EFFECTS OF RECIPROCAL PEER TUTORING FOR STUDENTS IN A 6TH GRADE MATHEMATICS CLASS

By

Samantha Graf

A Master's Thesis/Project Capstone
Submitted in Partial Fulfillment
Of the Requirements for the Degree of
Master of Science in Education
Curriculum & Instruction
Department of Curriculum & Instruction
State University of New York at Fredonia
Fredonia, New York

May 2016

EFFECTS OF RECIPROCAL PEER TUTORING

State University of New York at Fredonia
Department of [Insert Department Name]

CERTIFICATION OF THESIS/PROJECT CAPSTONE WORK

We, the undersigned, certify that this project entitled Effects of Reciprocal Peer Tutoring for Students in a 6th Grade Mathematics Class, by Samantha Graf, Candidate for the Degree of Master of Science in Education, Curriculum & Instruction, is acceptable in form and content and demonstrates a satisfactory knowledge of the field covered by this project.

[redacted]

Dr. Robert Dahlgren PhD.
Master's Capstone Advisor
Dr. Robert Dahlgren Course Instructor
Department of Curriculum & Instruction

5/13/2016
Date

[redacted]

Dr. Robert Dahlgren PhD.
Department Chair
Department of Curriculum & Instruction

5/13/2016
Date

[redacted]

Dean Christine Givner, PhD.
College of Education
State University of New York at Fredonia

5/18/16
Date

Abstract

The current mathematics curriculum intertwined with the Common Core State Standards has created a struggle for teachers and struggling students in the classroom to find time and successful ways for interventions. Research has shown for decades that tutoring has been a useful strategy employed with students and over time has been altered through trial and error to create different types of tutoring based upon student needs. Extensive previous research using Reciprocal Peer Tutoring (RPT) has occurred at the elementary and high school level. The purpose of this study is to select the specific research based tutoring program RPT and to use the historical research to create a study to explore its impact on struggling 6th grade mathematic students views of their math skills and show academic gains or losses. In the study described, students took a survey of their views of their individual math skills before and after the implementation as well as a pre and post-test for Quarter 1. Twelve students were selected to participate in the study that occurred 5 days per week for 3 weeks. After 3 weeks data was collected and analyzed to show the effects of RPT on academics and math viewpoint. At the completion of the study students were shown to have made growth in their math skills from quarter one.

Table of Contents

Chapter 1 – Introduction

Mathematics has been a primary subject that has continuously troubled students all over the nation. Each school year students enter the building under the premise that they will all learn and master a specific set of standards created for their grade. It is assumed that all students will enter the classroom with the cognitive and social skills necessary to be successful academically in the coming years. Such assumption is a fallacy and many students enter at different academic and social levels. Students begin to encounter these struggles and deficits as soon as Pre-Kindergarten. The distribution of mathematical skills and development in the public school setting can be up to four grade levels. These performance deficits have a strong correlation with a student's long-term failure in mathematics in school (Fuchs, 2002). Concepts in mathematics are so often intertwined and built upon one another that, if a deficit occurs in one area, there is an increased potential for struggle and potential failure in future lessons.

In March of 2010 the Common Core State Standards (CCSS) were developed by two primary organizations: The Council of Chief State School Officers and the National Governors Association. The major intention of these standards, according to Liebtag (2013), are "to provide clear academic benchmarks with more concise academic standards for essential learning that will prepare students to be college and career ready" (p. 56). The Oregon Department of Education (2014) states that, "Common standards help ensure that all students, no matter where they live, are prepared for success in postsecondary education and the workforce. Common standards will help ensure that students are receiving a high quality education consistently, from school to school and state to state" (p. 1). Therefore, a conclusion from these two definitions of The CCSS is

to place all students on a level educational platform for consistent academic skills and information to be taught at each grade level.

Educators and administrators at the state level developed the CCSS. Throughout the past 5 years, 45 states out of 50 states have adopted these new student and teacher curriculum expectations. This has been both embraced and pushed away. In 2014, Oklahoma and Indiana repealed use of the CCSS in their schools, with other states such and South Carolina signing a bill to discontinue the use of CCSS. North Carolina has also begun proceedings to repeal the standards (Gutierrez, 2014). This shows some beginnings of inconsistencies between states and the break down of utilizing CCSS. Marchitello and Wilhelm (2014) stated that, "If teachers and students are supported with high-quality curricula and instructional materials, a properly implemented Common Core will help prepare students to be complex problem solvers, as well as critical thinkers and readers" (p. 3). The underlying focus of the CCSS is to improve rigor in the classroom for all students and to establish common assessments for all so that all students are receiving the same academic content at the same grade levels across all participating states to ensure that they are prepared to enter college or the workforce at the end of their high school careers.

In 2001 President Bush introduced the educational reform policy, No Child Left Behind Act (NCLB. This package of reforms stated that it "intended to ensure that all children receive high quality education" (Jahng, 2011, p. 100). NCLB also required programs to be creating curricula that are research-based and are specifically created to allow for student achievement (Gordon, Morgan, Ponticell & O'Malley 2004). Eight years later, President Obama launched a federal grant program called Race to the Top

(RTTT), which was aimed to "advance educational reforms by rewarding high-achieving schools with funds and ultimately helping children get prepared for success and competition in society" (p.100). With the introduction of these two reforms, education quickly became a process of teaching and learning to prepare for the increased standardized testing administered to students (Green, 2014).

States were given the opportunity to voluntarily adopt the CCSS due to the lack of constitutional authority of the federal government mandating states to adopt the standards. As an incentive to states that chose to embark upon and embrace the new standards, federal funding was offered to those states to support their needs (Wallender, 2014). The pressure of these rigorous standardized tests and new academic expectations falls not only on students' shoulders but also onto teachers to make sure students are achieving as expected to with these new implementations. Strauss (2013) commented that the CCSS: "requires more progressive, student-centered teaching with strong elements of collaborative and reflective learning" (p. 1). Teachers have to utilize CCSS as well as keep current with rigor and best practices when teaching their students.

As states began to mend previous standards, create their new curricula and explore the application of these new standards into their daily lessons, learning gaps that were targeted to close were slowly beginning to expand once again. Haycock (2001) explained: "Between 1970 and 1988, the achievement gap between African American and white students was cut in half, and the gap separating Latinos and whites declined by one-third. That progress came to a halt around 1988, however, and since that time, the gaps have widened" (p. 6). Closing the achievement gap to earn educational equality across all socioeconomic and ethnic groups historically has been a goal of educators. The

steps to improve success in the achievement of this goal are an underlying focal point of the CCSS.

As the CCSS has been adopted by more states, it has come with criticism from many commentators. On February 16, 2014, Al Baker reported in *The New York Times* that there are states, such as New York, Georgia and Oklahoma that are thinking about withdrawing from implementing them in the classroom and reverting back to previous state standards (p. 1). The CCSS required rigorous curricula for daily lessons in the classroom, which has led to teachers needing to incorporate creative, supportive and successful strategies in the classroom for continuous academic achievement for students. The Hechinger Report (2014) summarized that many teachers' viewpoints on CCSS were taking a negative turn and discussed the issue with a group of teachers. When polled on their views about whether CCSS would hurt students more than help them, results showed that distrust of the CCSS had doubled in one year from 8% to 17%. Common complaints regarding the CCSS have also included a lack of current curriculum material for teachers to use in the classroom and students to access as well as the lack of training on new and ever changing expectations. The lack of curricular support and training for teachers has set in motion the inability for the newly developed and administered tests to have failing and lack of growth test scores. These struggles have led teachers to have to use their own personal creativity and knowledge of research-based strategies in order to supplement and support academic learning for students. Tutoring is a potential classroom tool for teachers and students to use in all subject areas and give the ability to modify as needed fort the specific learners. In the following section, I will explore the scholarship related to tutoring.

Tutoring

Tutoring is a cooperative learning classroom intervention that has become a strategy implemented more often in the classroom on a consistent basis. The Access Center (2004) stated that, "Peer tutoring incorporates research-supported practices with individualized instruction, which can be adapted to meet individual student needs." (p.1) Increasing class sizes as well as the increased demand of students' needs allows for peer tutoring to be a possible math class implementation for support of struggling students and filling in the academic gaps as well as increasing positive socialization amongst peers. According to Gartner and Riessman (1993), "Research on peer tutoring indicates that the intervention is relatively effective in improving both the tutees' and tutors' academic and social development" (p. 2). They also state "the gains for tutors often outdistance those of the students receiving the help" (p. 2). Studies of Reciprocal Peer Tutoring (RPT) illustrate that placing students among peers of closer to their personal learning levels, helps create not only an academic but also a social support network between the students. Participating students have an increase of personal academic stress reduction or pressure that might otherwise exist within a peer-tutoring environment (Ismail & Alexander, 2005). The multimodal effects on learning and socialization that peer tutoring encompasses is broad.

Research shows support for peer tutoring and the positive academic and social outcomes it can have on students, but there is a lack of consistent implementation data of procedures to further support the practice of peer tutoring in the classroom (Dufrene, Noell, Gilbertson & Duhon, 2005). Multiple studies have linked tutoring program success to organized and seamless tutor training sessions along with careful and

consistent program monitoring (Munoz & Rozz, 2009). Organization, monitoring and consistency of implementation in the classroom are direct links to the success of peer tutoring in the classroom.

Purpose

The purpose of my project is to investigate how Reciprocal Peer Tutoring (RPT) affects students in a suburban middle school 6th grade math class that have just been introduced to CCSS mathematics standards within the past 5 years. I have been working with students who consistently struggle through 6th grade math content and are always seeking support from peers and teachers but are unsure of the ways in which to do it in an appropriate and correct manner. Therefore, I am looking to explore the academic and social/behavioral effects implementing this research based strategy holds on struggling students' in 6th grade math as the school year progresses and the mathematics topics build upon one another with increasing difficulty. These students are merging from multiple elementary schools in the area into one specific middle school. Math curricula from grade to grade in North Carolina and the information that is to be taught with each standard are being refined each year, which is leading to gaps in learning as students progress from grade to grade each year. The multiple teaching strategies and curriculum implementation of each elementary school has the potential to pose a struggle for some students to transition into a new school, learn new curricula that builds off of elementary teaching but in a new way.

My review of the literature has shown that tutoring is a growing and accepted strategy to use in the classroom. The gap in RPT research for middle school mathematics is disconcerting due to the strong positive correlation it has with students' successes in

lower and higher school grades. Curricular changes and the increased expectation of student knowledge and more abstract thinking links to students' academic and social needs to increase for success. Developing and implementing a strong, successful peer tutoring system from which students positively gain can, in time, expand upon what students can achieve independently or with fellow peers. The main focus of this study is to reinforce the research of peer tutoring at the middle school level in mathematics and help develop a positive, strong and successful strategy for teachers and students to use in the classroom that will produce change and further the growth of struggling students in math.

This study looked at students from two different general 6th grade math classes of approximately 28 students per class in a small rural area outside of Raleigh, North Carolina. Data collection occurred by comparing a quarterly, common, pre-released North Carolina Benchmark assessment that has been modified to use different numerical values, as well as a questionnaire given to students prior to tutoring and after the conclusion of tutoring for the duration of the study. The test questions were broken down by each CCSS standard covered in each unit. Tutoring sessions were composed of basic key math skills required of students at the 6th grade level, questions that can be solved using multiple learned mathematical problem solving strategies, as well as rigorous questions that are created by Case21.com that North Carolina suggests to use and that correlates to all CCSS websites supported by the school district, as well as students' quizzes and unit tests that expose students' areas of difficulty as well as areas of acceleration.

Therefore, I am looking to answer these following questions using peer and scholarly reviewed research and first hand classroom implementation.

- What correlation does Reciprocal Peer Tutoring (RPT) have on 6th grade math students' benchmark scores in a suburban school setting?
- How does RPT affect social and behavioral skills of 6th grade students struggling in 6th grade math?

In the following chapter, I will review the literature related to the implementation of RPT in the middle school mathematics classroom. It is my hope that my study will be a small contribution to this literature.

Chapter 2 – Literature Review

In the previous chapter, I reviewed the contemporary problem related to elementary mathematics instruction and the lack of research in the implementation of Reciprocal Peer Tutoring (RPT) in middle school mathematics. Public schools are in serious jeopardy and creating a lack of confidence in our nation's educational system. Fewer than 1 in every 5 students are able to demonstrate adequate performance in mathematics unlike 14 other industrialized nations that rank higher in performance in Grades 4, 8 and 12 (Fantuzzo, Davis & Ginsburg, 1995). Teachers are employing strategies and interventions to support effective mathematics instruction to students to ensure successes. Mathematics is a subject that builds upon each previous lesson and increases in difficulty as it progresses (Fuchs, Fuchs & Yazdian, 2002) Educators continually research, implement and document possible classroom tools to support teachers and students in academic successes. In the following chapter, I will review the scholarship in middle school mathematics as it relates to the use of RPT as an instructional tool.

Educators throughout history have engaged in various forms to support the increase of students' collaborative work in the classroom in cooperative learning groups. Norman and Wood (2007) discussed the process of peer tutoring and described it as "the result of more than 30 years of empirical research, the haphazard pairing of students without the provision of adequate training, planning and organization has been transformed into orderly and carefully created peer tutoring systems" (p. 69). Therefore, research, flexibility and a tremendous amount of trial and error has led to the creation of a

multidimensional educational tool with the potential to grow and change with learners' needs.

Historically, tutoring has been used as a traditional strategy to provide supplementary support and help to students. Gordon, Morgan, Ponticell and O'Malley (2004) stated that, "tutoring has been around longer that the common school forms of education that we take for granted today" (p. 60). This research discusses the sociocognitive theory, which derives from the work of Jean Piaget in 1928 that stated, "The internal cognitive conflict arises when children express alternative perspectives. In resolving those disagreements, children explain and justify positions, question beliefs, seek new information or adopt alternative frameworks and conceptualizations" (p. 569). This frame of thought can be viewed as a support for the concept of peers supporting peers in tutoring and the ability for success when directly working with peers. Malone and McLaughlin (2007) discuss John Dewey, a progressive educator who viewed education as needing to shift the reason for education back to a student-centered idea to allow for the "growth of the individual child" (p. 28). The ability for students to acquire and master an academic subject or idea relies on how the teachers are effectively able to create and structure for multiple opportunities for students to respond to questions.

Peer Tutoring

Since the 1970s peer tutoring in various forms has developed and emerged as a classroom strategy implementation to increase academic successes. Researchers Wong, Chan, Chou, Heh and Tung (2003) deducted that peer tutoring is encompassed under a cooperative learning strategy title. Therefore, as an educational classroom tool that gives

opportunities for students to work in peer groups taking turns acting as a leader in questioning and drilling facts with their peers to guide in the correct solving and understanding of specific topics. Previous studies have proven positive outcomes from peer tutoring across multiple curricular subjects such as math and language arts as well as general education and special education (Bowman-Perrott, Davis, Vannest,Williams, Greenwood, & Parker, 2013). However, there are still gaps in the literature. Peer tutoring gives students an ability to learn from one another using multiple perspectives from one another, detect their own or others' errors, and constructively make supportive arguments that can lead to discussions and revisions between peers. This strategy has shown effectiveness across grades, ages, abilities and multiple subject areas (Malone & McLaughlin, 1997). This successful evidence-based practice, according to researchers Bowman-Perrott, Davis, Vannest, Williams and Greenwood, (2013), provides individualized one on one instruction for students to gain clarification of concepts in the classroom.

Peer tutoring as a blanket strategy encompasses multiple specialized instructional systems that are supported by extensive research to guide classroom instruction in a diverse and flexible atmosphere for all types of learners. According to King-Sears (2001), peer-mediated instruction has "improved academic performance for urban at-risk students" (p. 89). Utley, Mortweet and Greenwood (1997) supported this notion with research gathered about the multiple types of tutoring. Included in these is Class Wide Peer Tutoring (CWPT) with variations of Classwide Student Tutoring Teams (CSTT), Peer Assisted Learning Strategies (PALS) and Reciprocal Peer Tutoring (RPT). The

design of CWPT is sought to allow students one on one peer tutoring, the modeling of correct responses to correct peer errors and to offer a group reward contingency.

As schools have evolved in their curricula and mandated requirements, the complexity of needs that public schools require for their students' successes is also growing. Collaborative learning has shown to be an intervention that capitalizes on peer influences and gives students the opportunity to gain academic growth. Researchers Khatoon and Akhter (2010) defined collaborative learning as "an instruction method in which students at various performance levels work together in small groups toward a common goal" (p. 143). The groupings of common skill abilities allows for participants to gather all of the knowledge brought forth and effectively apply it where there is struggle in academics.

With the increasing constraints on teachers and their classroom time, educators and researchers have developed multiple methods in ways that peers can work together in multiple arranged groups to support each other in academic work, as described by Heller and Fantuzzo (1993). Those groups can be described as "ranging from loosely structured cooperative groups to highly scripted peer interactions" (p. 2). Collaborative learning gives students the responsibility of supporting their peers' learning as well as their own, which allows for the successes of one student to help another's learning (Khatoon & Akhter, 2010). They also discuss research that has shown that there are multiple benefits to peer tutoring. This cooperative learning strategy enhances the relationship of peers, academic retention of information and classroom behavior are some of the major positive outcomes of tutoring with peers The use of peer tutoring in the classroom has shown

through research studies to have an educational benefit for not only the tutee but also for the tutor.

The positive academic effect occurs for both general education and special education students. Behavior and socialization impacts have been shown to improve from this procedure for multiple types of students (Mayfield & Vollmer, 2007). More specifically, tutors and tutees each have benefits that come with each assigned title. Tutors have been shown to exude positive attitudes towards subject matter, greater self-esteem and a generally enhanced attitude towards daily school life. Benefits offered for tutees are added amounts of opportunities to answer questions, longer time actively engaged in academics and the immediate feedback on performance for students to evaluate (Menesses & Gresham, 2009).

Putting the two main jobs together of tutor and tutee in a pair or small group is the basis for RPT. Fantuzzo, Davis and Ginsburg (1995) developed this technique for students to apply, in which "students alternate between roles of tutor and tutee so that both students have access to all of the advantages of peer tutoring" (p. 266). Utley, Mortweet and Greenwood (1997) explained that the use of RPT was designed to service "low-achieving, high risk students" (p. 24). Such a design has also "demonstrated significant academic gains in achievement, better social interactions and less disruptive behavior" (p. 25). RPT has its greatest ability for growth when it occurs in an environment that is well structured. Students are given a script and they have been formally trained on their expectations of RPT, how it works and a script for the tutor and tutee to follow (Topping, 2005). The scripting and training from teachers allows for students to have clear cut expectations of their roles in tutoring as well as what to expect

from their peers that they work with. Discussions during these sessions emphasized the benefits of working with peers, the ways in which to work with peers, and students were given opportunities to see modeling of RPT as well as participate in mock RPT trials before beginning the actual trial (Heller & Fantuzzo, 1993). Another mentioned study from Heller & Fantuzzo trained a specific subgroup prior to the first day of implementation in the classroom. The person that was going to be overseeing the tutoring sessions trained students. Training occurred for an individual, one-hour session and students achieved competency in RPT at the end. Student participants were shown by modeling and firsthand experience; tasks that each role required, practicing mock trials of the multiple roles and assessing competency expectations (Pigott, Fantuzzo & Clement, 1986).

Additionally to the training pre-requisite of RPT, multiple research studies conducted have shown that incorporating a group reward contingency into the process has shown greater effectiveness in RPT tutoring in mathematics computation, behavior in the classroom and positive peer interaction in the classroom (Fantuzzo, Davis & Ginsburg, 1995).

Academics

Multiple studies over the past years have taken place gathering information in both mathematics and language arts. A study conducted by Menesses and Gresham (2009) occurred in a large southeastern school district in the United States. The school was an elementary school that serviced students in Pre-K through fifth grade. Selected classrooms were divided up and randomly assigned one of the following three types of instruction; non reciprocal peer tutoring (NPT), RPT and standard classroom

instruction. A request of this study was that teachers avoid use of peer tutoring during math instruction for the duration of this study. Prior to conducting the study, tutors were each individually trained verbally as well as given a demonstration of expectations. Tutors were given positive feedback during training and were trained until they reached 100% accuracy in all areas of expectations. Students participated in tutoring sessions three times per week until they reached the study's requirement of 15 sessions. Each tutoring session was described to students as a game with the coach/player titles was three minutes long and students worked on 10 different math problems. Progress monitoring occurred between the pairs and all recordings of work were placed on a chart. Contingencies were created for students to encourage accountability for not just one student but for the individual groups.

Social/Behavioral/Communication

RPT has not only shown its effects on academics in the classroom, it has also been connected to positive social outcomes for students. Dufrene, Noell, Gilbertson & Duhon, (2005) discussed the impact of RPT on students identified with behavior disorders. In their study, these students were shown to have a decrease in negative social interactions with peers due to peer tutoring and growth in positive social interactions. They commented: "Peer tutoring may contribute to a range of positive collateral effects including increased academic benefits for tutors, reduction in classroom behavior problems, increases in cooperation" (p. 75). The researchers also remarked that students engaging in peer tutoring gain an improved attitude toward math, and have a decreased negative attitude to working in the tutor/tutee roles assigned. There is a wide range of research that was discussed in this article also that indicates that peer tutoring has the

ability to reduce classroom behavior problems, increase students' cooperation, attitudes and self-concepts. With the use of peer tutoring, there has been a positive correlation of improved relationships between regular education students and special education students. Each of these positive outcomes of peer tutoring has the ability to improve confidence in students, which can lead to a positive outlook on mathematics; however, getting these positive outcomes require practice, monitoring from teachers and standard expectations.

Positive behaviors and social interactions for many students are not naturally inhibited when using peer tutoring. Walker, Rummer & Koedinger (2010) discuss how students "rarely provide conceptual, elaborated help that explains why, in addition to what and references domain concepts" (p. 282). With this struggle, students will be less likely to be engaged in the process or to gain any social/behavior benefits of the peer interactions of peer tutoring. Promoting and implementing communication and positive interaction in a collaborative learning environment is a major focus of peer tutoring.

A motivator for learning in the classroom can be heightened by giving students the opportunity to work in cooperative learning settings such as RPT (Rohbreck, Fantuzzo, Ginsburg-Block & Miller, 2003). Historically, developmental theorists such as Lev Vygotsky and Jean Piaget placed social interactions as the center of their cognitive development theories. Rohbreck, Fantuzzo, Ginsburg-Block & Miller referenced Vygotsky and that he specifically hypothesized that "peer social interactions are filled with valuable exchanges of information and skills in which children adjust their cognitions through relating to others who are at their developmental level yet who may reflect differing language, behavioral styles and perspectives" (p. 242). Socialization and

communication are necessary building blocks for students to successfully work with their peers. This communication process working appropriately will allow students the multiple explanations and viewpoints of peers to solving problems, as well as the confidence in the struggling subject, which can lead to a positive outlook on academics at hand therefore increased scores on tests.

Conclusions

Throughout this literature review, each study has brought to view different theories on cooperative learning and peer tutoring. Each study has shown that cooperative learning and peer tutoring have successes in the classroom with students academically as well as socially. A tremendous amount of research using RPT is in the subject of English/Language Arts. Mathematics is an evolving subject incorporating specifically RPT. Articles share that cooperative learning historically has been used in multiple ways in tutoring (PALS, CWPT) but RPT being implemented and studied in mathematics is not as frequent.

Research of RPT implementation is often with students at the elementary, high school or collegiate level. Taking the opportunity to study this intervention with struggling students at the 6th grade level allowed me as an educator to take the literature provided about successes and failures at the elementary and upper grade levels and apply those to middle school aged students in mathematics. Middle school aged students are at an important transitional age where academic and social support can provide a pathway for success in their current grade level and future grades. I believe implementing this in the class as an extension to daily classroom teaching, students can gain confidence and success they need academically and socially.

In the next chapter, I will detail the methods that I employed in this study of the impact of RPT on a group of 6th grade students.

Chapter 3 – Methodology

Subjects and Settings

This study was conducted in a rural, average-sized middle school of approximately 1,100 students. It took place in a 6th grade, general education mathematics intervention class period. The 12 selected students were composed of multiple races and a mixture of male and females. The classroom teacher and her teacher-team based student placement in this intervention class upon predetermined criteria from Quarter 1 test scores, 5th grade End of Grade (EOG) test scores and student request for more academic support in mathematics. All students participating in the study were general education students without IEPs or 504 plans. The classroom teacher implemented this process due to the lack of student progress in previous years with the speed of the information taught in the first quarter of the school year.

The classroom teacher, who is also the primary conductor of the study – a Caucasian female who has been a full time teacher for a little over two years – has observed over the past two years that a substantial amount of information of Quarter 1 mathematics for 6th grade students has led to academic difficulties for many students. This has led to the inability of many students to understand and master unit concepts due to the lack of understanding and mastery of a concept to allow for successful mathematics scaffolding. Student effort in the class was average and the drive to do well on tests and study was minimal. The specific students in this class had the lowest drive to do well in mathematics; they registered the greatest gaps in their learning history yet still did the minimal work needed to get through the class. Reciprocal Peer Tutoring (RPT) was a strategy introduced to the primary researcher in previous

educational workshops that indicated the capability to be used with these students not only for academic purposes but also for social and motivational support. Teacher, pupil, and parent consent was obtained according to the University Institutional Review Board policies and procedures (see Appendix A). The implementation of the strategy was conducted during students' daily math intervention core. Students were not graded for their participation or test scores.

Dependent Variables

The primary dependent variables encompassed in the study were (a) the percentage correct on the post-assessment of Quarter One (see Appendix D) and (b) the questionnaire results (see Appendix B).. The percentage correct on the test was calculated by weighing each question equally. There were 10 questions each being weighted at 10 points each for a total of 100 points. Students were graded on having the correct answer in the correct form just as the End of Grade (EOG) tests would require. If students did not complete the test in the allotted time or chose to not answer a question, it was marked incorrect and no points were awarded for that question. Before testing, students tutoring point tally sheets from the 10 days were documented. Students were awarded points based on how many corrective prompts were necessary after solving the problems. The point scale was a standard 3, 2, 1 scale. Students would earn 3 points if they got the question right at the first attempt, 2 points if their tutor had to give them one suggestion about ways to adjust their problem, and 1 point if the students required more than 2 prompts to correct their work. These points were recorded daily with each flash card identified and tracked to show change based upon each time the concept was

presented during the session. The questionnaire results were compared before tutoring and after tutoring on the standard Likert-type 1 to 5 scale.

To ensure that the data was being collected effectively and accurately, the teacher consistently monitored the students. The teacher scored the pre-assessment before tutoring was introduced; the questionnaire was given to students without any pre- or post-assessment scores given to them as encouragement or discouragement. McClelland (1994) states that questionnaires "provide a cost-effective and reliable means for gathering feedback that can be qualitative as well as quantitative. A survey/questionnaire can provide accurate and relevant data through thoughtful design, testing, and detailed administration." (p. 22) Tracking sheets were kept by the students and teacher recorded data daily that emerged from the sessions. All tutoring flash cards were associated with the 4 major unit topics tested in the first quarter and were identified and tracked as well to show any change in computation accuracy as tutoring sessions proceeded daily.

Independent Variable

A positive contingent reward was the independent variable incorporated into the study. The reward was awarded on an individual, partner and finally whole group basis. Pierce, Cameron, Banko & So (2003) discussed the idea of industriousness from theorist Eisenberger's work. Eisenberg as cited in Pierce, Cameron, Banko & So suggested, "people learn a general level of industriousness." (p. 564) His theory of learned industriousness was created and based upon the concept of effort put forth by the participant. Eisenberg as cited in Pierce, Cameron, Banko & So also stated "when individuals are rewarded for expending a large amount of effort on one activity, the sensation of high effort acquires secondary reward properties, thereby increasing people's

readiness to expend high effort on a subsequent task." (p. 564) All group participants chose the rewards given to students. They were listed, discussed and agreed upon to encourage 100% effort and participation. The teacher wanted full participation and effort daily in the 20-minute session. The top two individuals and top two groups at the end of each two day tutoring session would be gain some type of award decided upon by the whole group while students were being instructed on how RPT will work in the classroom. Individual contingencies were measured every two days and computed by the student who had the highest combined point score earned over the two days. Partner contingencies were measured at the end of each school week. The individual and partnership with the highest scores at the end of each data collection window earned first choice of the reward for that week and the second highest got the second pick. If students did not earn the opportunity to receive a reward, the teacher spoke to each group encouraging them to continue to work and reminding them to work as a team to understand the concept to allow for success on the next question presented to them on using that specific mathematics skill.

When implementing the intervention to ensure accuracy, the primary research developed a fidelity checklist of implementation. The list was developed to ensure that all steps created for the intervention were completed and to document students' participation, transition and correct implementation. The teacher documented daily all students present, their participation/engagement every 5 minutes as well as the transition of tutor and tutee in a timely (approximately 30 seconds) fashion. A student maintaining integrity and academic drive during their 20 minutes of work time was imperative for

proper data collection. Data collection occurred daily when tutoring sessions were in progress.

Experimental Design and Procedures

A Pre-test/post-test control group design was used to gather data for this study. All mathematics students on the team were given the same pre-assessment for Quarter 1, which was developed from previous years EOG Tests. From the results of that pre-assessment, the 12 students selected for math intervention class received the RPT (experimental group) and 12 other randomly chosen students were selected from the entire team to use as baseline data to compare the pre- and post-test data without any specific intervention outside of daily general classroom review (control group). Group contingency procedures have historically been shown to improve academics and social behaviors, according to Ya-yu & Cartledge (2004). Throughout the tutoring process a positive contingency was offered to all 6th grade students who took the pre-assessment to encourage them to do their best work; the same contingency was offered for the post-assessment to all students and students doing the RPT were offered individual and group contingencies themselves based upon points rewarded during tutoring sessions.

Baseline

A pre-assessment (see Appendix D) was given to all 6th grade math students on the team in order to gain baseline data. The test took one 50-minute class period. The scores of participating students were the only ones calculated in the study. Questions were scored as completely correct or incorrect as they would be on an EOG test. There was no partial credit given on any questions. Scores were recorded as a percentage and were compared to the post-assessment scores. After students completed the pre-

assessment, they were given a survey to gain an understanding and to help determine their views on mathematics. Students did not face any negative repercussions based upon their scores on the pre-assessment for their baseline data.

Intervention

Preceding the intervention phase, the classroom teacher practiced with a peer teacher the RPT instructions for the students and discussed the data collection process. After initial baseline pre-assessment was completed, all intervention students participated in a one time, one intervention core class training session instructed by the classroom teacher. RPT was announced to the students by the teacher and she stated that it would be occurring for the next few weeks during intervention time. RPT was introduced and instructed in a game like fashion to all of the students. Students were shown the score sheets each partnership would have that created a competitive nature as well as the score sheet the teacher would be using to gather each group's data. Students were made aware that there were multiple positive contingencies for achieving a certain number of points in each tutoring session as individuals and as partners.

A daily tutoring intervention session proceeded as follows: Students entered the classroom, gathering their tutoring materials which consisted of a folder including, flash cards, white boards, markers, an answer key in an envelope and tutor sheets (see Appendix C) assigned to them and met with their partner in their designated area. Next, the teacher set a timer for 20 minutes for students as a visual for time (10 minutes per student to be the tutor/tutee and then another period for them to switch roles) and reminded the students of the positive benefits of working hard during the session. At the end of each session students tallied the day’s points and recorded them at the bottom of

their sheets. After 2 days with the present flash cards, students were given a different set of cards that focused on a different grouping of Quarter 1 skills.

Tutor Training

Students were trained on two consecutive days for approximately 20 minutes each day. Day One included an introduction to RPT (the underlying point of the process and a discussion about the benefits if done correctly for the students) and a discussion of the length that students would be participating. Students during this first session viewed at first hand the manner in which peer tutoring works as the teacher was the tutor and a student was the tutee. The teacher (in the role of tutor) modeled positive feedback, the ways in which to identify to a peer a mistake and help them correct it and the manner in which to record points earned. During the last 5 minutes of Session one, students were given time to ask questions about tutoring processes and expectations. During Day 2 of training, students were given the opportunity to watch a second mock tutoring session with the teacher playing the role of the tutee and students playing the tutor. These pairs role-played possible scenarios and then all students were given time to practice each role themselves. A question and answer session occurred at the end of Day 2 for any clarification needed by students.

The methodology for design and implementation was developed for flexibility in RPT sessions if necessary and simple qualitative calculations of student data. Data collection occurred regularly and was done by one person to limit any errors and the pre and post-assessment being the same allowed for exact comparison to show growth or loss in knowledge. In the following chapter I will display and analyze the results from the RPT study.

Chapter 4 – Results

In the previous chapter, I detailed the methods that I employed with a group of 6th grade mathematics students in a study that explored the efficacy of Reciprocal Peer Tutoring (RPT). The effects of RPT on the selected mathematical students can be seen in Table 1 below. Before testing and tutoring was implemented in the classroom setting described above, students were given a survey and were given the same survey after tutoring. Responding to the pre-tutoring survey, students expressed their discomfort with 6th grade mathematics, with 68% of the students disagreeing or totally disagreeing with the statement "I am confident with my 6th grade math skills." On the same initial survey, all (100%) participants expressed that they strongly agreed that they needed more support in their mathematics. In the following chapter, I will report the results of my study of an intervention using RPT with these students.

Prior to the RPT intervention all students took a pre-assessment. Table 1 shows the scores for this assessment. Scores ranged from a low of 10% to a high of 60% with the mode of the students scoring at a 10%. Only one student passed the pre-assessment with a 60%. The arithmetic mean for the pre-assessment for this group was 18%. The average pre-assessment of the small group was compared to the scores of the entire team, which was a 22%.

After the RPT implementation for the small group, a post-assessment was administered. The scores for this can be seen in Table 2 below. Student scores ranged from a low of 10% to a high of 60%. Data collected revealed a median score of 30%, a mode of 30% and an arithmetic mean of 35%. The score range of the pre and post-assessment was the same but the number of students that at least doubled their score was

more than half. Table 3 below compares the pre-and post-assessment for students and shows the two data points (12.5% of the population) that overlap that show no growth as well as the single data point where a student (6%) loss growth from pre- to post-assessment.

The effects of RPT can be seen in Table 4, which represents the students' percentage change from pre-assessment to post-assessment. Only one student (6%) had a loss in his/her percentage change, while two students (12.5%) had no change in their scores. All other students (81.25%) had some amount of an increase in their percentage change. Over half (56.25%) of the students in the sample at least doubled their post-assessment score. As a result, the arithmetic mean of the post-assessment was a 35%, which led to a 65% change and increase in student scores after the RPT intervention.

All students on the team took the same pre-assessment and post-assessment and arithmetic averages were calculated. Table 5 below shows the comparisons between the two different groups and the different assessments. Both groups had positive growth from pre- to post-assessment. There was a 5% difference in the average scores from the pre-assessments, and a narrow 2% difference between the post-assessments. Both groups on average had growth, but the RPT group, according to Table 6 below, shows a comparison of the percentage change in scores for both the RPT group as compared with the whole class's percentage change. The whole team percent change was 90.9%, while the RPT group growth was 94.4%. Both groups made positive growth but the RPT group made steadier growth as compared with the whole class average.

When tutoring commenced and students were given their scores from the pre-assessment to post-assessment and given their survey again, there was a consistent

expression of the desire and need for additional math support from all students, and most still didn't feel confident about their math skills. Students (43%) expressed that they did not agree or disagreed with the statement of having confidence in their mathematics skills, unlike the first survey that showed more students expressing their lack of confidence in mathematics. All 16 students (100%) stated that they agreed or really agreed with the statement of "I could use more help/support to do better in math both before and after tutoring." There was minimal change in the pre- and post-survey rankings.

In summary, the results of the pre- to post-survey data indicate that the student-participants in this study entered math with knowledge of their struggles with mathematics and an understanding that they needed mathematics support. Although many students did make growth from the pre-to post-assessment, when students were surveyed again, they said they needed more help and were still not feeling an increase in their confidence levels related to mathematics. The data change in pre- to post-assessment showed growth occurred for a number of students, but that the amount of growth was inconsistent, while a small amount of students did not gain from pre- to post-assessment. Although many students made growth according to collected data, surveys showed that students felt they still needed to improve their skills and tests scores.

In the final chapter of this thesis, I will discuss the significance of these findings, the limitations of this study and possible avenues for further investigation.

Tables

Table 1-Shows results for all students of pre-assessment.

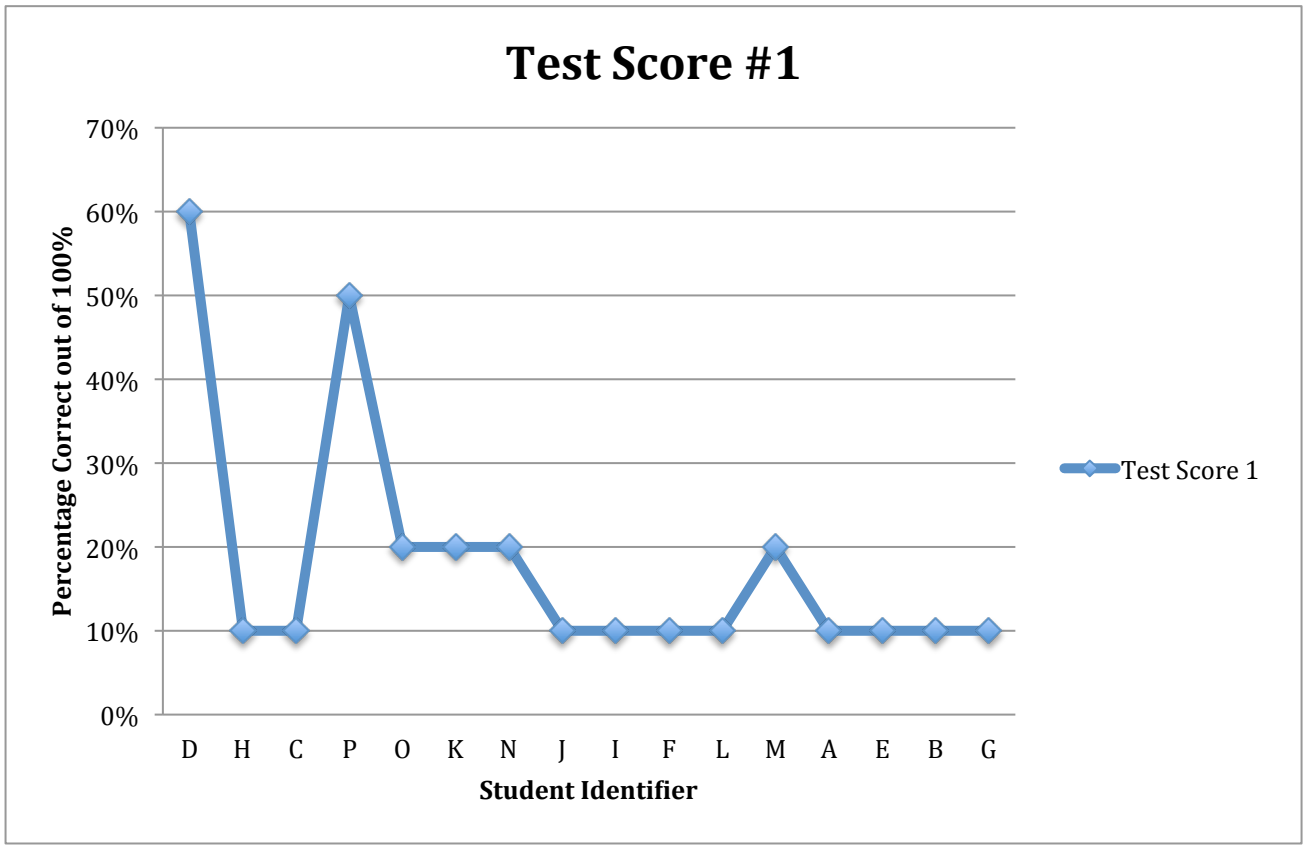


Table 2- Shows the results of the post-assessment

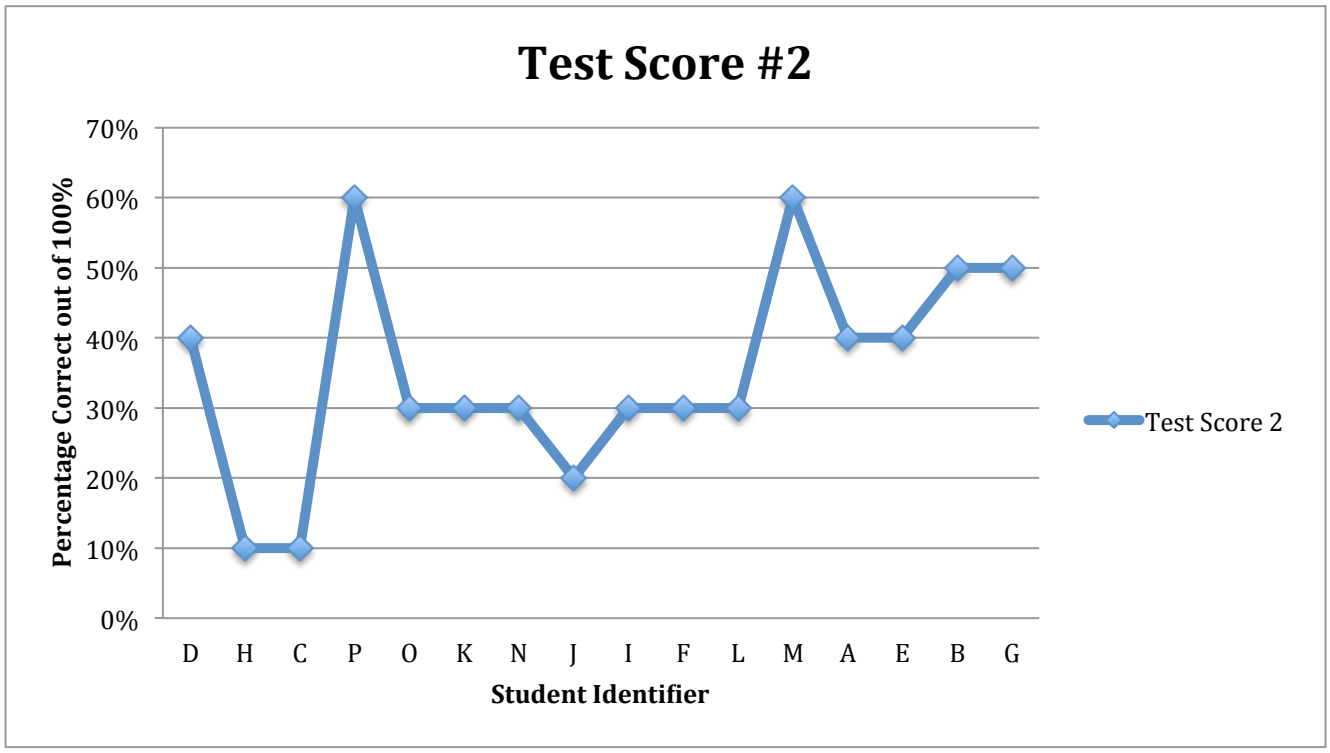


Table 3- Compares Pre-assessment and Post-Assessment data

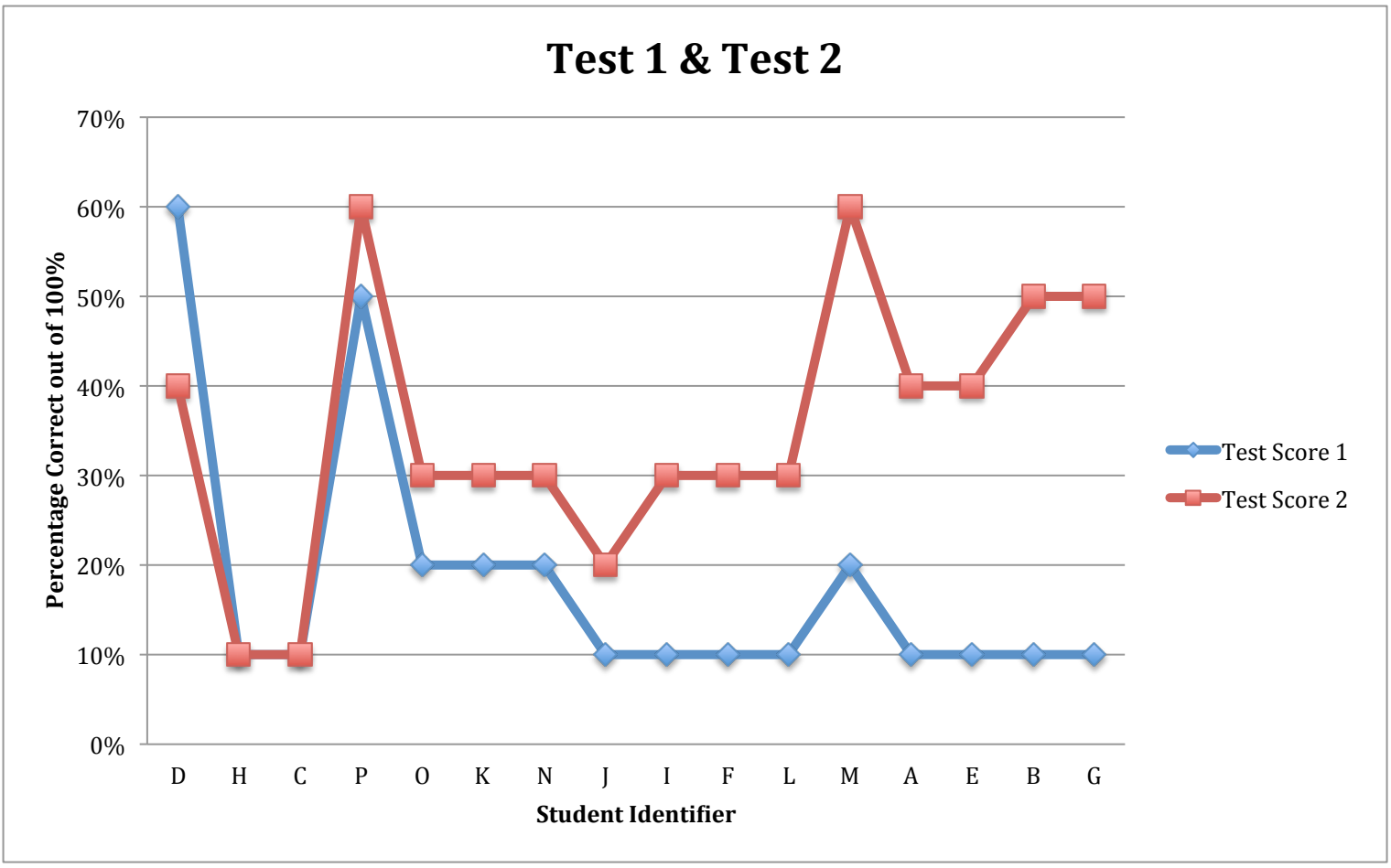


Table 4- Percentage change from pre-assessment to post-assessment

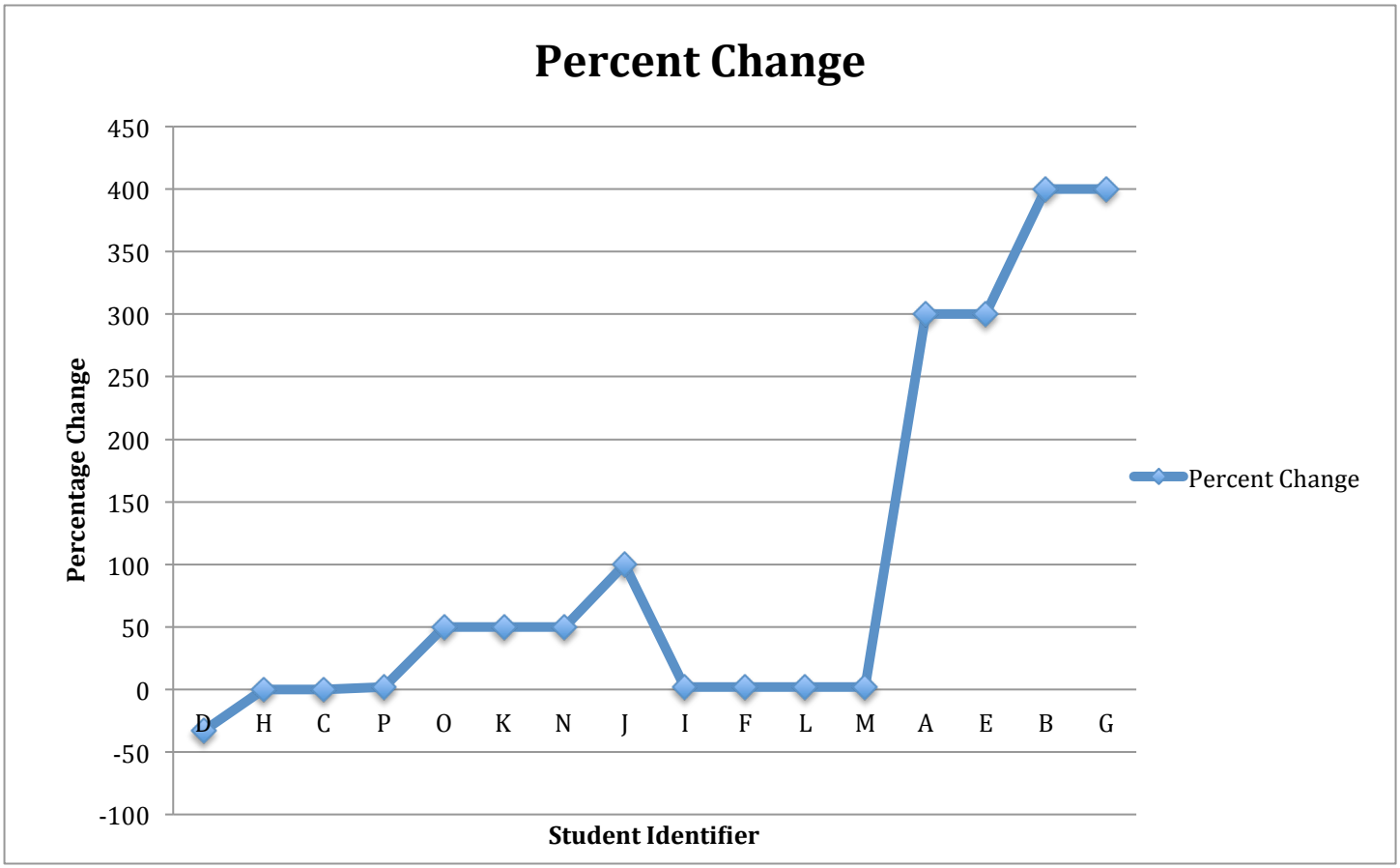


Table 5- Average Scores of whole group and RPT group pre and post-assessment

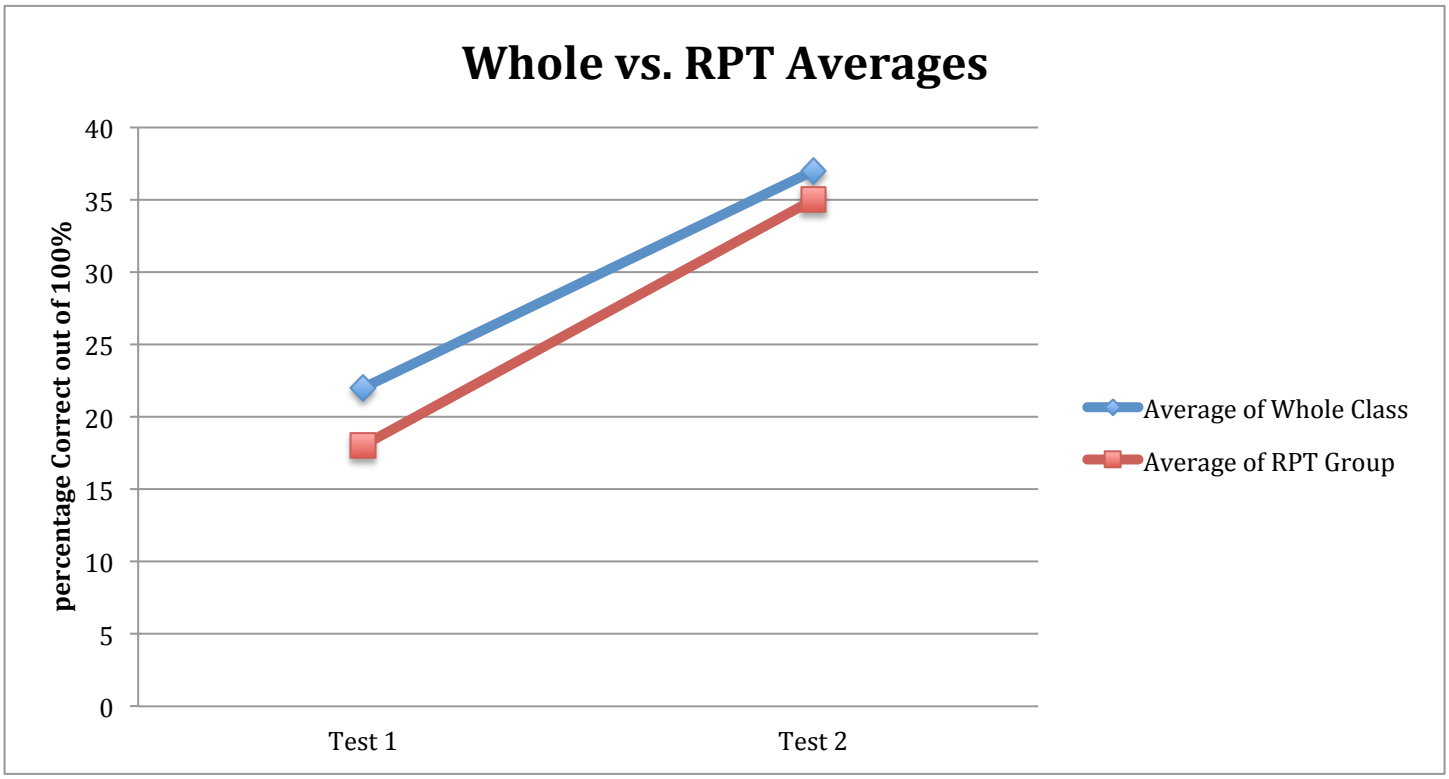
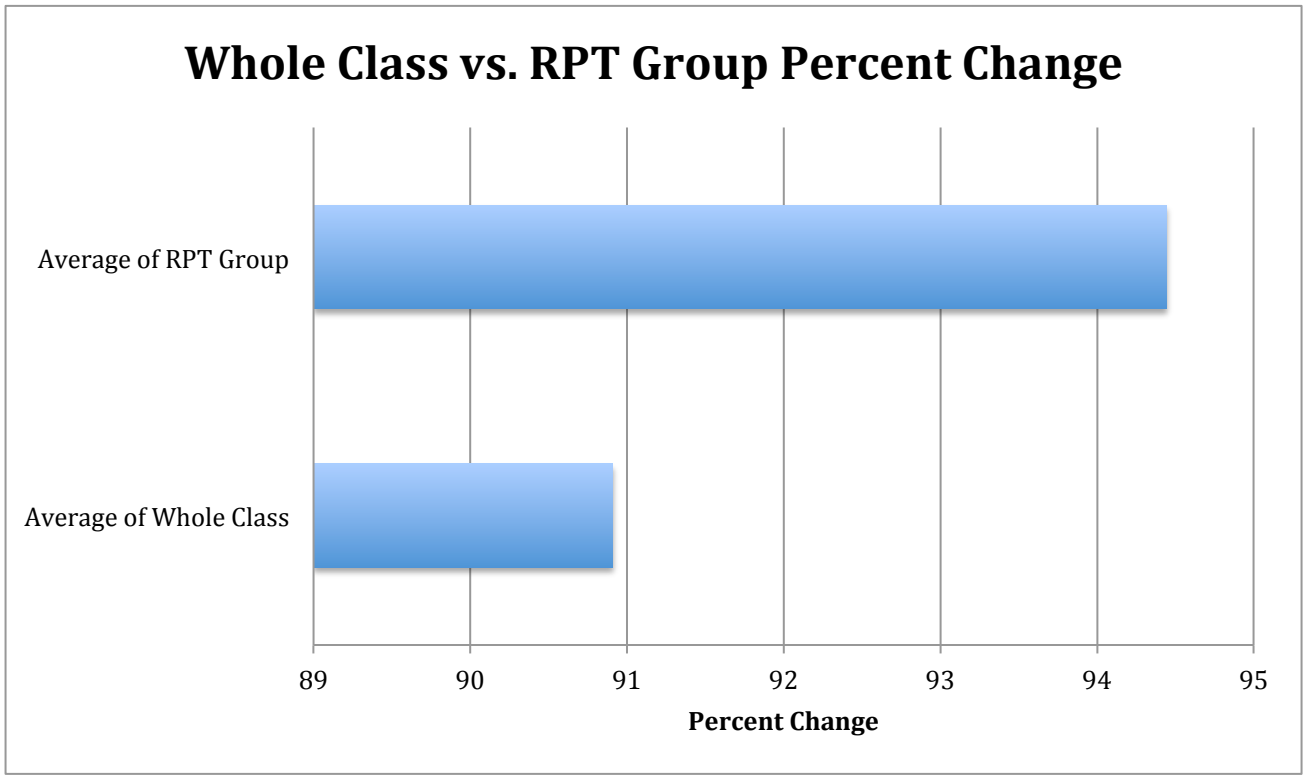


Table 6- Percentage Change of whole class vs. RPT group



Chapter 5 – Discussion

In the previous chapter, I presented the results of a study that implemented Reciprocal Peer Tutoring (RPT) in a 6th grade mathematics classroom and explored its effects on increasing test scores and the students' confidence and views of their mathematics class. The findings from this study indicate that students working together in cooperative dyads, even for a short time, achieve academic and social goals. Academic gains for participants had a wide range overall and the encouraged a positive mindset in mathematics that showed a slight increasing trend towards making positive gains for students. In the following chapter, I will discuss the significance and limitations of the study's findings and will explore the avenues for continuing research in this area.

RPT as a Support Strategy

The first topic explored was the use of tutoring as a support strategy in the classroom and the potential impacts it can have in the classroom academically as well as behaviorally/socially. Students participating in the study actively collaborated with peers, were motivated to gain a greater outlook on their view of mathematics and their skills; they also tried out a new strategy that allowed them to work with a peer to get better grades. The data that emerged from this investigation revealed that, although after the study was conducted, the way students viewed mathematics was not altered much by the intervention, and there were no negative outlooks for students. This study showed a glimpse of data that reinforced research conducted by Gordon, Morgan, Ponticell and O'Mally (2004) along with Norman and Wood (2007). Their studies discussed the implementation of tutoring in the classroom and the abundance of trial and error that has lead to the successful creation of a tutoring strategy for students to use in the classroom.

The historical successes of tutoring and theoretical ideology originate from progressive educator John Dewey, who argued that education needed to shift back to a student-centered ideology so that students at different academic levels are given multiple opportunities to learn from each other with guided support from teachers. John Dewey stated in his publication, Experience and Education, "Since freedom resides in the operation of intelligent observation and judgment by which purpose is developed, guidance given by a teacher to the exercise of the pupils intelligence is an aid to freedom, not a restriction upon it." (p. 84) Students need to be given the opportunity to learn from each other but they need the direction and lessons from teachers to be successful so that they can employ them independently as they mature.

Second, the study conducted occurred on 5 days per week during a three-week period. Within that time students were continually reviewing a concept from the first quarter of the year. Students were communicating and teaching each other, as well as themselves, concepts in mathematics. The classroom teacher/primary researcher created a structured environment, along with the one mock RPT session as an example of the method. Supporting research by Heller & Fantuzzo (1993), Topping (2005) and Pigott, Fantuzzo & Clement (1986) stated that practice and modeling was necessary for students to understand the purpose, expectations and proper implementation of peer tutoring to be able to obtain student achievement. Researchers explored RPT implementation that encompassed an abundance of trial and error and showed consistency with RPT used with students in the elementary, high and upper collegiate levels in mathematics and other subject areas were successful and showed to have positive effects on a majority of students. Malone and McLaughlin (1997) and Bowman-Perrott, Davis, Vannest,

Williams, Greenwood, & Parker (2013) discussed this cooperative learning strategy tool and the ways that it has been given the opportunity to be used in the classroom across all subject areas as well as general education and special education. They also emphasized that this strategy, as supportive for growth as it has been found to be in the research history, still requires further research. The idea of RPT in the classroom for my students was a great tool for a hands-off approach with the students and gave them the opportunity to take learning into their own hands. The gaps in the literature were evident in the study due to the inconsistent scheduling, time frame of implementation and lack of data gathered to conclude whether the growth rate could have been larger.

Third, research has shown that students involved in constructive activities had a direct correlation for predicted achievement but that the amount of help that students were given predicted the efficacy of the constructive activities; however, this did not have any bearing on the achievement (Fantuzzo & Ginsburg-Block, p. 126). Previous research has also supported the idea that students benefit from increased practice in their most difficult academic areas but they lack the skills to remain engaged in the academics.

The students in this study were driven to do well due to their intrinsic and extrinsic motivation. The students' drive for success came from the personal goals of wanting to improve their skills and mathematics grades as well as the positive reinforcement for having successful tutoring sessions. At the same time, these students always wanted to compare scores with each other. Students were gaining points each day depending on how their sessions went and how well they did with the skills that they were practicing. The classroom chatter often at the start and end of each session amounted to students asking one another about the number of points that had been

earned, and they were consistently holding each other accountable. All students were receptive to the classroom strategy. The goals for participants who accepted the strategy and engaged in the activities were trying to improve their mathematics skills in order to increase their mathematics scores.

Limitations

Although the study showed positive and encouraging findings for the use of RPT as a classroom tool for mathematics instruction, there were also limitations to consider when viewing the significance of the data collected in the investigation. Each limitation was analyzed after the data collection portion of the study.

The first limitation was the time constraint in the introduction and implementation of RPT. Students were only given two 30-minute sessions of introduction to RPT, its expectations and outcomes. They also had to ask any questions they had about the process during this limited time. The length of implementation was five days per week for three weeks and this included last minute unscheduled interruptions that postponed this 30-minute class period, or weather related days off. There were no previous or following data collections with which to compare this one time study results.

Second, class time that was devoted to RPT was interrupted, with students from other classes entering and exiting the room or student absences; groups were mixed up and mathematics topics were not given the three days of practice before rotation. This led to students being joined together that did not have partners there to work on skills that were not assigned to them for their three assigned days.

The third limitation was that this study was only conducted for three weeks out of a whole school year. Within those three weeks students were given topics that covered

the first 18 weeks of their mathematics studies; this included 6 units dealing with number sense, expressions and algebra. Conducting the experiment for a longer period of time or repeating multiple times could have given me a greater opportunity to see the effects of RPT on student learning.

Finally, the topics studied varied among groups, and not all groups were able to practice each topic for the same amount of time or even have the opportunity to practice a skill due to inconsistent class schedules for student attendance to sessions. This inconsistency did not put all students on an equal level of opportunity to review all concepts for the same amount of time during implementation. One small group was given the opportunity to use this strategy and there were no other groups to use as comparisons for success or failure of RPT. Although the collected data set was small, it followed research studies' growth trends in mathematics.

Further Research

The premise behind this study has great potential to be modified and used in the classroom on a consistent basis with some modifications made. First, more research needs to be completed on mathematics and on the use of RPT at the middle school level. Students entering middle school are beginning to take those basic math skills from elementary and apply them across the math curriculum and into real life situations. How can peers be partnered up successfully to learn more complicated math skills and to successfully teach each other? Does timing students harm them while working with their peers more than encourage and help them? Are there specific concepts that students in middle school struggle with that hinder their success and growth in other concepts?

Second, further research into RPT, the trial and error different practices and implementations in middle school needs to occur. Should students tutor each other on the underlying basic skills of each math concept or should students be tutoring fewer skills and more realistic word problems that are more like the test context? How long should students participate in RPT in the class to show growth?

As student needs continue to increase in the classroom along with other day-to-day factors, any independent activity that students participate in can encourage a growth mindset for math class, positive social interactions and academic support among peers. The conducted study, in its short time frame and limited data shows that trends in the classroom do follow the trends discussed in research. Therefore the question can be asked, what changes in the RPT strategy would be most effective for increased student benefit academically and socially and or behaviorally?

Conclusions

In summary, this study examined the effect that Reciprocal Peer Tutoring (RPT) had on 6th grade students struggling in mathematics. The study showed great potential for using RPT to ensure student success in mathematics. This study also provided insights on student perspectives when given the opportunity to improve their math skills independently using their peers and earning positive feedback from peers. Students enjoyed the RPT process, learning how to cooperatively work with others, the chance to support their peers in their learning and work collaboratively and independently. This study conducted in a 6th grade math classroom in a rural, low socioeconomic area gave students a positive outlook on learning. Students were focused, eager and driven to do well daily, even if it meant struggling with topics or group changes.

The premise behind this study has great potential to be modified and used in the classroom on a consistent basis with some modifications made. As a current classroom teacher, I recognize there are great limitations on instruction time for struggling students and I want to find a successful way to encourage students to enjoy the subject they are learning and may be struggling in and improve their academics in a creative way, using their peers and themselves. Conducting this study has led me to a realize that more research needs to be completed on mathematics and the use of RPT as well as successful implementation, and many more questions need to be carefully constructed and thought out to decrease limitations. The positive outcomes and strengths for successful usage of this strategy from my research and small time application show nothing but endless possibilities for teachers and students in the classroom. Working with students to guide them to learn positive communication with peers and to be able to self-monitor and support their peers takes more than one time trying a strategy and needs flexibility in the ways in which RPT is introduced to students, the time it is applied in the classroom, and the repetition of sessions with changes to be consistently trying to do better than the previous times. Education is continually changing and teachers have to continue to incorporate research and their own creativity in order to create an educational environment that allows for all students to learn and achieve at their highest levels and continuing to put into practice studies like and explain the pluses and minuses students and teachers will benefit.

References

The Access Center. (2004). Using Peer Tutoring to Facilitate Access. Washington, D.C., Retrieved from http://www.readingrockets.org.

Baker, A. (2014, February 16). Common Core Curriculum Now has Critics on the Left. The New York Times. Retrieved from http://www.nytimes.com

Bowman-Perrott, L., Davis, H., Vannest, K., Williams, L., Greenwood, C. & Parker, R. (2013). Academic Benefits of Peer Tutoring: A Meta-analytic Review of Single-case Research. *School Psychology Review, 42*(1), 39-55.

Dewey, J. (1998). Experience and Education. West Lafayette, IN: Kappa Delta Pi.

Dufrene, B. A., Noell, G. H., Gilbertson, D. N. & Duhon, G. J. (2005). Monitoring Implementation of Reciprocal Peer Tutoring: Identifying and Intervening with Students Who Do Not Maintain Accurate Implementation. *School Psychology Review, 34*(1), 74-86.

Fantuzzo, J. W., Davis, G. Y. & Ginsburg, M. D. (1995). Effects of Parent Involvement in Isolation or in Combination with Peer Tutoring on Student Self-Concept and Mathematics Achievement. *Journal Of Educational Psychology*, *87*272-281. doi:10.1037/0022-0663.87.2.272.

Fantuzzo, J. & Ginsburg-Block, M. (1998). Reciprocal Peer Tutoring: Developing and Testing Effective Peer Collaborations for Elementary School Students. *Peer Assisted Learning*, 121-144.

Fuchs, L. S., Fuchs, D. & Yazdian, L. (2002). Enhancing First-grade Children's Mathematical Development with Peer-assisted Learning Strategies. *School Psychology Review*, *31*(4), 569-583. Gartner, A., Riessman, F., & ERIC

Clearinghouse on Teaching and Teacher Education, W. D. (1993). *Peer-Tutoring: Toward a New Model.* Retrieved from ERIC database. (ED362506)

Gordon, E. E., Morgan, R. R., Ponticell, J. A. & O'Malley, C.J. (2004). Tutoring Solutions for No Child Left Behind: Research, Practice, and Policy Implications. *National Association of Secondary School Principals.NASSP Bulletin, 88*(638), 59-68.

Green, D. (2014, March 17). The Long Death of Creative Teaching. *US News and World Report.* Retrieved from http://www.usnews.com.

Gutierrez, K. J. (2014). An exploration and understanding of the U.S. Common Core State Standards: A multi-perspective organizational theory analysis. *The Journal of Human Resource and Adult Learning, 10*(1), 74-81.

The Hechinger Report. (23, October 2014). More Teachers Are Souring on Common Core, Finds One Survey. *US News and World Report.* Retrieved from http://www.usnews.com.

Heller, L. R. & Fantuzzo, J. W. (1993). Reciprocal Peer Tutoring and Parent Partnership: Does Parent Involvement Make a Difference? *School Psychology Review*, *22*(3), 517.

Ismail, H. N. & Alexander, J. M. (2005). Learning within Scripted and Nonscripted Peer Tutoring Sessions: The Malaysian context. *The Journal of Educational Research, 99*(2), 67-77,128.

Jahng, K. E. (2011). Thinking Inside the Box: Interrogating No Child Left Behind and Race to the top. *KEDI Journal of Educational Policy, 8(1),* 99-121.

Khatoon, S. & Akhter, M. d. (2010). An Innovative Collaborative Group Learning

Strategy for Improving Learning Achievement of Slow Learners. *Journal Of Research & Reflections in Education (JRRE)*, *4*(2), 142-160.

King-Sears, M. (2001). Institutionalizing Peer-mediated Instruction and Interventions in Schools. *Remedial and Special Education, 22*(2), 89.

Malone, R. A. & McLaughlin, T. t. (1997). The Effects of Reciprocal Peer Tutoring with a Group Contingency on Quiz Performance in Vocabulary with Seventh and Eighth Grade Students. *Behavioral Interventions*, *12*(1), 27-40.

Marchitello, M. & Wilhelm, M. (2014, September 26) The Cognitive Science Behind the Common Core. Retrieved from https://www.americanprogress.org.

Mayfield, K. H. & Vollmer, T. R. (2007). Teaching Math Skills To At-Risk Students Using Home-Based Peer Tutoring. *Journal of Applied Behavior Analysis, 40*(2), 223-37.

McClelland, S. B. (1994). Training Needs Assessment Data-gathering Methods: Part 1, Survey Questionnaires. *Journal of European Industrial Training, 18*(1), 22.

Menesses, K. F. & Gresham, F. M. (2009). Relative Efficacy of Reciprocal and Nonreciprocal Peer Tutoring for Students At-risk for Academic Failure. *School Psychology Quarterly*, *24*(4), 266-275. doi:10.1037/a0018174.

Muñoz, M.,A., Ross, S. M. & Neergaard, L. L. (2009). Supplemental Educational Services as a Component of No Child Left Behind: A Mixed-Method Analysis of its Impact on Student Achievement. *Planning and Changing, 40*(3), 135-159.

National Governors Association Center for Best Practices & Council of Chief State School Officers. (2015). *Common Core State Standards Initiative.* Washington, DC: Retrieved from http://www.corestandards.org.

Norman, R. K. V. & Wood, C. L. (2007). Innovations in Peer Tutoring: Introduction to the Special Issue. *Intervention in School and Clinic, 43*(2), 69-70.

Pierce, W. D., Cameron, J., Banko, K. M. & So, S. (2003). Positive Effects of Rewards and Performance Standards on Intrinsic Motivation. *The Psychological Record, 53*(4), 561-578.

Pigott, H. E., Fantuzzo, J. W. & Clement, P. W. (1986). The Effects of Reciprocal Peer Tutoring and Group Contingencies on the Academic Performance of Elementary School Children. *Journal of Applied Behavior Analysis*, *19*(1), 93-98.

Rohrbeck, C. A., Ginsburg-Block, M., Fantuzzo, J. W. & Miller, T. R. (2003). Peer Assisted Learning Interventions with Elementary School Students: A Meta Analytic Review. *Journal of Educational Psychology, 95*(2), 240-257.

Strauss, V. (2013, June 18). The Common Cores fundamental trouble. *The Washington Post.* Retrieved from http://www.washingtonpost.com.

Topping, K. J. (2005). Trends in peer learning. *Educational Psychology, 25*(6), 631-645.

Utley, C. A. Mortweet, S. L, & Greenwood, C. (1997). Peer-mediated Instruction and Interventions. *Focus On Exceptional Children*, 291-23.

Walker, E., Rummel, N. & Koedinger, K. R. (2011). Designing Automated Adaptive Support to Improve Student Helping Behaviors in a Peer Tutoring Activity. *International Journal of Computer-Supported Collaborative Learning, 6*(2), 279-306. doi:http://dx.doi.org/10.1007/s11412-011-9111-2.

Wong, W. K., Chan, T. W., Chou, C. Y., Heh, J. S. & Tung, S. H. (2003). Reciprocal Tutoring Using Cognitive Tools. *Journal of Computer Assisted Learning, 19*(4), 416-428.

Ya-yu, L. & Cartledge, G. (2004). Total Class Peer Tutoring and Interdependent Group Oriented Contingency: Improving the Academic and Task Related Behaviors of Fourth-Grade Urban Students. *Education & Treatment of Children, 27*(3), 235-262.

Appendices

Appendix A – Informed Consent

Student Consent Form for Participation in a Research Study

Academic, Behavioral and Social Effects of Reciprocal Peer Tutoring on 6th Grade Mathematics Students.

You are invited to participate in a research study. Below are some answers to question you may have about this study.

What is if for?

- The study is to see if Reciprocal Peer Tutoring can help improve your academics and your view on 6th grade mathematics.

Why me?

- You were selected to do this because you show a great desire to learn and do better in school.

What will I have to do?

- To participate in Reciprocal Peer Tutoring you will have to go through two days of training with the teacher/researcher.
- Three days per week during CIA time, you will work on RPT with an assigned partner. You will be working on questions made by the teacher/researcher to support your weak areas.
- You will be working to earn points for prizes.
- This study is not a graded activity. It is for your benefit only!

Did my parents say it was Okay?

- Your parents have consented (said yes) to you participating in this study.

What if I want to quit?

- This study is voluntary, and you may quit doing this anytime. If you decide you do not want to participate, you will join a different math intervention group.

By signing below, I am saying that I have read this form and have asked any questions I may have. All of my questions have been answered and I understand what I am being asked to do. By signing I am saying that I am willing and would like to participate in this study. I have also received a copy of this form to keep.

_____ _____

Signature of Student Date

Appendix B - Questionnaire

Name: _____ Questionnaire

Rate how you feel on a scale of 1 to 5.

1. Totally disagree
2. Disagree
3. I do not know if I agree or disagree
4. Agree
5. Really Agree

1. I am confident with my 6th grade math skills.
   1 2 3 4 5

2. I am good at doing math that has fractions in it.
   1 2 3 4 5

3. I am good at algebra (equations, solving for a variable)
   1 2 3 4 5

4. I am good at solving problems that require me to use order of operations.
   1 2 3 4 5

5. I could use more help/support to do better in math.
   1 2 3 4 5

More that I would like to share about Math:

Appendix C – Tutoring

Tutoring Cards:

Solve: 43	Solve: 30	Solve: 147+ 34=	
Solve: 33	Solve: 51	Solve: 34+56=	
Solve: (34)2	Solve: 12.6 x 5.2	What operation does the word "total" indicate to use?	
Solve: (13)3	Solve: 1.67 x 9.4	Solve: 112(23+6)-12÷6	
Solve: (25)3	Solve: 43.74 – 2.50	Solve: 2(32+8)- 16÷4+3(40)	
Solve: 43	Solve: 123.8 + 7.93	Solve: 2.5 of 5.14	
Write in expanded form: 34=	If A = L x W, Area = 234 Width = 23 Length= ?	Solve: 256÷13=	

Write in Expanded form: 45	If A = L x W and the area of a rectangular room is 50m2 and the length is 5.5m, what is the width?	Solve: 178÷45=	

Solve and round to 2 decimal spaces. 2.8 x 12.93	Solve and round to 2 decimal spaces. 9.03 x 6.8	Round to the nearest cent. $2.28 x .34
Round to the nearest tenth: 4.9867	Round to the nearest tenth: 6.0023	Round to the nearest tenth: 123.621
Round to the nearest hundredth: 5.234	Round to the nearest cent: $72.635	Round to the nearest cent: $9.0449

Appendix D – Review Tests

Quarter 1-Review Test- Pre and Post-Test

Name:_____

1. What is the value of $\left(\frac{2}{5}\right)^3$
   a. $\frac{6}{15}$
   b. $\frac{8}{125}$
   c. $\frac{8}{15}$
   d. $3\frac{2}{5}$

2. During a 1-day sale, a grocery store reduced the cost per pound of Honey Crisp Apples from $3.95 to $3.30. The store sold 120 apples that day. With the price decrease, how much less money did the grocery store earn on Honey Crisp Apples than before the price decrease?
   a. $78.00
   b. $474.00
   c. $396.00
   d. $0.65

3. A rectangular flag has an area of $\frac{3}{8}$ square foot. The width is $\frac{3}{4}$ foot. What is the length of the flag?
   a. $\frac{1}{8}$ foot
   b. $\frac{1}{4}$ foot
   c. $\frac{9}{32}$ foot
   d. $\frac{1}{2}$ foot

4. What is the value of the expression in the box?

$12 + 3(4 - 1)^3 + 2$

5. Stacy is making a quilt which will have an area of $42\frac{1}{8}$ square feet. The length of the quilt will be $8\frac{1}{2}$ feet. What should be the width, in feet of Stacy's quilt? (Write the answer as an improper fraction.)

6. Darren bought 23.6 ounces of coffee. The coffee costs $0.38 per ounce. How much, in dollars did Darren's coffee cost? (Write the answer as a decimal to 2 places.)

7. What is the product of 6.61 and 3.8? (Round the product to the nearest hundredth)

8. Juan wants to put a fence around each of his bean plants. He has a partial roll of fencing which is $16\frac{1}{6}$ feet long. Approximately how many bean plants will Juan be able to put a fence around using the roll if each plant needs exactly $2\frac{2}{3}$ feet of fencing?

9. Jimmy earns $1 for every $2\frac{5}{8}$ pounds of trash he collects. So far, he has collected $68\frac{1}{4}$ pounds of trash. How much money has Jimmy earned?

10. What is the greatest whole number that is less than $\left(\frac{3}{4}\right)^2 + \left(\frac{3}{2}\right)^3$
    a. 5
    b. 2
    c. 4
    d. 3