their own experiences in the real world (Boaler, 2008). At the end of the math task there should be a product of high quality content required from each group that serves as the end goal for the team (Eissa & Mostafa, 2013). Another effective structure to use when implementing cooperative learning groups is accountability (Slavin, 2013). Accountability is one of the most critical ingredients in successful cooperative learning groups (Slavin, 2013). Without accountability, too often, one or two students will do all the work for the team while the others feel no obligation to enter the struggle to solve the problem and therefore reap no benefits from it (Souvignier & Kronenberger, 2007). Some ways accountability can be accomplished are by creating individual jobs for each team member, calling on random students from each team to show that each member must be ready to answer, or possibly assigning a group quiz that will receive an average score for them all (Slavin, 2013).

For cooperative learning groups to be successful, teachers also need to be willing to relinquish control of the classroom so that the activity can be student led (Singer, 2007). The teacher still needs to be there to provide support, but too much support will

cause the students to feel a dependence upon the teacher rather than their own intellect (Dale & Scherrer, 2015). Math teachers commonly have a difficult time relinquishing control, because, traditionally, math teacher's primary instruction has been conducted through lecture format (Hossain, Tarmizi, & Ayud, 2012). Changing this, and pushing for more student led activities is a significant hurdle for many math teachers (Hossain, Tarmizi, & Ayud, 2012). The fear of change is primarily the fear of the unknown. This research is important because it removes the unknown and gives math teachers the opportunity to examine many different aspects of cooperative learning groups before blindly attempting to implement them. From this research, math teachers can learn to plan purposeful, well thought out cooperative learning group lessons that not only benefit students' academic performance, but also benefit their personal and professional lives by improving their communication skills.

Conclusion

The coming of the 21st century has brought with it many uncertainties for the US and its youth. Now more than ever other countries from around the world are becoming more and more educated and thus, pose competition to the future workforce of America (Casner-Lotto & Barrington, 2006). With the development of the Common Core Standards there has been a new focus on building the 21st century skills into the curriculum (Dale & Scherrer, 2015). No longer can students simply just be people who *know a lot* and received *good* grades in school (Casner-Lotto & Barrington, 2006). In the 21st century, employers are looking for applicants with social skills such as the five C's (McGuire, 2015). The future of America could be largely dependent upon the choices made about education in this generation (Casner-Lotto & Barrington, 2006). Students

need to be lifelong learners and continue to evolve as they persevere through the challenging and unique problems that life brings them. The research thoroughly covers the importance of what needs to be changed, but is lacking in practical examples for teachers to learn from. Practical research focused on advising classroom teachers rather than public policy is essential to the professional development of teachers and their success in the classroom. Chapter 2 reviewed the literature discussing cooperative learning groups and communication in math classrooms. Chapter 3 takes this information and describes in detail the cooperative learning group intervention that measured for effectiveness in improving students' communication skills.

Chapter 3

Methods

Students in math courses often struggle with communicating academically even if they are high achieving (Casner-Lotto & Barrington, 2006). This is because, in favor of procedures, math teachers typically do not spend significant amounts of time developing communication skills (Hossain, Tarmizi, & Ayud, 2012). This intervention aimed to measure the effectiveness of cooperative learning groups in developing student confidence and ability with communication.

Setting

This action research project took place at a middle school in an urban school district located in Southern California. The students at this school predominantly come from low-income families that rent apartments in the surrounding area. The parents are only minimally involved and rarely make contact with teachers to discuss their child's work and progress. The school's demographics are 82% Hispanic, 14% Asian, 3% White, and 1% African American (Great Schools, 2017). Ninety-two percent of the students qualify for free or reduced lunch (Great Schools, 2017). As a whole, the school's achievement on state English Language Arts testing was at 42% with the state average being 48% (Great Schools, 2017). The school's achievement on state mathematics testing was at 26% with the state average being 37% (Great Schools, 2017). The school had a total enrollment of about 675 students and 51% of these students were classified as English Language Learners (Great Schools, 2017).

Participants

The middle school math classroom being studied was comprised of seventeen student participants. The participants consisted of eleven males and six females between the ages of twelve and fourteen. There were ten Hispanic students and seven Asian students. The students were a mix of 7th and 8th grade students who were on an accelerated track in math and were currently taking Algebra 1. These students were accelerated because they consistently scored above grade level on state testing and district benchmarks. They were competent in their mathematics skills, but not their communication skills. They were adept at following teacher examples in order to learn how to solve problems, but consistently struggled to communicate this learning with either speaking or writing. This high level of mathematical ability but low levels of communication skills was the inspiration behind the cooperative learning group intervention. The researchers' hope for these students was that they would not only succeed in content, but also in life skills such as communication.

Roles of the Researchers

Two researchers split their roles and worked together to complete this project. One researcher took on the role of the *Intervention Expert*. The Intervention Expert completed all tasks that required an onsite presence. The Intervention Expert notified parents, students, and administration about the research and obtained all required informed consent forms. The Intervention Expert was also in charge of implementing the cooperative group strategy in the physical classroom. The Intervention Expert collected all data from pre and post-surveys, observations, student work, and conversation logs.

The Intervention Expert also kept a reflection journal and participated in member checks to help validate the study at its conclusion (Hendricks, 2017).

The second researcher took on the role of *Data Analysis Expert*. The Data Analysis Expert received all of the data collected from the Intervention Expert throughout the process of the intervention. The Data Analysis Expert then triangulated the data to come to meaningful conclusions about the effectiveness of collaborative learning groups and their effects on students' communication skills (Hendricks, 2017). The Data Analysis Expert brought these details to the Intervention Expert throughout the process in order to reflect and make necessary adjustments to the intervention. Both the Intervention Expert and the Data Analysis Expert have multiple years of experience teaching math with traditional methods, which provided a background that proved beneficial in comparing traditional direct instruction methods versus cooperative group methods.

Intervention Plan

The participants were high achieving math students who displayed a lack of confidence and ability to communicate their thoughts about math. The cooperative learning groups described in this section were measured for their effectiveness on improving students' communication skills. The cooperative learning groups were implemented three days a week for three weeks with two additional days prior to the beginning of research to collect baseline data, create teams, and set up the norms for working in cooperative learning groups. There was also one additional day after the implementation to collect post-survey data as well as to complete member checks with the participants (Hendricks, 2017). The first day, prior to research, allowed the Intervention Expert to collect baseline data by asking students to work in cooperative

learning groups with absolutely no preparation. This created the ideal scenario to collect data about their current communication skill level and confidence level. The students were placed into random groups and asked to complete a practice worksheet together. No further direction was given in order to not influence the results of the baseline data. The second day, prior to research, allowed students a chance to practice working in cooperative learning groups without the pressure of performing mathematically at the same time (Slavin, 2013). They discussed who their favorite super hero is, what super power they would want for themselves, and then came up with a super hero team name for their group. The activity and team name allowed students to become more comfortable with talking to one another as well as develop a sense of unity around their new team name. This helped students to better understand cooperative group norms and to be more engaged during cooperative group work throughout the intervention.

The cooperative learning groups were implemented three different ways each week in no particular order. The first way cooperative groups were used was with roles and accountability (Slavin, 2013). Each student was given a specific job to ensure that every member had a responsibility to fulfill. One student was called the *Spy* and was responsible for asking for help from other teams whenever their own team got stuck. Another student was called the *Ambassador* and was responsible for all questions and communication between the teacher and the team. The third student was called the *Detective* and was responsible for consolidating all their work down onto a single worksheet that was collected by the teacher at the end of the activity. Finally, if there was a fourth student in the group, they were given the job of *Headquarters* and had the responsibility of keeping everyone working and on task. The roles helped students

understand how to participate in a group setting. The worksheet prepared by the *Detective* was a graded assignment, which gave the whole team a common goal to motivate them to work together and communicate in order to complete the task (Slavin, 2013).

The second way the cooperative learning groups were implemented was with error analysis (Gasser, 2011). The students were taught a new lesson for the first half of class, but then broke into their cooperative groups to analyze common errors that the Intervention expert had seen in the past. The students were given problems that had already been solved, but contained errors. The students then had to work in their teams to identify the errors and write descriptions of the errors. Once finished with identifying the errors, each student was then required to individually write a short lesson summary. Working in the groups to write the description of the errors was a powerful scaffold that prepped them for communicating through writing without help from their teammates.

The final way cooperative learning groups were implemented was with engaging tasks that have multiple approaches (Boaler, 2008). The tasks were engaging because they did not have one precise way to solve them. The students had to think, discuss, and plan out their team's own strategy for solving and be prepared to present their results. The tasks generated great conversations because they had multiple approaches. This created disagreement and debate amongst team members who also shared the common goal of wanting to complete the task. All three of these implementation methods were used once each week, totaling three cooperative learning group lessons each week.

Data Collection Methods

The first piece of baseline data collected was the pre-survey (see Appendix A). This survey served two functions. First it was meant to screen students in order to

identify which students already felt confident about communicating in front of their peers. This way, the research was able to focus more on those students who lacked confidence and had the greatest potential for improvement. The second purpose was to get baseline, qualitative data about how students feel about working in groups and communicating with peers. The qualitative data were the baseline for the secondary research question regarding student confidence with communication skills. The second source of baseline data was collected on the same day from a conversation log, observation data, and a written lesson summary, all based on a cooperative group activity. The students were given no preparation or directions as to how the groups should work or communicate to ensure that the data collected represented their current communication levels. The conversation log and written lesson summary were used to obtain the baseline data needed specifically for the primary research question about communication skills. The observation data collected was focused on checking for participation levels, which helped answer the secondary research question because high levels of participation were interpreted as an indicator of confidence.

The Intervention Expert utilized three different data collection tools for each week of the intervention. One tool was assigned to each of the three days per week. For the first implementation, when students were using roles and accountability, the Intervention Expert collected observation data by using a tally sheet to record the number of times students behaved in a way that showed communication skills of some way (see Appendix E). This was primarily done as a check for participation to see if the students were actually using the roles appropriately and attempting to help their team complete the task. This check for participation allowed the Data Analysis Expert to see if there were any

increases in participation from week to week as more participation was viewed as an indicator of increased confidence, therefore helping to answer the secondary research question.

The second tool, written lesson summary, was collected after the error analysis lessons. The process of error analysis in a group setting allowed students to view what they were just taught compared to common mistakes. This helped students to develop a better understanding of what was taught, which enabled them to communicate more effectively when writing the written lesson summary. These lesson summaries were collected each week for the Data Analysis Expert to compare and see if there was any increase in their ability to communicate academically. The goal was to see more clarity and depth of understanding in their writing by the third week, therefore helping to answer the primary question regarding levels of communication skills.

The third tool, conversation log (see Appendix F), was used during the engaging task lessons. These tasks offered multiple approaches and encouraged increased communication amongst team members, therefore making it the perfect type of lesson to collect data specific to their conversation skills. The conversation log was used to measure two different aspects of their communication skills. First, it kept track of how many turns students made in their conversations. This helped reveal information to the Data Analysis Expert about the quantity of communication that was happening. Second, it looked to identify if each turn was building on each other and developing understanding of the content. This was how the Data Analysis Expert was able to come to conclusions about the quality of the students' communication skills. This tool was used to help answer the primary research question by helping to identify any changes in their

communication skills throughout the cooperative learning group intervention. In addition to these three data collection tools, the Intervention Expert also wrote in a reflection journal (see Appendix I) after each day of the intervention.

Finally, the post-survey (see Appendix B) was given after the intervention to obtain more qualitative data to compare with the original data obtained from the pre-survey. Almost the same exact survey was used for both the pre and post-surveys to see if there was any direct change in how students answered the questions to the survey. The surveys were both meant to answer the secondary research question by asking students about their feelings regarding group work and communication in general.

Ethical Research Practices

Ethical research is always of critical importance, but is even more so when children are involved. Children are vulnerable, immature, and often do not know how to self-advocate. This has the potential to create harmful situations for children involved in research (Graham, Powell, & Taylor, 2015). High standards of ethical practice need to be upheld when children are involved. For this reason, the Intervention Expert and Data Analysis Expert both completed trainings from the National Institute of Health (NIH) in order to become certified in performing research on human subjects before any research had begun. Also, an Institutional Review Board (IRB) approved the study after checking to ensure that the research study was ethical in practice. The child's choice was taken very seriously in this research. Both the child and parent were given informed consent forms (see Appendix C & D) to be able to opt-in or out of participating in the study. All choices made by parents and children were respected. Both the parent and the child had to be in agreement before they were included as research participants. The students who

became participants were informed and reminded each week that they had the option to discontinue participation in the study at any time. The topic of cooperative learning groups was chosen in part because it posed minimal risk to the students while providing potentially great benefits to the students' development of communication skills. It was the goal of the Intervention Expert and Data Analysis Expert to ensure that all participants were safe and received maximum benefits from the cooperative learning groups.

Plan for increasing validity. One type of validity used in this study was credibility. Credibility was used to ensure that the facts and findings were accurate so that correct conclusions were made when analyzing the results (Hendricks, 2017). It would have been pointless to examine the effectiveness of cooperative learning groups if there was no credibility. Credibility was accomplished through Triangulation, the use of many different sources of data to help verify accuracy (Hendricks, 2017). The Intervention Expert collected written summaries and conversation logs to answer the primary research question about the effectiveness of cooperative learning groups in teaching conversation skills. The Intervention Expert also collected observation data and survey data to answer the secondary research question about student confidence with communication. All of these sources helped strengthen the credibility of the study by means of Triangulation.

One of the hopes of this study was that the results would potentially benefit or inform other math teachers about the effectiveness of cooperative learning groups in promoting communication skills. For other teachers to benefit, the study needed to have another type of validity known as transferability. Transferability can be defined as the ability for other teachers to generalize the results from the study to their own classrooms

without having to replicate the study (Hendricks, 2017). This was accomplished by supplying a thick description of the setting, study, and participants so that the reader could easily judge whether or not the results would apply to their own setting and students (Hendricks, 2017). For example, if a teacher's student demographics and achievement data match the study's participants, then that teacher could be reasonably sure that they would experience similar results if they were to implement cooperative learning groups.

The last type of validity used in this study was confirmability. Confirmability helps to ensure that correct solutions are reached in the process of analyzing the data (Hendricks, 2017). One way the study accomplished this was by using peer debriefing with a co-worker to get the viewpoint of someone who was not involved in the project at all (Hendricks, 2017). Discussing the results with a non-involved individual helped to remove bias and ensured that the Data Analysis Expert was seeing the data with clarity and no other influences (Hendricks, 2017). Member checks were also used in order to hear the students' opinions about the conclusions made about the data (Hendricks, 2017). Both of these methods helped to confirm that the results used for answering the two research questions were accurate in their measurement of communication skills and student confidence.

Confidentiality and informed consent. Ensuring confidentiality was a top priority of this research project. All of the general information about the site and participants were purposefully stated in such a way that it would be impossible to identify the students, site, or even the school district. None of the students' names were used in any of the research. Instead, numbers were given to each of the participants and were

used throughout the study as a means for the researchers to be able to identify them. All physical copies of information about the participants were locked in a file that only the Intervention Expert had access to. Also, all digital copies of information were stored on two password-protected computers that only the Intervention Expert and Data Analysis Expert had access to. The digital copies were placed on two computers so that both researchers could have access to the information during the study. All data were either shredded or deleted three years after the completion of this study.

All of the students, parents, and administrators at the site were given informed consent forms (see Appendix C, D, & G). The site administrator gave full support to the research study and saw it as a beneficial process for the kids. The parents and students were given a clear choice to decline participation in the study with no penalty to the student in any way. The Intervention Expert made it a priority to remind the students each week that they could opt-out at any time during the intervention. There were no advantages or rewards given to students who participated, such as extra credit. This allowed students to make a clear and honest decision along with their parents as to whether or not they wanted to participate.

Conclusion

This intervention was designed to discover whether or not cooperative learning groups have a positive influence on students' communication skills. The hope was that by implementing cooperative learning groups three days a week for three weeks there would be a noticeable increase in students' confidence and ability to communicate academically. The next chapter discusses the results and implications of the data collected during the intervention process.

Chapter 4

Findings and Discussion

During the early phases of planning this intervention both researchers became increasingly interested in the importance for mathematics students to not only be able to solve problems but also be able to communicate their knowledge in a clear way. Both researchers have experience teaching advanced courses of math where the students feel confident in their ability to solve problems but lacked the skills necessary to communicate that knowledge to another individual. This was important to the researchers because being successful in the workforce requires high levels of communication skills. The focus of the intervention became more solidified as both researchers agreed that they wished their students were more capable and confident in their communication of the course content. The review of the literature led both researchers to believe that cooperative learning groups were the key to accomplishing these goals. Students learn best from experience and through cooperative learning groups students can practice both content and communication skills side-by-side (Hossain, Tarmizi, & Ayud, 2012).

The first research question sought to measure how the regular and consistent use of academic discourse through cooperative learning groups would impact 8th grade math students' ability to communicate effectively about academic content as measured by written lesson summaries and conversation logs. The written lesson summaries were collected once a week after an error analysis lesson where students had a chance to examine non-examples of the content and discuss the differences in cooperative learning

groups. The error analysis and discussion in groups was meant to replace individual practice of problems to better prepare them to be able to communicate the content through writing (Slavin, 2013). The summaries were evaluated based on accuracy, clarity, and usefulness (see Appendix H). To be considered *accurate*, the summary had to correctly explain one of the features of the day's lesson with absolutely no errors. If there was even one error then that summary was not counted as being accurate in the data. For a summary to be considered *clear*, language used by the student had to make sense, have mostly correct grammar usage, and be easy to read. This had nothing to do with content, but simply their writing style. For example, many students wrote summaries utilizing fragmented sentences, bullet points, or awkward short phrases that sounded more like step-by-step guides than written paragraphs. Some of these poorly written summaries were considered *accurate* and, in some rare cases, *useful*, but they were not *clear* due to their lack of sentence structure and difficulty with reading. Finally, summaries were considered *useful* if they were written in such a way that a student could use the summary as a study tool. This was the most difficult criteria for them to achieve because to be useful they needed to supply enough *accurate* and *clear* information that one could be taught the content just from reading the summary. Figure 1 details the data from the written lesson summaries beginning with the baseline data all the way through to the end of the intervention at week 3.

The students' level of accuracy improved steadily throughout the intervention. As a class, their baseline data revealed that only 47% of students wrote accurate summaries. This means that over half the class had incorrect information in the baseline data collection. Week 1 of the intervention improved to 64% likely due to the pre-instruction

that was given about how important it is to have accurate information in a summary (White & Dinos, 2010). This progress continued as 76% of them had accurate summaries by week 2, and finally, 94% had accurate summaries by the end of the intervention, week 3. The percentage of accurate summaries doubled as a result of the intervention. There was brief instruction about the expectations for the summaries before they would write them, which gave them a goal to aim for, but the discussion in cooperative learning groups was where they really got to think through the content and verbalize it before writing it down (Souvignier & Kronenberger, 2007).

Cooperative learning groups had a significant positive impact on the accuracy of the information contained within the summaries, but they had a neutral effect on the clarity of the students' writing. The baseline data revealed that 58% of the students were able to communicate their thoughts clearly. This does not mean that the content was accurate, only that their use of language made the author's *intent* clear to the reader. During week 1 this increased by a small amount to 64%, but then dropped all the way down to 47% in week 2. Week 3, the final week of the intervention, was equal to the baseline data. When one considers the fact that English teachers spend an entire year trying to help their students take small strides in improving their writing abilities, it makes sense that working in cooperative learning groups for only three weeks in a math class is not enough time to see positive or negative results in this area.

The cooperative learning groups were found to have no effect on students' writing abilities, but there was more positive data that came from the usefulness of their summaries as study tools. Only 17% of students in the baseline data wrote anything that could be used to study later in the unit. The information might have been accurate, but

many of them were not clear or were incomplete, thus making them invalid as a serious study tool. For example, the reflection journal notes (see Appendix I) that many of the baseline summaries just restated the lesson's objective without actually explaining the topic at all. This improved slightly during week 2 as 23% of them were able to write useful summaries. During the last two weeks, the intervention expert encouraged the students to use the discussion time to identify the key concepts that could be used for studying in order to strengthen their summaries (Slavin, 2013). This encouragement helped immediately as 58% of the week 2 summaries were evaluated as being useful. There was a decrease in percentages during the last week from 58% to 47%. That being said, 47% was still more than double the useful summaries written during baseline data collection and week 1 of the intervention. Increasing from 17% to 47% was a significant improvement and shows the value of teachers playing a role in directing the discussion in cooperative learning groups to better reach a specific goal (Slavin, 2013).

Summaries that did not meet any of these criteria were categorized in Figure 1 as *none*. The hope was to see this percentage decrease rather than increase like the other percentages for the written summaries. The baseline data revealed that 29% of the students wrote summaries that were not accurate, clear, or useful in any way. This decreased down to 17% during weeks 1 and 2 of the intervention and decreased even further to only 5% during week 3. This showed a significant improvement and illustrates how effective the cooperative learning groups were at improving students' communication skills. With the exception of cooperative learning groups having no effect on students' writing clarity, the data shows consistently positive results about the effects

of cooperative learning groups on students' communication skills in the form of written lesson summaries.

Figure 1

Written Lesson Summary Data

Written Lesson Summary Data				
<i>Percentage of Class that Met Standard for Each Category</i>	Accurate	Clear	Useful	None
Baseline	47%	58%	17%	29%
Week 1	64%	64%	23%	17%
Week 2	76%	47%	58%	17%
Week 3	94%	58%	47%	5%

The next collection of data sought to continue answering the primary research question about the effectiveness of cooperative learning groups on improving students' communication skills. This set of data was collected in the form of conversation logs (see Appendix F). The students were assigned challenging tasks that would permit multiple approaches to solving (Boaler, 2008). Having multiple approaches created many opportunities for rich discussion amongst the participants as they worked in their cooperative learning groups to agree on the best method to complete the task (Hossain, Tarmizi, & Ayud, 2012). The students' conversations were scored on a scale of zero to four by examining how many turns students took (back and forth conversation) and whether or not their replies to each other built upon each other's ideas. A score of zero meant that the conversation did not last three turns. The most common example of this was when a student would ask a question of a teammate only to receive a yes or no answer in reply. These were scored as a zero because they did not last three turns and did not help to build understanding of the content. In this case, the standard that the researchers were measuring, communication skills, was referred to as *not observed* in Figure 2. Students scored a one as soon as their conversation reached three turns. A score of one only reflects quantity and not quality as is referred to in Figure 2 as having *partially met* the standard. Students were able to score a two if their conversation lasted for three turns and those turns were actually building on each other. Building on each other meant that they were engaged, listening, and actually putting effort into their responses to one another. Scoring a three or four was more difficult as students had to also accurately develop the intended learning in their conversations. The difference between a score of three or four was based on the clarity of their communication. If

anyone could pick up the conversation log, read it, and understand what the students meant, then it would be considered a four, or exceeding the standard. If only the teacher or someone else with knowledge of the subject could understand what they were saying because of their connection to the content, then they would only score a three. A score of three is still a great score and was looked at as having *met* the standard. It would mean that their conversation lasted three turns, built upon each other's responses, helped to develop understanding of the content, but could have been communicated more clearly or with more precise wording. A score of 4 would be a perfect and precise conversation. Figure 2 displays all of this data in order to clearly examine any benefits from using cooperative learning groups to improve verbal communication skills. As discussed in the reflection journal, conversations were difficult and time consuming to record accurately, so upon reflection, the intervention expert decided to only record four conversations each week to ensure quality over quantity so that the conversations could be accurately recorded and scored (see Figure 2).

The baseline conversation log data (see Figure 2) showed that two out of the four recorded conversations did not last three turns and therefore did not count as actual conversations and scored a zero, or *not observed*. The other two conversations scored a one (partially met) only because they lasted three turns. Unfortunately, the score of one also showed that the students were not listening carefully to each other and did not build on each other's ideas. It was noted in the reflection journal that many of these conversations that only scored a zero or one was due to the student's impatience when working with their teammates. In other words, the baseline data showed that the students were not talking or attempting to communicate. They were sitting in small groups but

working alone. Spending time setting up norms and expectations before beginning the intervention had a significant impact on the results (Slavin, 2013). Immediately, the second week of the intervention the conversations improved a little bit. Two of the conversations were scored as approaching the standard because not only did they last three turns, but they also built on each other's ideas. There were still two conversations that only partially met the standard, but none of them scored a zero this time. The following week improved even more so as two conversations met the standard. They lasted three turns, built on each other, and even developed the content accurately, although not clearly. This was why they were not scored as a four. By week 3, the students had become much more comfortable with their teammates and trusted each other more (White & Dinos, 2010). Because of this they were more open to respectful debates and all four of the recorded conversations scored a three. No conversation during the intervention scored a four, which is understandable because of how difficult it is to do so. Scoring a four would probably require a longer intervention to get the students communicating at that level. Although no conversation scored a four, these are still positive results that illustrate the benefits cooperative learning groups have on students' communication skills.

Figure 2

Conversation Log Data

<i>Conversation Log Data (4 conversations recorded each week)</i>					
<i>Number of Recorded Conversations</i>	Not Observed (Score = 0)	Partially Met (Score = 1)	Approached (Score = 2)	Met (Score = 3)	Exceeded (Score = 4)
Baseline	2	2	-	-	-
Week 1	-	2	2	-	-
Week 2	1	-	1	2	-
Week 3	-	-	-	4	-

The second research question sought to measure how the implementation of cooperative learning groups affected 8th-grade math students' confidence in communicating academically with their peers as measured by observational data and surveys. The observational data were collected on a tally sheet once a week. The goal of this was to measure how many times students and their cooperative learning groups participated in a variety of different ways. The intervention expert checked for all group members actively participating, group roles being used correctly, students being respectful of one another, perseverance in discussion, and completed work (Slavin, 2013). Participation was checked for every five minutes, and completed work was checked for at the end of the class period. Everything else was tallied in real time as it was observed. Figure 3 shows the summary of the tallies collected of the different forms of participation for each group (see Figure 3).

The data from weeks 1-3 showed a tremendous amount of variance. Each week the data changed and showed something different about each groups' amount of participation. Most of this variance was likely due to differences in student attitude each week (Souvignier & Kronenberger, 2007). An individual group's participation could be affected by their interest in the topic, how much sleep they got, what they had for breakfast, distractions in their personal lives, and a myriad of other potential helps or hindrances. There was no real cohesive trend from week 1 to week 3, but there was still an extremely valuable piece of information that came from the baseline data.

Participation was almost non-existent pre-intervention. Setting up and practicing the norms of cooperative group work had an immediate impact upon their participation during week 1 (White & Dinos, 2010). Every category of participation was at minimum

doubled for any week after the baseline week with the exception of their respectfulness towards one another and their ability to complete the assignment. These two categories did not improve because, before the intervention, these participants were *already* respectful of each other and determined to always complete their work. Upon reflection, the tally sheet could have had these two categories removed for this group of students as there was no need for improvement. In the other areas of group roles, whole group participation, and perseverance in discussion, this group *did* need improvement. The data in Figure 3 shows that they improved in these areas as there was a dramatic change from the baseline data to the overall data for weeks 1-3 (see Figure 3). The reflection journal also agrees with this as it discusses the stagnation or leveling off of improvement after the immediate jump from the baseline data to weeks 1-3 data (see Appendix I).

Figure 3

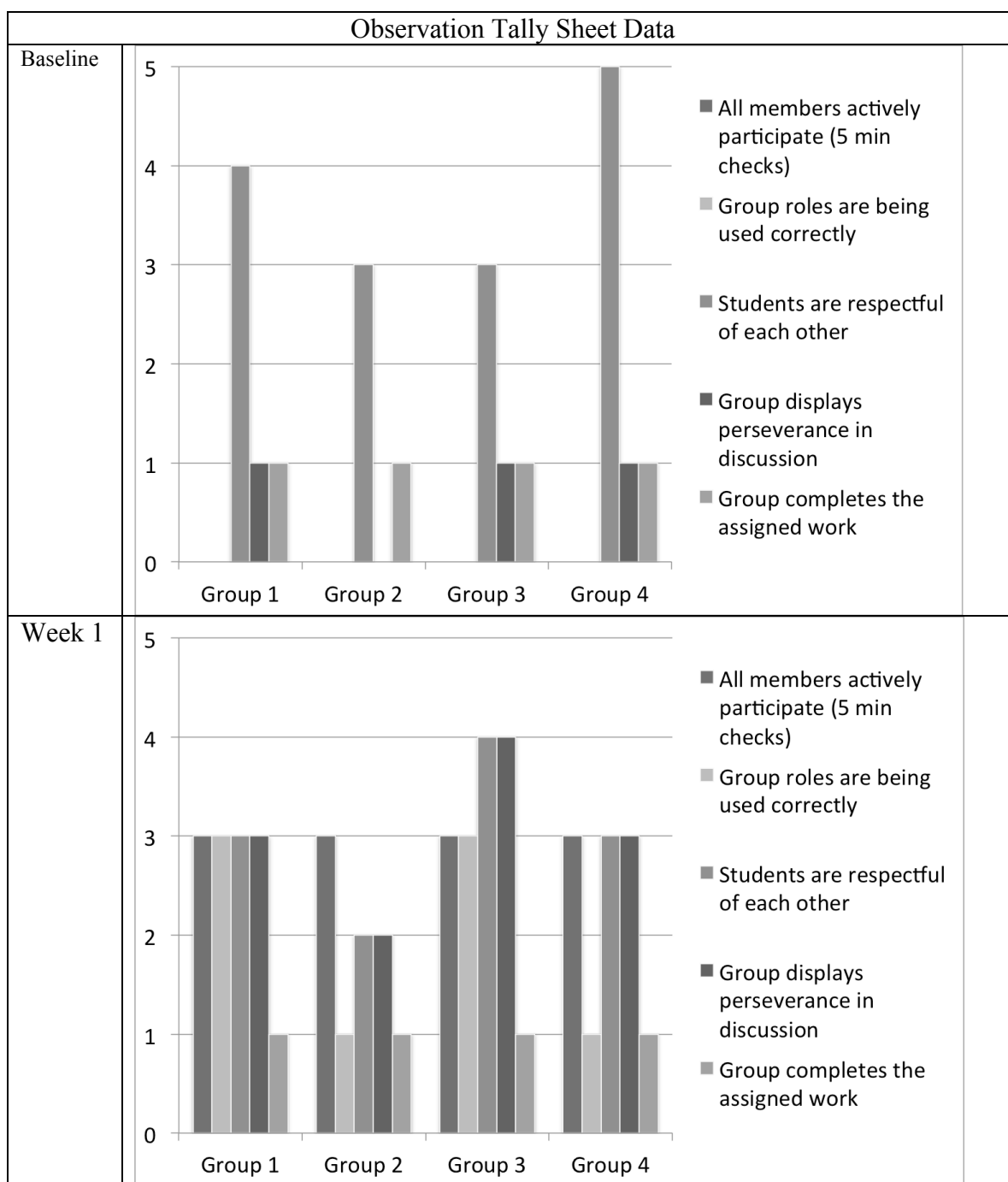
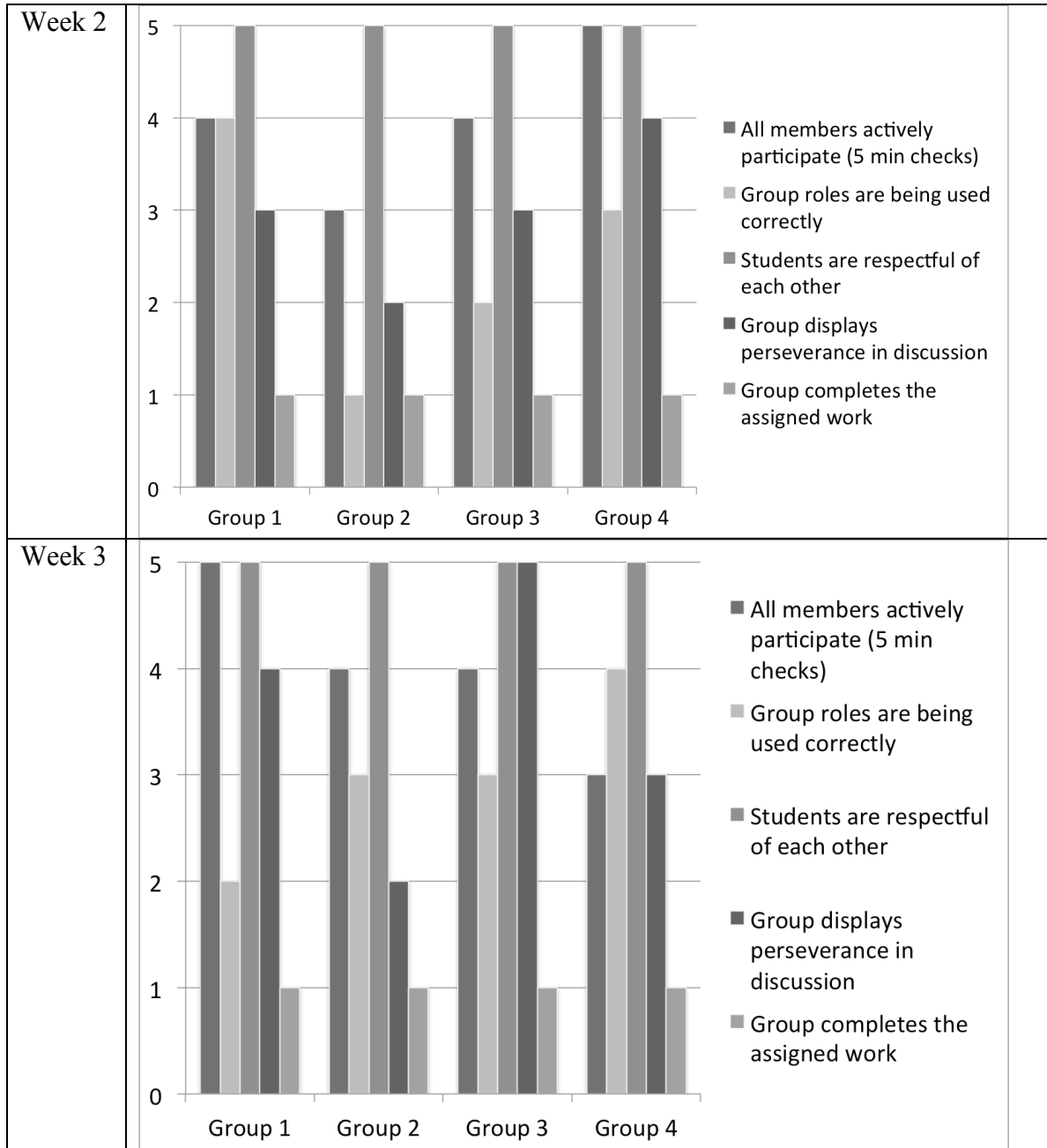
Observation Tally Sheet Data (Baseline through Week 3)

Figure 3 (continued)

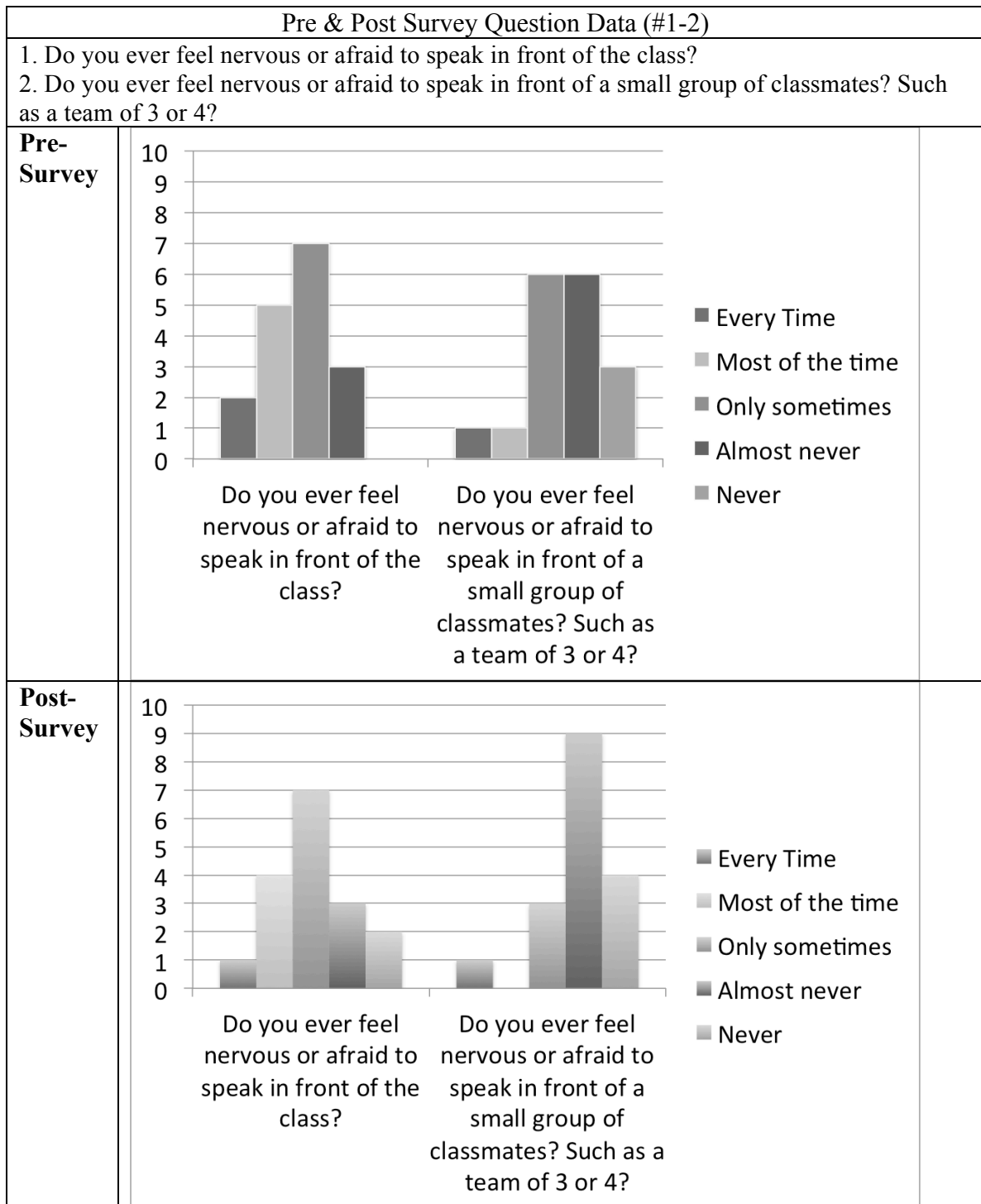


The final collection of data also sought to answer the secondary research question about students' confidence in communicating academically with their peers as measured by pre and post-surveys (see Appendix A & B). The survey questions were identical for both the pre and post-survey. This was intended to reveal any direct changes to the participants' attitude and confidence towards communicating academically. The first two questions focused on whether or not students feel nervous or afraid when speaking in front of their class or a small group. They were given the choice to select either every time, most of the time, only sometimes, almost never, or never. The graphs in Figure 4 show the differences in responses between the pre and post-surveys for questions 1 and 2.

The data from Figure 4 reveals some slight shifts in the students' confidence in the time between the baseline data and week 3. The number of students who responded as being nervous or afraid *every time* they speak in front of others, decreased by one. The number of students who selected, *most of the time*, decreased by two. The number of students who selected, *only sometimes*, decreased by three. The number of students who responded as being nervous or afraid, *almost never*, increased by three. The number of students who selected, *never*, increased by three. All of these changes were very slight, but every change was a positive change showing the benefits of cooperative learning groups on student confidence with communication skills. All three of the responses that reveal some level of insecurity with communication skills decreased, while the two responses that reveal confidence increased. So, while these changes were slight, each category improved in just three-weeks' time. If a teacher were to implement cooperative learning groups throughout the year, then their students' confidence could be expected to increase even more so. This helps to prove (see Figure 4) that cooperative learning

groups do in fact strengthen student confidence with communicating academically (Hossain, Tarmizi, & Ayud, 2012).

Figure 4

Pre & Post Survey Question Data (#1-2)

Question number three of the pre and post-surveys focused on the initial emotions students feel when the teacher announces that they will be working in groups. There were four general responses that students gave to this open-ended question. Some students expressed excitement, happiness, or general positivity towards the announcement of group work. A student response like this was categorized as a *positive response*. Others expressed no change in emotion. They were not happy, sad, excited, anxious, or any other emotion. They were not afraid or against working in groups, nor were they excited. These student responses were categorized as *neutral*. A neutral response was still viewed as having confidence because of the lack of anxiety or fear. They may not have enjoyed group work, but they were still confident enough to participate without hesitation. An interesting type of response that emerged was that their emotions depended on who they worked with. In other words, how comfortable they felt with their cooperative group partners determined their confidence level. This was seen as a lack of confidence when analyzing the data because, in the real world, students will not always get to choose whom they work with and need to overcome these fears of communicating with non-friends (Casner-Lotto & Barrington, 2006). These responses were categorized as *depends on group partners*. Finally, any response that was outright against group work because of fear, nervousness, or anxiety was categorized as *negative*. Figure 5 displays the data to summarize question 3 (see Figure 5).

Even though the results were a little mixed, the overall data showed a positive change in the participants. The negative responses were reduced by half, and those that felt it depended on group partners also decreased, both of which were changes showing the benefits of using cooperative learning groups. The interesting thing was that positive

responses also decreased, which is not good, but neutral responses had the most dramatic change by shifting from 29% all the way to 47%. It would make sense that some of this increase to the neutral responses came from those who gave a positive response on their pre-survey. This is because those who initially said they were confident would not be expected to lose confidence when so much of the data are showing positive returns. Therefore, it makes sense to assume that the positive responses that were lost moved to the neutral responses. In other words, they were still confident, they were just losing interest in the activities and therefore gave a neutral response rather than a positive one. This highlights an important point that cooperative learning group activities need to vary throughout the year to keep students' interest (Boaler, 2008). Using the same activities over and over will eventually cause students to lose engagement. Overall, question three still reveals a positive shift when strictly looking at confidence levels of students (see Figure 5).

Figure 5

Pre & Post Survey Question Data (Question #3)

Pre & Post Survey Question Data (#3)				
3. How would you describe your feelings when the teacher announces that you will be working in teams to work on and or discuss a topic?				
<i>Percentage of Class that Wrote each Type of Response</i>	Positive Response	Neutral Response	Depends on Group Partners	Negative Response
Pre-Survey	35%	29%	24%	12%
Post-Survey	29%	47%	18%	6%

Question 4 of the pre and post-surveys was an open-ended question focused on how confident students feel when having to explain or communicate with academic language. In other words, it focused on communication of content language rather than just communication in general. The students' answers revealed three different feelings that were generalized as *not confident*, *little confidence* (or *sometimes confident*), and *confident*. The data in Figure 6 shows the changes in responses from pre to post-survey.

The data in Figure 6 is incredibly positive and shows a dramatic increase in confidence when communicating with academic language and content. Those who were *not confident* reduced from 18% of the class all the way down to 0% of the class. Those who have *little confidence* or were *sometimes confident* reduced from 23% of the class to only 12% of the class. Finally, those who were *confident* increased from 59% of the class all the way up to 88%. There is no question or obscurity in this data. According to question four of the pre and post-surveys, the three-week intervention dramatically increased students' confidence when having to communicate using academic language with their peers (see Figure 6).

Figure 6

Pre & Post Survey Question Data (Question #4)

Pre & Post Survey Question Data (#4)			
4. How confident do you feel in using academic language in explaining/communicating with your peers?			
<i>Percentage of Class that Wrote each Type of Response</i>	Not Confident	Little Confidence / Sometimes Confident	Confident
Pre-Survey	18%	23%	59%
Post-Survey	0%	12%	88%

The last question sought to identify the specific frustrations or challenges students feel towards working in small groups. In the reflection journal (see Appendix I), the data analysis expert generalized the student responses as either off task behavior, one person doing all the work, too shy to talk or participate, difficulty with explaining their thoughts, or simply not understanding the teacher's directions for the activity. The reflection journal explains that off task behavior, one person doing all the work, and being too shy to talk or participate was all really connected to the group members that students work with (Eissa & Mostafa, 2013). Both researchers felt there was value in splitting these up into their own categories in order to have more detailed information about the effects of who students work with. An extra category for *no frustrations or challenges* was also added because some students volunteered this opinion in the post-survey. Figure 7 lays out the number of responses for each category. The data do not add up to seventeen (number of participants) because some participants shared multiple frustrations or challenges in their responses.

There was very little change in any of the responses to this question. In fact, more students claimed shyness as being a frustration than before the intervention. The only positive changes were that students appeared to no longer have trouble understanding activity directions and two students stated that they had no frustrations or challenges on the post-survey. Considering all the positive data thus far, both researchers were perplexed by this. So, when the intervention expert performed a *members check* at the end of the intervention to validate the findings, this particular question was discussed with the students (Hendricks, 2017). Two interesting ideas came from the student participants during this discussion. First, they expressed that the question was written

poorly as they did not realize they had the option to say that they had no frustrations or challenges. There was a number of students who simply thought of a *potential* frustration or challenge even though it was not an actual concern to them at the time. Secondly, two students argued that even though they feel more comfortable communicating with each other, that did not change their concerns about group work. They still experience frustrations such as having to do all the work or not knowing how to explain a concept to a peer. They expressed confidence yet recognized the challenges. This was insightful information gathered from the participants and helped to show that this was not a truly open-ended question as it led students to answer in a specific way. Although, it was still useful to analyze experiences that these students have had in the past (see Figure 7) as a means to help prevent these situations with strategies like groups roles or common goal for accountability (Slavin, 2013).

Figure 7

Pre & Post Survey Question Data (Question #5)

Pre & Post Survey Question Data (#5)						
5. What are some frustrations or challenges that you have experienced in the past with communicating in small groups? If you can't think of any, try to predict some potential challenges.						
<i>Number of Students who Chose Each</i>	Off Task Behavior	One Person doing all the Work	Too shy to talk or participate	Difficulty with explaining concepts	Don't understand activity directions	None
Pre-Survey	5	5	4	4	3	0
Post-Survey	5	4	6	4	0	2

The data collected for this intervention were designed to complement one another in order to gain a complete picture of the effectiveness of cooperative learning groups. The written lesson summaries and conversation logs were used in tandem to answer the primary research question about the effectiveness of cooperative learning groups on improving communication skills. This was because, together, they cover both written and verbal communication. The written lesson summaries allowed the students' ability to communicate through writing to be measured, while the conversation logs allowed their verbal communication with each other to also be measured. This allowed a significant portion of communication skills to be measured within the same intervention. The observation tally sheet and surveys were used to answer the secondary research question about the confidence level of students when communicating about academic content. The surveys were used to collect students' perceptions of how they feel about their own confidence. The observation tally sheet focused on how much they actually participated during the lesson activities as a way to measure confidence. Basically, the surveys showed what students felt, whereas the observation data showed what they did. These two separate perspectives allowed for the data regarding confidence to be more accurate as they complemented one another. The reflection journal allowed both researchers to more accurately remember the specifics of what happened each day in order to help with interpreting the data. The intervention expert also performed member checks as well as peer debriefing to verify the results. The peer debriefing was done with the math department chair at the school site of the intervention and the member check was done with the participants. The peer debriefing did not reveal anything different than what the researchers had already concluded, but simply helped to validate their conclusions. The

member checks revealed some interesting information about a flaw in question five of the surveys, but also served to validate and confirm the rest of the study. The triangulation of written lesson summaries, conversation logs, observational data, surveys, reflection journals, peer debriefing, member checks, and collaboration between the two researchers all worked efficiently to validate the final conclusions of this study.

Conclusions

All of the data discussed contained mostly positive information about cooperative learning groups as an effective classroom strategy. The primary research question was seeking to discover whether or not cooperative learning groups could help to improve students' communication skills. This was measured with written lesson summaries and conversation logs. The written lesson summaries revealed that cooperative learning groups help students to communicate through writing more accurately and teaches them to focus on the information that is more useful to communicating effectively. Unfortunately, the written lesson summaries did not show any improvement to the clarity of their writing. The conversation logs revealed a significant improvement to their verbal communication as all conversations recorded were meeting expectations by the end of the intervention. The data shows that cooperative learning groups did indeed improve the communication skills of these 8th grade math students.

The secondary research question was seeking to discover whether or not cooperative learning groups were effective in building confidence in students when communicating in front of peers. This was measured using observational data as well as pre and post-surveys. The observational data measured confidence by analyzing the frequency of participation amongst groups. The observational data revealed that there

was significant initial improvement the week after the baseline data were collected.

Unfortunately, this growth did not continue, but instead plateaued after the first week.

The data showed that students held onto their initial improvement throughout the intervention, but did not improve in any significant way past that initial improvement.

The pre and post-surveys measured students' own perceptions of their confidence levels.

The surveys had positive results and revealed that more students identified as feeling confident about communicating in front of their peers than before the intervention.

Question five of the surveys proved to be a poorly written question that seemed to skew some of the data by not truly being open-ended, but rather led the students to answer it in a way that was not reflective of their own beliefs. The intervention was a success as the data collected helped to validate the effectiveness of cooperative learning groups at improving confidence and communication skills of students in an 8th grade math class.

Recommendations for Further Research

The research surrounding cooperative learning groups has ample information about how cooperative learning groups improves achievement in all subjects. That is why the researchers of this study decided to focus specifically on communication skills rather than academic achievement. Upon reflection, both researchers agreed that this study could be improved if it could be continued on for a longer period of time. Noticeable gains were made in just three weeks, so it would seem plausible that continuing the process for a longer period of time might provide even greater benefits. It is also plausible that a longer period of time would cause students to plateau or level off and reveal a need for other strategies that would help them to continue their improvement of communication skills. Further research would be needed to determine this. Since the

participants of this study belong to an advanced math class, it would also be good to have this study performed on low-achieving students to see if the same results occur. The reflection journal talks about how the intervention expert struggled to get students to utilize their group roles (jobs) appropriately. There could be great benefit to having more research performed on different types of roles that teachers assign students to identify the roles that are most effective in creating accountability for group work. Finally, both researchers realized that verbal and written are not the only types of communication. There is also non-verbal communication. It would be interesting to see research on whether or not cooperative learning groups are effective at improving positive non-verbal cues such as eye contact, visual affirmation, open posture, and others. Non-verbal communication is equally important and it would be good to better understand how a classroom strategy such as cooperative learning groups might affect it. All of these recommendations would help to further the understanding of cooperative learning groups and their effectiveness in teaching essential communication skills to students for use in the 21st-Century workplace.

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Appendices
Appendix A

Pre-Survey**Student #** _____

1. Do you ever feel nervous or afraid to speak in front of the class?

Circle the best response:

- a) Every time
- b) Most of the time
- c) Only sometimes
- d) Almost never
- e) Never

2. Do you ever feel nervous or afraid to speak in front of a small group of classmates? Such as a team of 3 or 4?

Circle the best response:

- a) Every time
- b) Most of the time
- c) Only sometimes
- d) Almost never
- e) Never

3.) How would you describe your feelings when the teacher announces that you will be working in teams to work on and or discuss a topic?

4.) How confident do you **feel** in using academic language in explaining/communicating with your peers?

5.) What are some **frustrations** or **challenges** that you have experienced in the past with communicating in small groups? If you can't think of any, try to predict some potential challenges.

Appendix B

Post-Survey**Student #** _____

Take a moment to think about the cooperative learning groups that we have been using the last three weeks, then answer the following questions. You will probably notice that they are the same questions as the Pre-Survey, this is intentional. Please respond to them honestly as to how you currently feel after the intervention

1. Do you ever feel nervous or afraid to speak in front of the class?

Circle the best response:

- a) Every time
- b) Most of the time
- c) Only sometimes
- d) Almost never
- e) Never

2. Do you ever feel nervous or afraid to speak in front of a small group of classmates? Such as a team of 3 or 4?

Circle the best response:

- a) Every time
- b) Most of the time
- c) Only sometimes
- d) Almost never
- e) Never

3.) How would you describe your feelings when the teacher announces that you will be working in teams to work on and or discuss a topic?

4.) How confident do you **feel** in using academic language in explaining/communicating with your peers?

5.) What are some **frustrations** or **challenges** that you have experienced in the past with communicating in small groups? If you can't think of any, try to predict some potential challenges.

Appendix C

Student Assent Form

Authorization to Serve as a Research Participant

Dear Student,

I will be conducting a study in our classroom to determine how successful working in cooperative learning groups will be in developing communication skills. I am asking permission to use the data I collect from you during this process. Participation in this study involves only regular classroom activities. You may ask me any questions at any time about this study. Our Principal has approved this study.

The purpose of this study is to help develop your communication skills for the 21st century. Teamwork and communication are very important life skills that are a foundation for a successful life. The study will take place in room 16 and will last for 3 weeks. I will be implementing cooperative learning groups as a way for you to practice your communication skills while continuing to simultaneously learn the course content. During this study, I will be collecting various forms of data to determine whether this study on cooperative learning groups was successful. Possible types of data that I will collect may include written conversation logs, observation notes, written lesson summaries, and survey data.

Benefits of participating in this study include learning how to use the academic language you have been taught, how to become confident while communicating with your peers in your group, and most importantly improving your higher-level conversation skills while discussing concepts taught in your class. I will not include your name in any report about this study. You have the right to ask me not to include your data in the study and you may at any time tell me that you no longer want your data to be included.

If you agree to let me use your data in the study, please print and sign your name below.

I give permission for my data to be used in this study

Print Name

Student's Signature

Date

Appendix D

Informed Consent Form

Authorization for a Minor to Serve as a Research Participant

Dear Parents or Guardians:

I will be conducting a study in our classroom to explore the effectiveness of placing students into cooperative learning groups, which will allow them opportunities to work on their communication skills as they solve rigorous tasks as a team. My hope is that all of the students will become more confident and capable when communicating about academic content. I am writing to ask permission to use the data that I collect from your child during this process. Participation in this study involves using only regular classroom activities. Feel free to contact me at any time regarding your child's participation. I can be reached at _____. Our principal has approved this study.

The purpose of this study is to prepare students for the teamwork and communication skills necessary for the 21st Century. Communication skills are foundational to building a successful life. The study will take place in my classroom, room 16, and will be administered for three weeks. I will be collecting written conversation logs, observation data, written lesson summaries and survey data. Students will be placed into small groups to complete tasks as a team. This will not interrupt or slow down the course content in any way. It is simply a chance for them to work as a team instead of independently.

The potential benefits of participation in this study is that students will feel much more confident in communicating with a group of people as well as learn to articulate their thinking in a clear manner. Only _____, researcher, _____, collaborator, and _____ our supervising professor at Concordia University, will have access to the data collected for our study. Your child's participation in this study is strictly confidential. Only _____, _____ and _____ will have access to your child's identity and the information that may be related to your child's identity.

Please be aware that the use of data from your child is voluntary. If you feel that you do not wish to have your child participate in the study, please check the appropriate box and sign the form below. You may choose to remove your child from the study at any time during the study.

- ☐ I give permission for my child's data to be used in this study. I understand that I will receive a signed copy of this consent form. I have read this form and completely understand it.
- ☐ I do not give permission for my child's data to be included in this project

Student's Name

Signature of parent/guardian

Date

Appendix E

Observation Data Tally Sheet

Every time a group is seen exhibiting these behaviors they receive a tally mark.

Behaviors	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
All members actively participate						
Group roles are being used correctly						
Students are respectful of each other						
Group displays perseverance in discussion						
Group completes the work assigned						

Appendix F
Conversation Log

Scoring Guidelines			
Conversation		Understanding	
2	Student conversations last for at least three turns and build upon each other	2	Student conversations develop the intended learning clearly and accurately
1	Student conversations last for at least three turns	1	Student conversations develop the intended learning unclearly or partially
0	Student conversations either don't last for three turns or are not related to the content	0	Student conversations do not develop the intended learning
* Understanding is only given a score for conversations with at least three turns (NS).		Add scores from conversation and understanding for overall level of communication.	

Level of Communication Skills (Expectations)				
0 – Not Observed	1 – Partially met	2 – Approached	3 – Met	4 – Exceeded

Intended learning:			
Conversation: 2 1 0	Understanding: 2 1 0 NS	Conversation: 2 1 0	Understanding: 2 1 0 NS
Communication Level:		Communication Level:	
Conversation: 2 1 0	Understanding: 2 1 0 NS	Conversation: 2 1 0	Understanding: 2 1 0 NS
Communication Level:		Communication Level:	

Appendix G

AUTHORIZATION FOR AN EDUCATION INSTITUTE TO SERVE IN A CAPSTONE PROJECT

Title of the Project:**CUI Student(s) in Project Team:****CUI Students(s) Employment Affiliation(s):****CUI Student(s) Phone Number(s) & E-mail(s):****CUI Student(s)' Capstone Advisor:****CUI Capstone Advisor Phone # & E-mail:****Location(s) of Educational Institute(s) where Project will Occur:****Purpose(s) of the Project:****Procedures to be Followed:****Time and Duration of the Project:****Benefits of the Project:****Persons who will have access to the records or other documentation:****Date when the records or other documentation will be destroyed:**

-----Authorization-----

I understand that participation in this project is confidential. Only the CUI students working on the project, collaborators, and capstone advisor will have access to students' identities and to information that can be associated with their identities.

The results of the Capstone Project may be presented publicly at CUI, to the PI's colleagues at his/her site, or to the PI's cohort and may be selected for publication in the CUI library.

Please check the appropriate box below and sign the form:

☐ **I give permission for my educational institution to participate in this project.**

☐ **I do not give permission for my school to participate in this project.**

Signature of Principal or Appropriate Administrator

Date

Printed Name of Principal or Site Administrator

Appendix H

Written Lesson Summary Rubric

Accurate – 1 <i>(The information in the summary contains no mathematical errors.)</i>	Clearly Communicated – 1 <i>(The information in the summary is communicated in such a way that it is easy to understand the writer's intent.)</i>	Useful for Studying – 1 <i>(The information in the summary contains key components of the lesson that would make the summary a useful study tool for reviewing.)</i>	Total ____/3
			____/3

Appendix I

Reflection Journal / Intervention Plan Outline

Week	Day	Lesson	Collected Data
Pre	-- 1 -- 3/7/17	Group Work with no student Preparation	Baseline Data: Conversation logs, written lesson summaries, observation data, and the Pre-Survey
<p>Reflection:</p> <p><i>Pre-Surveys:</i> The Pre-Surveys revealed a number of common threads from the students.</p> <ul style="list-style-type: none"> • Their confidence with communicating academically is largely dependent upon how comfortable they are with their peers. • The students have different levels of confidence when communicating academically versus just simply communicating about anything. They primarily lack confidence with academic discourse. • Academic language does not feel “normal” to them • Students complained about past experiences with group members not participating, listening, or being bossy. Also, that student explanations are generally poor and don’t help each other very much. • Many of them feel like they understand the concept in their own mind, but can’t explain their thinking. • Many would rather work alone than in a group <p><i>Baseline Conversation Logs:</i> Four conversations were recorded. Two of the conversations scored a communication level of zero, or “Not Observed.” This is the lowest possible score. It implies that the conversation did not last three turns and therefore didn’t develop any deep thoughts about the content. The other two conversations scored a one (communication expectation partially met) simply because they lasted for at least three turns, but they did not develop understanding of the content at all. All this shows that my students have very poor communication skills. I believe some of the students could do better, but they are currently impatient with group members and don’t see value in the collaboration. Conversation logs take significant time to accurately record. I believe it would be best to only attempt to record 4 conversations each time using this tool. Otherwise I think it would be rushed and I wouldn’t be able to write everything the students say.</p> <p><i>Baseline Written Lesson Summaries:</i> Most of the students just re-wrote parts of the instructions or lesson objective for their summary, which isn’t necessarily a bad thing, it just makes it difficult for me to assess their actual ability to communicate when they are just copying. Overall though, their rephrasing of my words was done well and shows a lot of promise for their ability to communicate through writing. Many of the students summarized what the activity rather than the content of the lesson. A few of them completely missed the point and wrote down incorrect information. A summary should not be busy work, it should be a useful reference for the student to go back and read through. I only saw two such summaries (#14 & #15) that I felt like might be useful for the student to keep as a reference. Overall, their language usage reads well, but the content is severely lacking. I think that I need to give a lot more direction next time about my expectations.</p> <p><i>Baseline Observation Data:</i> At no time during the activity did I ever see the entire group engaged in the task. There were always one or two students who were not trying or participating. I haven’t taught them their roles yet as this is the baseline data. Next</p>			

Appendix I (continued)			
<p>week they will learn how to utilize their individual roles and I'll be able to reflect on that data. One great thing is that my students are already very respectful of each other. I observed many interactions that demonstrated respect for one another. I only saw 3 instances of student conversations persevering to a logical conclusion, and even those were shallow in the content that was discussed. All groups finished the assignment, but it was primarily the work of 1 or 2 students from each group rather than the whole group.</p>			
-- 2 -- 3/9/17	Group norms discussion with super-hero topic	No data to be collected this day. It is just to prep students for the intervention.	
<p>Reflection: No data were collected, this was just for the teams to have a chance to bond. The students had a lot of fun with this activity. It went about as perfect as I could have hoped. Many of my more shy students were speaking out, sharing, and having fun. This activity was primarily for them to become more comfortable with their new team peers and I believe it was a success. My informal observation of the students seemed to indicate an almost 100% level of student engagement, which is not surprising when the topic is superhero's, but the goal today was not math related, it was about working on group communication norms and practicing them. The students came up with a number of great norms like: eye contact, acknowledging each other's opinions, nodding your head when listening, active listening, turn taking, and being respectful. No doubt other teachers have had this type of discussion with them or they probably wouldn't have thought of so many great key words. This is exciting because they are not used to using these skills in their math class, but they must already have some experience from their other classes. This overlap should help the students to quickly adjust to the intervention and really improve their communication skills.</p>			
One	-- 3 -- 3/14/17	Roles and Accountability group practice	Observation data on participation
<p>Reflection: <i>Observation Data:</i> Compared to the baseline observation data, the students are already improving. I decided part way in the activity that the best way to measure "all members actively participate" was to check on 5 minute intervals, otherwise it seemed like I would never stop giving them tally marks as there was so much more participation this time than before. All four teams' members were participating each time I checked. It was awesome. I think this was because of two things. One, the bonding activity from the week before made them more comfortable with each other. Two, the content for today was a little more challenging than last week, so I'm thinking that they needed to rely on one another more so than last week. The students were also using their group roles for the first time. Each group used the detective appropriately, which is not surprising considering that I collect the detective's paper at the end of the lesson to check for participation. Two teams used the ambassador (the student who does all the communicating between teacher and team) correctly by having their ambassador ask me questions rather than other team members. I didn't see any Spy's (Spy's ask for help from other student teams) used ever and I also didn't see any of the Headquarters (group managers) actually leading or directing their group. So, they still need some work on utilizing their roles properly, but it was great for their first try.</p>			

Appendix I (continued)		
<p>Students were still very respectful to one another just like last time.</p> <p>The groups were far better at persevering in discussion this time around. Last week I only saw 3 discussions persevere in an entire class period. This week I saw 12. Again, I'm not sure how much of this was the group roles or the content being more difficult and forcing them to rely upon one another.</p> <p>All groups completed the assignment.</p>		
-- 4 -- 3/15/17	Error Analysis	Written lesson summaries
<p>Reflection:</p> <p><i>Written Lesson Summaries:</i> I used error analysis for the first time today to help my students understand non-examples of what they are learning and then had them write lesson summaries to measure their progress.</p> <p>Students 1, 6, 9, 15, and 17 all had great summaries. Some focused on summarizing the big picture ideas of quadratics while the others focused on clearly summarizing the procedures. Either way, this group of students did great.</p> <p>The summaries seem to show that the error analysis seemed to really help students solidify the procedures better by examining non-examples. There were a total of 5 summaries that had mistakes, another 3 that were incomplete, and 4 that were so simple they were basically just a re-write of the objective on the board.</p> <p>Overall the lesson summaries were of better quality than the baseline summaries because they provided information that would be more beneficial to the student if it were reviewed for a test and they were far less dependent upon the lesson objective for the language of their summary.</p>		
-- 5 -- 3/17/17	Math Task	Conversation logs
<p>Reflection:</p> <p><i>Conversation Logs:</i> Students had to use their factoring skill to put together a puzzle that is link by matching polynomials and their factored pairs. Four conversations were recorded and all four lasted a minimum of three turns, which is an improvement over the baseline data. Two of these conversations did not develop the intended learning and therefore only received a score of "1" since the only goal met was the three turns in the conversation. The other two conversations lasted at least three turns and did in fact develop the learning, but it was at a very low level and was not entirely clear. These conversations scored a "2" as they are beginning to approach the standard of clear, developed communication.</p>		
Two	-- 6 -- 3/20/17	Roles and Accountability group practice
	<p>Reflection:</p> <p><i>Observation Data Tally Sheet:</i> There was very little change in the observation data this week. Two teams tried out the spy role, which was good, but everything else is almost identical to last week. My students, being higher Algebra kids, are really great at completing tasks and working hard, and they are definitely working together better in groups than they ever have before... but they seem very timid about leaving their groups to seek help. I try and remind them about the benefit of using the Spy (help from peers) and Ambassador (help from teacher), but they seem to just want to stay in their little team and work without outside help. This is fine for learning math, but my goal is to build confidence and teach communication skills which I think the evidence for is beginning to flat-line. It's possible that the roles' names just aren't interesting to</p>	

Appendix I (continued)			
the kids, maybe something more current like an “Avengers” theme might spur them to use them more.			
-- 7 -- 3/22/17	Error Analysis	Written lesson summaries	
Reflection: Error Analysis: This lesson started by looking at errors on transforming graphs of quadratic functions in order to help them understand what is correct and write an accurate summary. These were the best summaries yet. I asked them to pick one transformation and write about it. Since we had actually looked at three different types I didn’t want to overwhelm them with a 3-part summary. So, they got to self-select the topic of their summary. All but two summaries were accurate, clear, and helpful in the way they were written. Two of them, numbers 10 & 12, had some misunderstandings about C. #10 Thought C caused reflections while #12 thought C caused horizontal translations rather than vertical. There were more accurate and clear summaries this week than in previous weeks.			
-- 8-- 3/24/17	Math Task	Conversation logs	
Reflection: <i>Conversation Log:</i> This lesson allowed students to examine 3 different phone plans and required them to decide as a team, which would be the best. The concepts of this performance task was primarily centered on systems of equations. This task yielded the best results so far for this intervention. I recorded two conversations that had a score of 3 (meeting the standard), a score of 2 (approaching), and a score of 0 (standard not observed). Seeing two conversations meet standards was very exciting as I was hoping this would start to happen. The conversations lasted for more than three turns, the students responses to each other were building on each other, and they actually taught each other something. Awesome! Definitely the highlight of this week. And these were only the conversations that I was quick enough to hear and record. I can only listen to one conversation at a time, but there seemed to be much engagement around which cell phone plan was best. Having a life-applicable task really seems to help.			
Three	-- 9 -- 3/27/17	Roles and Accountability group practice	Observation data on participation
	Reflection: <i>Observation Data Tally Sheet:</i> Once again, there was very little change at all in the observation data. The first week there were some significant jumps in participation that was recorded, but it seems to have leveled off now. The students are still not using the roles properly as they prefer to just work within their teams without having to get up. I think this is the key. I need to change my roles to accommodate this. If the students are too shy to use the roles to reach out to other groups, then I need to think of roles that could create accountability within the groups themselves. This might be the key to increasing the participation past the point it has been stuck at. Participation is good, but I think it could be great if I could fine tune these group practice times. None of the teams finished the assignment, but it was a long one, so I wasn’t too surprised, and in this case was not an indicator of them being off task as they were definitely working.		

	Appendix I (continued)		
	-- 10 -- 3/28/17	Error Analysis	Written lesson summaries
	Reflection: <i>Written Lesson Summaries:</i> Students looked at common errors made when solving with the quadratic formula (mostly involving double negative mistakes) and then they were expected to write a summary about the correct way to solve. The summaries were overall very clear and detailed. Student #2 is the only one who had an actual error in their summary. Students 5, 8, 10, 11, 14, and 16 all left out some important information, although they had no mistakes. All other students thoroughly covered the concept. They have been doing great with the written lesson summaries. This is probably a testament to the high number of teachers on campus that require students to write summaries.		
	-- 11 -- 3/29/17	Math Task	Conversation logs
	Reflection: <i>Conversation Log:</i> Students looked at a task where three bank robbers are running from the police. The three robbers, a policeman on foot, a cop car, and a helicopter are all graphed as lines. The prompts are all based on utilizing systems of equations. The students enjoyed the task and found the topic to be entertaining. All four of the conversations that I recorded were at a communication level of 3. They lasted at least three turns, built on each other's comments, and developed the learning, although not clearly. I was never able to score a conversation at a level 4 during this intervention as the development of understanding was always a little unclear or only partially developed. Still, this is an improvement and with time I assume they will only get better.		
Post	-- 12 -- 3/30/17	Member Check discussion / wrap-up	Post-Survey
	Reflection: At first look the post survey data is very similar, but I am excited to see how it compares to the Pre-Survey once I have the chance to compare the data in exact detail. I completed a member check on this day as well. I explained to my students what I had been trying to accomplish all along and see if they feel like they have improved as my data suggests they have. At first only my very social kids were sharing and they were all saying they felt about the same, which was a little discouraging. But then I took an informal hand raise to see if I could get more of a feel from the quieter students and seven of them raised their hands to indicate that they feel they have grown in confidence and ability with their communication skills in a math classroom. This was exciting to see, and I am even more excited to really crunch the numbers and pull all the data together to write about.		