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The Effects of Learning Groups on Student Achievement and Attitude in a Sixth Grade Mathematics Class

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ABSTRACT

THE EFFECTS OF LEARNING GROUPS ON STUDENT ACHIEVEMENT AND ATTITUDE IN A SIXTH GRADE MATHEMATICS CLASS

by

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A handbook for implementing "Student Team Learning" as an alternative teaching strategy for middle level math teachers was developed after conducting extensive action research project within a sixth grade math classroom. A literature review on barriers to learning mathematics in middle schools and Student Team Learning as a teaching strategy was conducted. An action research project was conducted and from the pre to post-test data and best practices implementation regarding student team learning methods the handbook project was constructed. The handbook includes an introduction to Student Team Learning; guidelines for implementation; a student attitude survey; lesson practice questions, review sheets, and pre/post-check quizzes; a classroom newsletter; student data forms and individual/team recognition awards; and resources.

TABLE OF CONTENTS

LIST OF TABLES

Table Page

CHAPTER 1
INTRODUCTION OF THE PROJECT

The Problem

In the state of Washington math scores on the Washington Assessment of Student Learning (WASL) have consistently been behind the core subject areas of reading and writing for students in grades 3 through 10. In fact, going back to the inception of the (WASL) in 1997, math scores have only outperformed those of reading or writing at a particular grade level eight times (Washington State Report Card). This means that in the twelve years the state has given a standardized test to measure the performance of schools and the progress of students, only 9% of the time has mathematics scored higher than reading or writing (Washington State Report Card). Worst yet, is the fact that students taking the math assessment have not outperformed the content areas of reading or writing at any grade level since 2005 (Washington State Report Card).

In the Lake Chelan School District, WASL scores have, unfortunately, followed the same trend. In grades 3 through 10, mathematics scores have fallen behind those of reading and writing 96% of the time since 1997. Only four times in 96 attempts have mathematics scores beaten either reading or writing scores at a particular grade level (Washington State Report Card). The 2010-2011 school year, Chelan Middle School was placed on step 1 of the state's academic intervention program for not showing annual yearly progress (AYP) for low income, Hispanic, and English Language Learners in the subject of mathematics. In response; the school board, superintendent, and building principal scrambled to find out why students performed so poorly and what interventions could be implemented within the school and classrooms to see that scores improve.

As students move to middle school and beyond the type of instruction they receive is less differentiated and more direct. Direct instruction is a teacher centered approach that is most

effective for teaching basic or isolated skills (Kroesbergen & Van Luit, 2003). Teachers follow a sequence of events, generally stating the objective, review skills necessary for new learning, question students, provide group instruction and independent practice, assess performance, and give more practice (Swanson, 2001). This is the type of instruction that is prevalent in most schools, including Chelan Middle School, within the math department. Teachers are expected to cover a lot of information throughout the year and a direct approach to instruction is the quickest way to pass the information along. The problem with a direct instruction to teaching mathematics in middle school is that not all students benefit from this method. A fast paced instruction has taken the place of a differentiated instruction which can discourage students to a point where they become disengaged in the classroom. The length of time that teachers stand up front and instruct, allows students to become less involved in the curriculum and more frustrated with the instructor. And, the inability for students to work collaboratively in learning teams without being rewarded makes the classroom feel more like a work environment than a learning environment (Slavin, 1991). In the end, you have students that might achieve less due to the environment and attitude they bring to class.

Purpose of the Project

Math scores on state tests have fallen behind reading and writing scores 91% of the time since the inception of the WASL. For the first time Chelan Middle School is on AYP due to insignificant progress by English Language Learners students in math, Hispanic students in math, and low income students in math. For this project I am going to find and test a method of instruction to improve student achievement and attitude in a 6^{th} grade math class.

As a first step I am going to elaborate on instructional methods that address barriers to

learning mathematics. Then I will design a method for teaching this instructional strategy for meeting the needs of students at Chelan Middle School.

Operational Definition of Term

The following defined terms are used throughout this paper.

1. Academic English: The Englsih language ability required for academic achievement in context reduced stituations , such as classroom lectures and textbook reading assignments. This is sometimes referred to as cognative/academic language proficiency (Glossary, 2011).

2. Averge Yearly Progress (AYP): The calculation required by the US Department of Education that determines if a school is meeting standard in reading and mathematics. Annual benchmarks are set according to federal rules and are based primarily on expected student performance on statewide assessments (OSPI, 2011).

3. Cooperative Learning: A highly organized small group of learners working together as a team to solve a problem, complete a task, or accomplish a common goal (Miller, C.K., & Peterson, R.L., 2002).

4. Differentiated Instruction: An instructional approach to teaching in which educational curriculum content, instructional process, and student products are adapted according to student readiness, interest, and current level of performance (Herrel & Jordan, 2008, p. 162).

5. English Language Learners: Students whose first language is not English and who are in the process of learning English (Glossary, 2011).

6. Direct Instruction: A teacher-centered instructional approach that is most effective for teaching basic or isolated skills (Kroesbergen & Van Luit, 2003).

7. Formative Assessment: Evaluation that occurs before or during instruction and is used to assist with planning or making adaptations (Arends, 2000, p. 474)

8. Grade Level Equivalency (G.L.E): The current grade level a student is academically performing in school (Glossary, 2011).

9. Heterogeneous Grouping: A grouping arrangement in which students of varying abilities learn together in cooperative learning arrangements(Ansalone,G., 2006).

10. Homogeneous Grouping: A group of students organized by ability levels (Marzano, R.J., Pickering, D.J, & Pollock, J.E. 2001, p.87).

11. Jigsaw: A cooperative learning strategy in which material is broken down into sections depending on how many people are in each group. Students take a section and meet in expert groups with students that have the same section to discuss the material. Then students return to their teams and take turns teaching their teammates about their sections (Slavin, 1991, p.11).

12. Jigsaw II: A cooperative learning strategy that has students working in four-to-five member heterogenous teams. Team members go over the entire lesson to be learned rather than one part. Each team member than receives a topic on which to become an expert. Students with the same topic meet in expert groups for discussion, and return to teach their teammates what they have learned. Students take individual quizzes, which are formed into teams scores, and a class newletter recognizes the highest scoring teams and individuals (Slavin, 1991, p.11).

13. Learning Barriers: The issues that students face which affect their opportunity to be successful in the classroom. These include: student confidence, interest, home environment, classroom management, language, and cultural differences (Jones, 2011).

14. Low-Income: Students that are on a free and reduced Title II lunch plan (RLP) (Elementary and Secondary Education Act, OSPI, 2010).

15. Math Attitudes: The positive or negative feeling a student has towards mathematics (Aiken, 1963, p. 551).

16. Mixed Ability Groups: A classroom where students are divided up by ability and then placed in small, four member heterogenous groups of mixed ability levels (Cohen, 1994, p. 22).

17. Peer Instruction: An effective means of elaborating and explaining material to someone else (Slavin, 1990, p. 16).

18. Student Team Learning: A set of instructional techniques in which students are placed in four to five member heterogenous learning teams to master basic skills initially presented by the teacher (Slavin, 1988, p. 8).

19. Student Teams-Achievement Divisions: The simpliest form of STL, students are placed in four to five member learning teams made up of high, average, and low performing students, boys and girls, social class, and students of different racial or ethnic backgrounds. Each week the teacher introduces new materials and students work together in teams to complete worksheets on the material. Team members study the material until everyone on the team understands. Following team practice, students take quizzes on the material individually. The quiz scores are

then counted and individual scores are formed into team scores by the teacher. Students are then recognized for their individual improvement and team are rewarded for group success (Slavin, 1988, p. 9).

20. Team Accelerated Instruction: A combination of individualized instruction and team learning designed for use in elementary and middle school mathematics classes. Students work in the same heterogenous teams as in STL, but individually get their instruction from the teacher. Student track their individual homework completion and quiz scores on a student data sheet. This folder is kept in class and updated frequently (Slavin, 1990, p. 12).

21. Teams-Games-Tournaments: An instructional strategy that uses the same teams, instructional format, and worksheets as STAD. However, students play academic games to show their individual mastery of the subject matter (Slavin, 1988, p. 10).

22. Track: A students academic path through school (Glossary, 2011).

23. Tracking: The racial and ethnic inequalities that persist in society that are mirrored in schools and classrooms (Arends, 2000, p. 118).

24. Washington Assessment of Student Learning (WASL): The state test for Washington from 1997 until the summer of 2009. It tested students in reading, writing, science, and mathematics under the federal No Child Left Behind requirement (Assessment and Testing, OSPI, 2010)

CHAPTER 2
REVIEW OF LITERATURE

Problem Statement

Math scores on state tests have fallen behind reading and writing scores 91% of the time since the inception of the WASL and MSP (Washington State Report Card). For the first time Chelan Middle School is on AYP due to insignificant progress by English Language Learner (ELL) students in math, Hispanic students in math that have successfully transitioned out of the (ELL) program, and low income students in math. For this project the researcher changed the instructional technique used in a sixth grade math class to measure the differences in student achievement and math attitudes.

Barriers to Learning

Learning barriers are variables that affect the opportunity for a student to be successful in the classroom. There are a multitude of learning barriers that affect a student's attitude and achievement. The researcher chose to focus on learning barriers that had a direct correlation to the specific research design for the treatment group. These include English Language Learners (ELL), socioeconomic status, attitudes towards mathematics, and ability grouping.

English Language Learners

The growing Hispanic population in the United States has reached a new milestone, topping 50 million, or 16.3% of the nation, officially solidifying its position as the country's second-largest group, U.S. Census Bureau (Martinez & Ariosoto, 2011). This means that nearly one in five students are Hispanic. Many of these are ELLs in mainstreamed classrooms around the country. There are also a number of other Hispanic students not considered ELL on language tests, yet they lack the academic English to be successful. The language practices that children bring to school invariably affect how and what they learn (Nieto & Bode, 2008). ELLs struggle

to grasp social and academic vocabulary which can place them on a track for disaster. Immigrant and refugee students are more likely to be retained in-grade, to be inappropriately placed in special education, and to be at risk for being placed in low academic tracks on the basis of language differences or slow academic progress (Nieto & Bode, 2008). This tracking of students puts them at further risk of failure rather than success. ELLs have higher dropout rates and demonstrate significant achievement gaps on state and national assessments (Biancarossa & Snow, 2003). A survey of teachers concerning their preparedness to teach language-minority students found that only 20 percent of teachers felt "very prepared" to teach them (Nieto & Bode, 2008). If teachers are unprepared to teach these learners, there is a greater risk of failure. This lack of preparedness is most likely due to the fact that the teaching force is 90% White, a percentage that has not significantly changed in forty years (Nieto, 2003).

Poverty

Poverty impacts every aspects of an individual's life, including education. It impacts people with income less than that deemed sufficient to purchase basic needs such as food, shelter, clothing and other essentials (Jensen, 2009). Jensen (2009) has identified six different types of poverty: situational, generational, absolute, relative, urban, and rural. Students who live in poverty are at greater risk of academic failure. In schools with 25% of the students living in poverty, all students, poor, affluent, or in between, tend to do worse than students from schools in wealthy communities (Bainbridge & Lasley, 2002). There are many obstacles that students living in poverty face both at school and home. Issues of transportation, health care, family care, high tardy rates, and absenteeism are common problems among poor students (Jensen, 2009). The effects of living in poverty can take an emotional toll on students. The added stress of living in poverty impacts a student's academic success as well. It is safe to say that poverty and its

attendant risk factors are damaging to the physical, socio-emotional, and cognitive well-being of children and their families (Klebanov & Brooks-Gunn, 2006). Students living in poverty often show up to school hungry, they have poor hygiene, and lack appropriate clothing. These factors at the middle and secondary level greatly impact self-esteem, social interactions, and the hierarchy of social status. Children of poverty bring behaviors to school that impact their ability to learn and be taught. Children raised in poverty are more likely to act out, be impatient, impulsive, have gaps in social appropriateness, and have less empathy for others (Jensen, 2009). Consequently, these factors can also have an impact on the attitude the individual brings to school.

Attitude

A Student's negative attitude towards math has proven to be a learning barrier. Attitudes towards mathematics tend to develop during late elementary and early junior high grades (Aiken, 1976). The attitudes of other influential people in a child's life also influence their attitude towards math. Studies have found that students' attitudes toward mathematics were positively related to how they rated their fathers' attitudes towards mathematics (Aiken, 1963). This is one reason why middle school mathematics instruction needs to engage students in a positive learning experience. Students need to enjoy the process of learning in order to prevent or change their negative attitude. The most frequent reasons which students gave for disliking the subject of math were: working problems outside of school, word problems that were frustrating, possibilities of making mistakes in arithmetic, and too many rules to learn (Aiken, 1963). When students have a negative attitude towards mathematics they shut down physically (Slavin, 1988). This causes them to quit before attempting to solve problems, homework assignments, and other curricular activities. When attitude scores are used as predictors of achievement in mathematics,

a low, but significant positive correlation is usually found (Neale, 1969, as cited in Aiken, 1976, p.295). From this, it can be assumed that the attitude that students bring to school will carry-over into the class. If a negative attitude is present, there is a lower chance of success.

Ability Grouping

The way in which students are grouped in class for instruction can be a learning barrier that affects achievement. Grouping strategies can be traced back to 1867 when educational reformer W.T. Harris initiated a plan in St. Louis, Missouri, allowing for the rapid promotion of students through the elementary grades (Marzano, Pickering & Pollock, 2001). This plan to separate students was a first step towards ability grouping. Educators at the time believed this was the best approach to meeting the academic needs of each individual. The theory holds that grouping allows teachers to match instruction to student capabilities more effectively than in the non-grouped, heterogeneous context (Kerckhoff, 1986). At the beginning of this century the implementation of ability grouping was common practice. Among the first was the Santa Barbara Plan, a model that divided grades into A, B, and C sections. Although each section mastered the same basic content, the A group addressed the content more in depth than the B group, who addressed the content more in depth than the C group (Marzano, Pickering & Pollock, 2001).

There are three outlying problems identified with tracking students. The first factor is one that students have no control over. It incorporates social status and ethnicity as an outcome of tracking individuals. Ability grouping is perceived to perpetuate social class and racial inequalities because lower-class and minority students are disproportionally represented in lower tracks (Braddocks, 1990). The second factor is a consequence of the first in that ability translates into social class. Critics emphasize tracking is not only a technical arrangement, but also a social

phenomenon in which groups are formed on the basis of a socially esteemed trait, "ability," and the ranking of groups thus constitutes a status order (Dreeben & Gamoran, 1986). The third problem with ability grouping is that it doesn't allow students in a lower track an equal opportunity to learn depth of knowledge. Ability grouping is most damaging to low achievers because they experience a slower pace and lower quality of instruction, teachers who are less experienced or able, who do not want to teach low-track classes, and who have low expectations for performers (Oakes, 1985). Consequently, students in low ability tracks typically begin to develop a less-than-congenial attitude towards schooling (Hoffer, 1992).

Environmental Management of Learning

The classroom environment has a direct impact on learning. The environment includes such aspects as the physical, cultural and social relationships of academics found within a classroom. The physical environment of a classroom consists of the organization of the room, temperature, room preparation, and arrangement of furniture. To accommodate the diversity of learning styles, theorists suggest that students work together to develop group standards for the physical environment of the classroom (Marzano, 1992). Teachers are responsible for the culture that develops within their room, which is largely dependent on the social relationships that develop between the teacher, student, and school. An important aspect of the learning environment that teachers are responsible for is the instructional strategies they choose to use. These strategies can include direct instruction, independent work, hands-on learning, cooperative learning, and technology based instruction. All of which can accomodate differentiation for the many different types of learners in the classroom.

Teachers can create a culture of success where students feel like they are involved in the decision making. Democracy in the classroom involves students helping set group norms, rules

and expectations for daily operations. Excellent teachers find many ways to focus on equity and democracy as part of their pedagogy (Nieto, 2003). By being a part of the decision making, students feel safe and supported in class which meets their emotional needs. When students feel that they are an integral part of the classroom, they feel safe and comfortable which allows positive relationships to develop. Positive relationships support learning. The best relationships for learning are those in which the other people feel that their needs are being met (Kottler, Zehm, Kottler, 2005). Teachers can develop strong relationships with students by simply making eye contact and calling them by their first or preferred name. Human relationships are central to effective instruction (Nieto & Bode, 2008).

The instructional decisions teachers make directly impact the learning environment of the classroom. The challenge for all teachers is to figure out what kind of lessons will appeal to and enhance the achievement of their specific group of students (Ridnouer, 2006). Differentiating instruction by incorporating hands-on activities and lessons in which students work in pairs and cooperatively learn are all academic changes that help students be successful. It is important that teachers also provide a variety of formative assessments that check for understanding. Assessments need to be frequent and take on many forms to account for the diverse learners in the classroom. Ongoing student-involved classroom assessment is the best tool for revealing increments of improvement in students and for keeping them believing that success is within reach if they keep trying (Stiggins, 2005). Another important factor in student success is the relationships individual students develop with other members of the class. When students are not taught and encouraged to care about and to cooperate with one another, we can expect to see a highly competitive climate where some students are assigned high academic status, some average status, and the remainder low academic status (Kottler, Zehm, & Kottler, 2005). If

teachers are not careful, students can be unnecessarily labeled. By teaching students how to work together in groups and the importance of camaraderie, students begin to think less about their individual needs and more about the needs of the group. It is the job of the teacher to provide a safe, supportive, and academically challenging environment that fosters these types of relationships that build self-esteem and enhance an individual's attitude and opportunity for success.

Learning Groups

You cannot automatically assume that children know how to successfully work together. The chances are that they have not had any previous successful experience in group learning tasks, working with people who are not personal friends or family members (Cohen, 1994). Therefore, students need to be taught how to work together in groups that consist of different types of learners and ability levels. This is no different than any successful athletic team. Individuals on an athletic team learn to successfully work together from their coach. These behaviors are then internalized and spread throughout the group. Once the behavior is an expectation among the group it becomes a norm, or classroom rule. This is no different in the classroom among groups of learners. Students must be prepared for cooperation so that they know how to behave in the group work situation without direct supervision (Cohen, 1994). When the expected behavior is established by the teacher, students can begin to successfully work together towards a common goal. When an individual comes to feel that he or she ought to behave in this new way, even very young students can be heard lecturing other members of the group on how they ought to be behaving (Cohen, 1994).

Cooperative learning is an instructional strategy that benefits all students. It is a highly organized method of instruction that helps students increase social skills, self-esteem, and

achievement. Cooperative learning is an active learning process in which academic and social skills are fostered through face-to-face student interaction, individual accountability and positive interdependence (Jensen, 1995). Although cooperative learning methods differ in many ways, they can be categorized according to the following six principal characteristics. These include: group goals, individual accountability, equal opportunities for success, team competition, task specialization, and adaptation to individual needs (Slavin, 1995). There are many approaches to Cooperative Learning. One method is Student Team Learning (STL). This method incorporates each of the six principal characteristics of cooperative learning into an umbrella of instructional strategies that can be used to increase student relations and achievement in the classroom. According to Slavin and his research on Student Team Learning, in the heterogeneous classroom that uses cooperative learning, students develop a new sense of camaraderie that extends across racial or ethnic barriers to create new friendships less likely to exist in the traditional classroom (Slavin, 1991).

Student Team Learning (STL) is a set of instructional techniques based on years of research on cooperative learning at John Hopkins University (Farnish, 1995). Several strategies fall under the umbrella of STL including Student Teams-Achievement Divisions, Jigsaw, Teams-tournament-Games, and Team Accelerated Instruction. In STL students work in three to five member heterogeneous groups in which they support each other's learning in a safe environment. Students are not only responsible for their learning, but the learning of the entire group. They have group discussions and together complete learning tasks. The members have a common set of goals. If attained these goals are rewarded with individual recognition and group rewards. Each group can be made up of students from different ethnic backgrounds, genders, socio-economic class as well as different abilities. All members are supported in their learning by their

peers. The research found that when students worked in small teams where success depended on the learning of all team members, students showed increased motivation and achievement, displayed increased self-esteem, exhibited more caring about how their classmates did in their work, and chose more friends, including more friends of another race or ethnic background (Slavin, Leavey & Madden, 1986).

Student Teams-Achievement Divisions (STAD) is one strategy that falls under STL. This model places students in three to five member heterogeneous learning groups of mixed performance levels, gender, and ethnicity (Slavin, 1995). In this cooperative model students receive weekly instruction on new lessons and then work in groups to complete tasks. The group is not finished until all members have a firm grasp on the concept. They are assessed individually on what they have learned, but they also receive a team score. Therefore individual accountability is high to learn the material since their individual score becomes part of the team score. It is a sink or swim model of instruction since students are only as strong as their weakest teammate. The main idea behind STAD is to motivate students to encourage and help each other master skills presented by the teacher, if students want their team to earn team rewards, they must help their teammates to learn the material (Slavin, 1995). Students begin to see learning activities as social instead of isolated, fun instead of boring, and under their own control instead of the teacher's. Students are given external individual rewards for improvement and external rewards for team progress. Individual rewards consist of student recognition and certificates of improvement. External rewards for the team can be as simple as extended free time or as elaborate as a pizza party. In STAD classrooms the students begin to see their teacher as a resource person who has valuable information that they need to accomplish something important (Slavin, 1991).

Jigsaw II is another cooperative learning strategy that puts the responsibility of the groups' learning on students rather than the teacher. It is a modification from the original Jigsaw developed by Aronson and colleagues (Slavin, 1991). In Jigsaw II, learning teams are made up of four to five members. The groups are heterogeneous and mixed in abililty levels, gender, and ethnicity like STAD and TGT (Slavin, 1995). For this instructional strategy all teams work on the same lesson objective, but each member takes on specific aspect of the objective to become an expert on. Group member from the different teams that have the same lesson objective meet in expert groups to discuss and master the objective they were given. Group members then go back to their teams and teach the piece of the lesson objective to the other members of the team until everyone understands that piece of the lesson's objective. At this point they let the teacher know, and they are given a practice assignment to complete individually within the group. During group work it is essential that the teacher spend time monitoring each group's progress by being available to answer questions when necessary, but also checking to make sure that the learning taking place is valid (Rottier & Ogan, 1991). If the teacher identifies a learning gap, they can provide immediate intervention. It is the teacher's responsibility to close learning gaps with classroom discussions when necessary. Student evidence and feedback are used to reflect and refine the teaching process (Knight, 2006). At the end of each section of lessons, students take post-check quizzes to monitor for understanding like they would under STL. Rewards and recognition are then given to learning groups that meet individual and group goals.

Another instructional strategy that falls under STL is Teams-Games-Tournaments (TGT). Under this method learning groups follow the strategies under STAD and Jigsaw II until it is time to check for understand. Teams-Games-Tournaments are classroom competitions among groups to review big ideas for post assessments. Early studies of TGT used competition between

teams as a means of motivating students to cooperate within teams (Slavin, 1995). Tournaments are played by similar ability students from each group. Homogeneous grouping of students works best for this strategy. It allows students equal opportunity to be competitive against other students at the same ability level. Individual players score points that contribute to a team score (Aronson & Patnoe, 1997). These points are then added to the group's overall team score. Therefore, the group's success is dependent on each individual's mastery of the concept. The rewards attached help promote team cooperation and cohesiveness.

Team Accelerated Instruction (TAI) is a cooperative learning strategy that incorporates individualized instruction and team learning. Like STL students are placed in small heterogeneous groups differing in ability, gender, and ethnicity. The big idea behind TAI is creating an individualized mathematics program adapted to a student's individual needs. Teams work together to assist each other, but individuals work at their own level and rate. Individual programs within groups can range from simple addition to algebra (Slavin, 1991). Students enter a track and are placed in groups based on a pre-assessment test. Students monitor their progress by keeping a binder that charts individual assignments, quizzes, and tests (Slavin, Leavey & Madden, 1986). Individuals are recognized for their improvement and teams are recognized for their group's progress through units. This recognition can be as simple as individual certificates of improvement, or as big as team parties for meeting certain group goals.

According to the sources above most researchers agree that team learning needs to be highly organized to be effective. This organization needs to break down barriers that separate students and effect learning. In summary team learning needs to motivate the building of relationships specific to the learning barriers described above.

Benefits of Learning Groups

Working in learning groups is more than being able to work together and complete a group assignment. Productive group work is an essential stepping stone to learning and mastery (Frey, Fisher, & Everlove, 2009). When students participate in learning groups they develop social skills that go beyond the classroom. Vygotsky proposed that every function in a child's cultural development appears twice: first, on the social level, and later, on the individual level (Vygotsky, 1978, p. 57, as cited in Frey, 2009, p. 14). Therefore, we can conclude that learning is a social interaction that leads to individual mastery.

As students are placed into heterogeneous learning groups, the social benefits are immediately evident, in that groups must interact with each other in order to conquer a common goal. Learning groups allow students to do this. To consolidate and build new understanding, groups need to have considerable face-to-face interaction (Frey, Fisher & Everlove, 2009). During this interaction it becomes apparent that students have more in common than they originally thought. Group goals are a good way to promote positive relationships among group members. Social research has gathered impressive evidence to show that when people work together for group goals, there are a number of desirable effects on people's feelings for one another (Cohen, 1994). These positive feeling towards the group go beyond racial boundaries, making the social aspect of learning groups even more popular. Researcher Robert Slavin (1987) reviewed fourteen cooperative classrooms whose groups were ethnically and/or racially mixed. In eleven of these studies there were significantly more friendship choices across racial and ethnic lines among the groups (Cohen, 1994). Another positive social aspect of learning groups is how students treat each other within the group. For learning groups to succeed, competition among group members must be eliminated and members need to treat each other

with respect. Research by Sharan (1984) has examined how members of different ethnic groups treat each other while working cooperatively (Sharan, 1984). They found that cooperative learning produces more cross-ethnic cooperation and less negative and competitive behavior between members of different ethnic groups (Sharan & Shachar, 1988). When individuals participate in learning groups they develop a more positive attitude towards mathematics and an increased self-esteem. Cooperative learning methods increase self-esteem because students feel more liked by their peers and in turn do better academically (Slavin, 1990). The improvement of self-esteem has been validated in a number of research studies on the topic. According to Slavin (1991) students in STL classes have been found to feel better about themselves than do students in traditional classes (Slavin, 1991). This is also supported in studies found for Teams-Games-Tournaments (DeVries & Slavinr, 1978) and Jigsaw (Blaney, Stephen, Rosenfield, Aronson & Sikes, 1977, as cited in Slavin, 1991). It is apparent that a student's ability to work with others increases self-esteem. This intrinsic characteristic promotes self-worth, a positive attribute of learning groups that will impact students throughout their lives.

Group discussion and modeling of thinking skills that take place in learning groups help struggling students see how other students think. In other words, struggling students learn strategies that higher achieving students use. These strategies help the individual work through problems and master concepts better than if they were working independently. By interacting with others, children learn not only what to think, but how to think (Frey, Fisher & Everlove, 2009).

The ability to think is demonstrated through increased achievement. The effects of cooperative learning activities have been positive for increased academic achievement in recent empirical studies conducted with students with and without disabilities (Miller & Peterson,

2002). Reviews of studies comparing achievement for ability groups vs. heterogeneous classes have consistently found ability grouping to have little or no effect on student achievement overall in secondary schools (Slavin, 1990). This is also true of students living in poverty. The peer interactions and modeling that occurs when students work cooperatively helps them learn to be become better learners. Research has shown that students who live in poverty, that know, trust, and cooperate with one another typically do better academically (Jensen, 2009). Therefore you can assume the heterogeneous grouping of these type of learners is a more positive strategy to learning then having them grouped by ability level.

ELL students need opportunities to interact and practice their new language skills as much as possible. Sitting in a room where the teacher directs instruction does not provide ELL students the opportunity to practice their language skills. Cooperative learning is especially effective for ELL students because the students have more opportunities for verbal interactions in small groups (Herrel & Jordan, 2008). The other benefit of cooperative learning for ELL students is that through curriculum based interactions they are able to access more of the content and develop both social and academic language. Swain (1993) proposes that a classroom where children work together to solve problems and produce projects supports their language development in several ways (Swain, 1993).

Summary

The diversity in today's classrooms brings many challenges to teaching. Research highlights the presence of learning barriers that affect the opportunity for students to be successful. The learning barriers presented in this project are ELL's, socioeconomic level, attitudes towards math and ability grouping of students. These learning barriers have shown that they can lead to lower achievement and poor attitudes towards learning. As teachers begin to

differentiate instruction and incorporate cooperative learning groups into the classroom, they can begin to break down these barriers. Research has shown that heterogeneous learning groups have a positive effect on student achievement. Student Team Learning and the instructional strategies incorporated in it include Student Team Achievement Divisions, Jigsaw II, Team-Games-Tournaments, and Team Accelerated Instruction. When these instructional strategies are used successfully, they can increase achievement. They also improve increased math attitudes, social skills and build self-esteem. Student's beliefs that they are valuable and important individuals are of critical importance for their ability to withstand the disappointments of life, to be confident decision makers, and ultimately to be happy and productive individuals (Slavin, 1990).

CHAPTER 3
PROCEDURES

Purpose

Administrators, parents, community members, and teachers at Chelan Middle School are concerned and feel a sense of urgency to find out why students are falling behind in mathematics. New and revised standards are continually being updated by the state to show exactly what students are expected to know and do. These same standards are being used in all middle school math classes on a daily basis. Supplemental math support has been added to the school day in the form of lab math classes and after school math programs have been implemented for students that need extra support.

Yet, looking at the data collected over the years by the Office of Superintendent of Public Instruction, one possible reason that students are falling behind in mathematics is simply because they do not like mathematics in comparison to other core subject areas. If students did enjoy math I believe the research would show a closer alignment between scores in mathematics and the subjects of reading and writing.

Why do students at Chelan Middle School not like math? I believe the majority of students do not like math because it is less hands-on and more teacher directed than the instruction they received in elementary school. This is a bold statement that cannot go unnoticed, especially since there have only been 3 times since 2005 where grades 6 through 8, at Chelan Middle School, have scored a higher percentage on the states test compared to the 3rd through 5th grade classes at Chelan Elementary School (Washington State Report Card, 2010).

If students at the Chelan Elementary School are consistently performing at fifty percent and higher in mathematics on our state assessment and the middle school is actively up-to-date on teaching the state standards and providing interventions for students falling behind, then it is

fair to say the problem lies in the classroom. People might say this problem is due to the instructional approach students transition through as they move from elementary to middle school. In elementary school, students experience a variety of hands-on instruction in a homeroom with the same teacher throughout the day. Students work in learning teams and are rewarded for doing well. Teachers have more time to get to know students and how they learn best. Differentiation of instruction is common practice because teachers understand it allows for greater student achievement and increased math attitudes. The purpose of this action research project is to compare student mathematical achievement and attitude change between present instruction and an STL instructional technique.

Ethical Standards

This study follows the ethical standards in human subject research. Additionally, the project was reviewed and approved by the Central Washington University Human Subjects Review Committee, number H10118. (See Appendix A)

Location and Population

The action research project took place at Chelan Middle School in Chelan, Washington. All research was performed in room 107. The researcher is a 6th grade math and science teacher who teaches three periods of math and two periods of science throughout the day. For this project the researcher's 2nd period math class was chosen to receive the treatment. The 5th and 6th period math classes were used as controls when measuring differences in achievement and attitudes.

The 2nd period class was chosen for this study because it best represents the size, income, and ethnicity of classes and students at CMS. The number of students in the 2nd period class represent the median class size from the three groups used for the research study. Income, a

learning barrier addressed that can effect student achievement and attitude is best represented in the 2nd period class since the number of students that fall into this category is higher than 5th period, but lower than 6th. Cultural diversity, the mixture of different ethnic groups in the classroom, is best respresented in 2nd period for the reason that students who fall into this category are an average of the same students from the two other classes. A table of the demographics of each math class is shown below.

Classroom Demographics

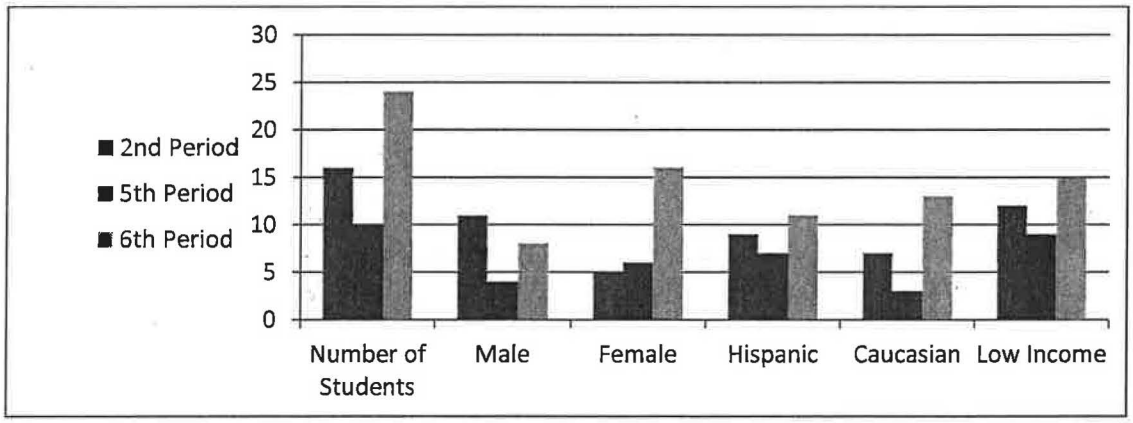


Table 1

Permission

The students involved in the research were minors. Therefore, a parent letter and permission slip were sent home the second week of class. (See Appendix B) In order for students to be able to participate in this study, parents had to fill out the permission form allowing their child to be a part of the study. A student ascent form was also needed for student participation. (See Appendix C) The researcher read aloud the student ascent form during class explaining the purpose of the research and answered questions. Students signed the bottom of the form stating that they would like to be involved, but reserved the right to discontinue the research at any time.

Curriculum

The Lake Chelan School District adopted the Pearson, Prentice Hall Mathematics curriculum in the summer of 2004. It is the instructional curriculum used in all of the researcher's math classes. The textbook includes 12 units that cover all Washington State 6th grade math standards that are eligible to be assessed by the state. This research project covered the first four units of the Prentice Hall Mathematics: Course I textbook: Decimals, Algebra: Patterns and Variables, Number Theory and Fractions, and Addition and Subtraction of Fractions.

Normative Assessment

In the spring of 2008 all students in grades 3, 4, 5, 6, 7, 8, 9 began taking the Northwest Evaluation Association (Informative Data, 2008, 2011) assessment. It is a nationally normed assessment that represents more than 2,200 school districts and more than three million students in 42 states (Informative Data, NWEA, 2011). NWEA assessment is a computerized adaptive test called Measure of Academic Progress (Informative Data, 2008, 2011), that has been nationally normed to measure a student's progress or growth in math, reading, and language. When students answered questions correctly, the questions got harder. When students answered incorrectly, the questions got easier. The final score was an estimate of the student's achievement. The scale used to measure achievement was a RIT scale (Rasch unit). A RIT scale is an equal-interval scale used to chart a student's academic growth from year to year (Informative Data, 2008, 2011). The information gained for each student was broken down into strands that included: numbers and operations, algebra, geometry, measurement, probability and statistics. All three of the researcher's math classes completed this assessment at the beginning of the school year. The information gained from the assessment was used as a comparative

analysis of mean and median RIT scores. Students in each of the researcher's math classes again participated in the assessment at the conclusion of the study. A comparative analysis was used to measure academic growth among the 2 groups.

Math Attitude Questionnaire

To begin this project, I needed a questionnaire to administer to students that would measure attitudes towards mathematics. A five point Likert scale was chosen for this task. To complete a Likert survey a respondent states their level of agreement to a statement by choosing one of five Likert points that include: 1. strongly disagree, 2. disagree, 3. undecided, 4. agree, and 5. strongly disagree. A summative score was attained from the values of each Likert item that was used to measure individual items or a group of items within a classroom. For this research project I adapted a math attitude scale by Aiken (1963). The questionnaire included twenty statements about math attitudes in a math class. (See Appendix D)

Formative Assessment

Formative assessment is a part of the instructional process. It helps teachers adjust their teaching practices and informs students on their current understanding of a topic. During this research project, students in all three math classes participated in the same assessments from Prentice Hall Mathematics. This included a pre-check quiz before the sections were taught, followed by a post-check quiz after the sections were taught. Each unit consisted of eight to ten sections. There were two to three pre-check quizzes and two to three post-check quizzes given during each unit depending on how the unit was broken up. The pre-check quizzes were considered practice and did not get entered into the grade book.

Classroom Procedures for All Classes

Students in each math class entered the classroom and sat in their assigned seats. For the treatment and control groups this was the procedure to begin each class period. When the bell rang, students began working on a Problem of the Day, an entry task, located on the whiteboard. The entry task was used to get students thinking mathematically and not specific to the research design. This task was either completed on a student whiteboard, in a math journal, with a partner, or mentally. After attendance was taken, I walked around the classroom talking with students about the problem and checking answers. If I found this was a topic that needed further explanation, the class came together for a group discussion. During this discussion we talked about strategies for solving the problem.

Once the entry task was completed, I began to introduce the next lesson or we corrected an assignment from the previous day. If there was an assignment that needed to be corrected, students grabbed a green correcting pencil and corrected their own assignment from the answers located on the overhead at the front of class. Once assignments were corrected, students used a calculator to turn their score from a fraction into a percentage. While students found their percentages, I called out their names and turned their percentages into a number from 1-10. This was the score that will be placed into the grade book. If students completed all problems, but scored less than 50% I gave them 5 points for their effort. The procedures used to correct assignments were followed by both the treatment and control groups and not specific to the research design.

5th and 6th Period Instructional Procedures

Explicit instruction is traditional in nature. It is a teacher-centered approach that works for teaching basic skills in mathematics. It is also the instructional approach that I have used for

the past four years. For this research project I will use a direct instructional approach to continue to teach the 5th and 6th period math classes.

Once the entry task for 5th and 6th period was completed and assignments were graded, I stood in front of the class and stated the objective for the day. I then explained to students what they should be able to do by the end of class. I reviewed skills necessary for the new information and used a PowerPoint presentation to show pictures and diagrams, broke down the tasks into smaller steps, and modeled the skills that students would be working on to complete the assignment. I questioned students and asked for feedback throughout the lesson. The instruction lasted for 30-35 minutes. As students mastered the material, I gave them more practice to work on independently at their seat. I allowed students to talk about the assignment with their neighbors, check answers with other students, and raise their hand if they needed extra assistance. If the assignment wasn't completed by the end of class it was homework for that night.

2nd Period Instructional Procedures

For the research treatment group, students in 2nd period math, were exposed to instructional activities developed from research on cooperative learning methods. The research on cooperative learning at John Hopkins University led to the development of Student Team Learning (Slavin, 1991). I have taken the activities developed from Student Team Learning and adapted them to my teaching methodologies and classroom practices to enhance student achievement and math attitudes in 2nd period math. The activities under Student Team Learning that were used for this research included: Student Team-Achievement Divisions, Team-Games-Tournament, Jigsaw II, and Team Accelerated Instruction.

Students Team Learning is a student centered approach for teaching mathematics. Therefore, the role of the teacher becomes less significant as students master basic skills. The teacher is referred to as a coach who oversees his team. This type of instruction revolves around the word "team". It is a major theme used within the instructional activities and one that students relate to. Team success requires that all team members do their best work. Cooperative goals encourage students to be accountable to their team and help each other do well because it means their team will do well. I decided to use this approach while developing the procedures to be followed during the research because it had the potential to relate to every type of student.

At the beginning of the research study the class developed a list of team rules that they followed while they worked in their teams. These rules included: 1) Your team captain is in charge; 2) Pay attention so you don't miss out on important information; 3) Listen to your captain and other team members; 4) Be helpful; 5) Support your teammates; 6) Cooperate with your team daily; 7) Do your own work. The classroom rules were enforced within teams by team members and through individual accountability to the team by following the rules in place. These rules were supported by the teacher and enforced by the teacher if they were not be properly enforced by the team. A final draft of team rules developed by the ideas from the class was located on the wall next to the door of the classroom. The control classes did not follow these rules, instead they followed a set of classroom expectations given by the teacher at the beginning of the year.

For the research project, students worked in four member heterogeneous groups that consisted of one high performer, two mid-level performers, and one low performing student. These groups were a mixture of girls and boys, as well as Hispanic and Caucasian students. The teams were created from the pre-check quiz. Students were then ordered by the number of points

they earned on the pre-check quiz and then randomly assigned to teams. The top four performers on the pre-check became the team captains. The next eight mid-level students were randomly assigned by putting there names into a hat. The student names were individually pulled out and students were placed into one of the four teams. The four low performing students were also randomly assignmed by putting there names into a hat and drawing out one at a time to each of the four teams. All indivuals had equal opportunity to be team captains depending on how they performed on the pre-check quiz.

On the day that teams and captains were announced, the captains came into the classroom during lunch. I began by teaching the captains a math card game they would teach their team the following day as an entry task. As a group we discussed the lesson to be taught the following day. I broke down the lesson into smaller steps, discussed strategies for solving problems, answered questions, and went over examples. Once students felt comfortable in their mastery of the topic, I gave them five example problems to complete that night and bring in the following morning before school to check their understanding of the lesson's objectives. If the captain did not have the correct answers I worked with the student to correct any misconceptions they had about the lesson. As students entered class I placed them into their teams and let the captains take over. During the card game, teams created a team name that was placed on a team scoreboard located under the team rules. After the game, I began the lesson for the day. The instructional approach used to teach the lesson was similar to the explicit approach used in 5th and 6th period. I stated the objective, reviewed any prerequisite skills, and modeled the concept or skills using a PowerPoint or other visual aid. During this time of instruction, I frequently assessed student comprehension by asking questions or answering questions by students. The instruction lasted 15-25 minutes before the captains took over in their teams. In each learning

team the captain gave students the problems they correctly answered the night before. The captain modeled how to solve the first problem, answering questions along the way while team members followed along. The second problem was completed as a group, facilitated by the team captain. The third through fifth problem was independent practice for each team member. As students finished the problem the team captain marked a star next to the problem if it was correct, or had the team member check their work if it was wrong. While teams worked cooperatively I walked around the room facilitating the group work, answering questions, and identifying students that might need extra help. Once all five questions were answered correctly by everyone in the group, the team captain raised his or her hand to have me check for consensus. If everyone agreed they had mastered the lesson for the day I gave them an assignment that students completed independently in their groups. During the remainder of class students' worked on the assignment, checked each other's work, talked about questions they had. At the end of the period the assignment became homework if it was incomplete.

Students remained with the same team for the sections taught in the book. This lasted between 6 and 8 school days. The day before the post-check quiz students worked in their teams on a review sheet that was facilitated by the team captain. The review sheet was a chapter test taken from the Prentice Hall workbook for the given chapter. Students completed the questions on the test that covered the sections learned the last 6 to 8 days. Once the review sheet was completed I gave the captain an answer key to check for accuracy. It was up to the captain to determine if their team had mastered the content. If the captain believed there was a gap in the students knowledge and content being covered I would step in and help bridge the gap until everyone on the team felt confident in their understanding. If the captain thought their team was ready for the quiz, the team members placed the chapter test in their binders and spent the

remainder of class playing the math card game learned at the beginning of the section. The review sheets were not graded; instead they were a tool to help teams prepare for post-check quizzes.

On the day of a post-check quiz, students got into their teams to compete in a math review game. The four team captains sat at a table together. One mid-level performer from each team sat at another table together. The other mid-level performer from each team sat at a third table together, and the low-performer from each group sat at a fourth table together. Except for the team captains being placed at the same table, students do not know the reason for where they were sitting, yet I know it was to give each student an equal opportunity to compete and be successful. Each table was equipped with a student whiteboard, eraser, and whiteboard pen. The game consisted of review questions similar to those they would see on the post-check quiz. I began the game by writing a question on the whiteboard. The goal was to answer the question faster than the others at the table. A point went to the first person at each table that correctly answered the question. Two rounds were played among the groups and an accumulative score was kept on the whiteboard. The winning team received 5 points, second place 3 points, and the third place team 1 point. These points went towards their overall team score.

After the game was played, students went back to their assigned seat and completed the post-check quiz. All quizzes were 10 questions and consisted of multiple choice and short answer questions. Once students finished the post-check quiz, they turned the page over and completed the pre-check quiz for the next sections.

Post-check scores were graded by the teacher and individual scores for each team member were summed to get a team score. The maximum team score for the post-check quiz was 40 points. The team score was one component used to determine team champions. The

other components included the team competition and homework points. Homework points were given to students that completed homework on time, finished the whole assignment, with a score of atleast 50 percent or higher. These scores were placed on the team scoreboard located under the team rules for all students to see. The three scores were then added together to determine the team champions. Team champions each received an "Outstanding Improvement Award" trophy filled with M&Ms. The students that showed the greatest improvement from the pre-check to the post-check quiz also received an award for outstanding improvement. At the end of the research project the student that won the most "Outstanding Improvement Award" trophies got to invite five friends for a pizza party during lunch.

At the end of each competition, a newsletter was passed out to every student in class. The newsletter recognized students for their participation and outstanding achievement. It named students with the greatest improvement scores, and those that had 100% homework completion. The newsletter also included team rankings broken down by their total number of points scored from the post-check score, homework score, and competition points. The last component of the newsletter was an overall ranking of students by the number of trophies they had won.

For the last component of the research project, students monitored their own progress by filling out a data sheet. The data sheet was filled out after their pre-check assessment and post-check assessment. It included their pre-check scores, post-check scores, improvement scores and homework points, and overall team placing. Students used a line graph to compare pre-check scores and post-check scores, all of which was located in their individual folder.

Method of Data Analysis

To analyze the effectiveness of the instructional methods with respect to barriers to learning the researcher will use descriptive statistics to find patterns of achievement and attitude towards math. The primary sources for the descriptive statistics for attitude will be a Likert scale survey and for achievement will be NWEA scores.

The reasearcher also analyzed qualitative data from his journal and observations to identify patterns in learning with respect to the barriers that can effect learning. The method that the researcher used was to compare and contrast student behaviors with respect to the different instructional methods.

CHAPTER 4

DATA ANALYSIS

Overview of the Project

In this section, the researcher discussed analysis of the data and how these results were used to create a handbook for math teachers who want to implement a team approach.

In this study, I identified learning barriers that can affect student achievement and attitudes within a math classroom. These barriers included: English Language Learners, Hispanic students, socioeconomic status, attitudes towards math, and ability grouping. The goal of the action research was to find and test a method of instruction to improve student achievement and attitude in a 6^{th} grade math class. The instructional approach choosen for this project was Student Team Learning. This cooperative learning strategy incorporates methods of Student Team Acheivement Divisions, Team-Game-Tournaments, Jigsaw II, and Team-Accelerated Instruction as a way to differentiate instruction, promote student relations, increase achievement in the classroom, and attitudes towards math.

Analysis of Data

For this study a five point Likert scale survey was distributed to all students at the beginning of the research project. Nineteen weeks later, at the end of the research project, the students completed the Likert scale survey for a second time. The emphasis of the survey was to measure student attitudes towards mathematics. The 5 points on the Likert scale correlated to: 1. strongly disagree, 2. disagree, 3. undecided, 4. agree, and 5. strongly agree.

The directions for completing the Likert scale questionnaire were read aloud in class. To accommodate struggling readers all questions were also read out loud, and students could ask for clarification on any unknown terms. Below are two Likert scales that show the list of the statements that students were given to answer in both English and Spanish.

Directions: Please write your name in the upper right hand corner. Each of the statements below expresses a feeling that a person might have toward mathematics. You are to express, on a five point scale, the extent of agreement between the feeling expressed in each statement and your own feeling. The five points are: Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A), and Strongly Agree (SA). You are to circle the letter which best describes how closely you agree or disagree with the feeling expressed in each statement AS IT CONCERNS YOU.

1. I do not like mathematics, and it scares me to have to take it.	**SD D U A SA**
2. Mathematics is very interesting to me, and I enjoy math courses.	**SD D U A SA**
3. Mathematics is better when I get to work out problems by myself.	**SD D U A SA**
4. My mind goes blank, and I am unable to think clearly when working math.	**SD D U A SA**
5. Mathematics makes me feel uncomfortable, restless, irritable, and impatient.	**SD D U A SA**
6. The feeling I have toward mathematics is a good feeling.	**SD D U A SA**
7. I am always under a lot of pressure in a math class.	**SD D U A SA**
8. I like to work in a team with other students during math class.	**SD D U A SA**
9. This math class is the best part of my school day.	**SD D U A SA**
10. I get bored and zone out in math class when the teacher talks in front of the class.	**SD D U A SA**
11. Mathematics is something which I enjoy a great deal.	**SD D U A SA**
12. When I hear the word math, I have a feeling of dislike.	**SD D U A SA**
13. I have a fear of not being able to do mathematics.	**SD D U A SA**
14. I really like mathematics.	**SD D U A SA**
15. Mathematics is a course in school which I have always enjoyed studying.	**SD D U A SA**
16. It makes me nervous to even think about having to do a math problem.	**SD D U A SA**
17. I have never liked math, and it is my most dreaded subject.	**SD D U A SA**
18. I am happier in a math class than any other class.	**SD D U A SA**
19. I like my math class this year better than last year.	**SD D U A SA**
20. Working in teams during math class is helpful, and makes learning fun.	**SD D U A SA**

(Adapted from Aiken, L. R. (1963). Attitude Towards Mathematics. *Review of Educational Research, p. 588)*

Direcciones: Por favor de escribir su nombre en las esquina derecha. Cada declaración abajo expresa un sentimiento que la gente tiene sobre las matemáticas. Usted debe de expresar su opinión, usando una calificación de cinco puntos, el intento del argumento es la diferencia de los sentimientos de otros con los sentimientos de Usted. Las cinco calificaciones son: No de Acuerdo Fuertemente (NAF), No de Acuerdo (NA), Sin Igual (SI), Acuerdo (A), De Acuerdo Fuertemente (DAF). Usted debe de circular lo que mejor describa sus sentimientos acerca con las declaraciones COMO LE PRETIENE A USTED.

1. No me gustan las matemáticas, y me da miedo tomas clases de matemáticas.	**NAF**	**NA**	**SI**	**A**	**DAF**
2. Las matemáticas son muy interesante para mí, me gustan los cursos de matemáticas.	**NAF**	**NA**	**SI**	**A**	**DAF**
3. Las matemáticas es mejor cuando yo puedo trabajar en problemas solo.	**NAF**	**NA**	**SI**	**A**	**DAF**
4. Mi mente se borra, y no puedo pensar claramente estoy trabajando en las matemáticas.	**NAF**	**NA**	**SI**	**A**	**DAF**
5. Las matemáticas me hacen sentir sin a gusto, irritable y impaciente.	**NAF**	**NA**	**SI**	**A**	**DAF**
6. El sentimiento que yo tengo a cercas a las matemáticas es bueno.	**NAF**	**NA**	**SI**	**A**	**DAF**
7. Yo siempre estoy bajo mucho estrés en clase de matemáticas.	**NAF**	**NA**	**SI**	**A**	**DAF**
8. Me gusta trabajar en equipo con otros estudiantes durante me clase de matemáticas.	**NAF**	**NA**	**SI**	**A**	**DAF**
9. Esta clase de matemáticas es la mejor parte de mi día escolar.	**NAF**	**NA**	**SI**	**A**	**DAF**
10. Me aburo en la clase de matemáticas cuando el maestro está hablando al frente de la clase.	**NAF**	**NA**	**SI**	**A**	**DAF**
11. Las matemáticas es algo que me gusta mucho.	**NAF**	**NA**	**SI**	**A**	**DAF**
12. Cuando escucho la palabra matemáticas, tengo un sentimiento de disgusto.	**NAF**	**NA**	**SI**	**A**	**DAF**
13. Tengo un sentimiento de miedo y creo que no puedo hacer las matemáticas.	**NAF**	**NA**	**SI**	**A**	**DAF**
14. Me gustan las matemáticas.	**NAF**	**NA**	**SI**	**A**	**DAF**
15. Las matemáticas es un curso que siempre me a gustado estudiar en la escuela.	**NAF**	**NA**	**SI**	**A**	**DAF**
16. Me pongo nervioso nada más de pensar en tener que hacer matemáticas.	**NAF**	**NA**	**SI**	**A**	**DAF**
17. Nunca me han gustado las matemáticas y es mi curso menos apreciado.	**NAF**	**NA**	**SI**	**A**	**DAF**
18. Estoy más feliz en mi clase de matemáticas que otras clases.	**NAF**	**NA**	**SI**	**A**	**DAF**
19. Me gusta mi clase de matemáticas este año mejor que la del año pasado.	**NAF**	**NA**	**SI**	**A**	**DAF**
20. Trabajando en equipos me ayuda más, y aprender es divertido.	**NAF**	**NA**	**SI**	**A**	**DAF**

(Adapted from Aiken, L. R. (1963). Attitude Towards Mathematics. *Review of Educational Research, p. 588)*

Below, Table 2 is a compilation of average scores for students in each of the researchers classes for the fall and winter survey.

	Fall Scores			Winter Scores		
	Treatment	Controls		Treatment	Controls	
Question	**2nd**	**5th**	**6th**	**2nd**	**5th**	**6th**
1	2.06	2.63	2.20	1.31	1.72	1.45
2	3.87	3.00	4.04	4.62	3.72	4.50
3	2.87	3.09	3.04	2.31	2.27	2.33
4	2.43	2.63	2.16	1.56	2.09	1.45
5	2.50	3.09	1.91	1.25	1.45	1.66
6	3.93	3.09	3.83	4.31	4.27	4.16
7	2.25	2.72	2.20	1.87	2.36	1.54
8	4.18	3.18	3.91	4.87	3.45	4.16
9	1.93	3.09	3.41	4.25	4.00	3.91
10	2.18	2.09	2.16	1.81	1.54	1.75
11	3.68	2.90	3.70	4.25	3.63	4.08
12	2.18	3.18	1.95	1.31	1.81	1.62
13	2.87	2.45	2.54	1.87	1.45	2.04
14	3.31	2.81	3.66	4.37	3.90	4.16
15	3.50	3.36	3.62	4.12	3.90	4.04
16	2.50	2.09	2.12	1.75	1.36	1.54
17	2.56	2.09	2.16	1.56	1.45	1.54
18	3.06	2.63	3.50	4.25	3.9	3.95
19	4.25	3.36	3.87	4.68	4.27	4.12
20	4.25	3.81	4.04	5.00	4.00	4.04
Number of students	16	11	24	16	11	24

Table 2

I used descriptive statistics to compare the average change in Likert scores from the two questionairres given, then compared those to the 2nd period treatment group and 5th/6th period control groups. A practical difference between the fall and winter survey was 1 or greater. There was no practical difference between the treatment and control groups on items: 1, 2, 3, 7, 10, 11, 15, 16, 19, and 20. The 2nd period treatment group had the greatest practical difference between surveys on items: 4, 9, and 17. The 5th period control group showed the greatest practical difference on items 6 and 12. The 2nd period treatment and 5th period control groups showed a 1

point or greater difference in attitude on items 5, 13, 14, and 18. Looking closer at item number 9, students in 2nd period during the fall disagreed strongly with the statement, "This math class is the best part of my school day," compared to students in 5th and 6th period that were undecided. By the end of the action research students in 2nd period showed a practical difference of 2.32 on the same question, whereas students in 5th and 6th period showed a change of less than 1. A question that stood out to me from the data was item number 1. On the fall survey students in all classes disagreed with the statement, " I do not like mathematics, and it scares me to have to take it". This means that students in all the math classes seemed to like math more than I initially believed. The practical difference for the same question after the winter surevey for all classes was less than 1.

Analysis of Data on Specific Learning Barriers

The data received from the Likert scale survey was broken down by the learning barriers observed at the researcher's school. Table 3 shows average scores for Caucasian students on a reduced lunch plan for all classes observed. Table 4 contains average scores for Hispanic students. All Hispanic students in the researchers classes are on a reduced lunch plan, therefore Table 4 includes the results for all Hispanic students as well. Table 5 includes all students on a reduced lunch plan, and Table 6 includes all ELLs students.

The descriptive statistics from table 3 indicate that Caucasian students in the 2nd period treatment group displayed a practical difference of one or greater on eleven of the twenty statements between the fall and winter survey. Students in the 5th period control group showed a practical difference on thirteen of the twenty statements, and the 6th period control group showed a practical difference on two of the twenty statements answered. (See Table 3)

Caucasian Students on RLP

	2nd Period Treatment			5th Period Control			6th Period Control		
Question	**Fall**	**Winter**	**Diff.**	**Fall**	**Winter**	**Diff.**	**Fall**	**Winter**	**Diff.**
1	2.33	1.33	+1.00	2.50	1.50	+1.00	2.28	1.28	+1.00
2	4.33	5.00	+0.66	3.50	3.50	0.00	3.85	4.42	+0.50
3	3.00	1.66	+1.39	2.50	1.50	+1.00	3.00	2.14	+0.86
4	2.33	1.33	+1.00	3.50	2.00	+1.50	2.00	1.28	+0.72
5	1.66	1.33	+0.33	2.50	1.50	+1.00	1.57	1.28	+0.29
6	4.00	4.33	+0.33	3.50	4.00	+0.50	3.85	3.85	0.00
7	1.33	1.33	0.00	3.00	2.50	+0.50	2.85	1.28	+1.57
8	4.66	5.00	+0.33	3.00	4.00	+1.00	3.85	4.71	+0.86
9	3.66	4.66	+1.00	3.50	4.50	+1.00	3.43	3.57	+0.14
10	1.33	1.00	+0.33	2.50	1.50	+1.00	1.71	1.57	+0.14
11	4.33	4.33	0.00	2.50	3.50	+1.00	3.71	3.85	+0.14
12	2.00	1.66	+0.33	2.50	3.50	+1.00	3.71	3.85	+0.14
13	4.00	2.33	+1.66	2.50	1.50	+1.00	2.00	2.14	+0.14
14	2.66	4.33	+1.66	3.50	2.00	+1.50	3.85	4.42	+0.50
15	2.33	3.66	+1.33	3.00	3.50	+0.50	3.85	3.71	+0.14
16	4.00	1.66	+2.33	1.50	1.50	0.00	1.57	1.43	+0.14
17	3.66	2.00	+1.66	2.50	1.50	+1.00	1.57	1.14	+0.42
18	3.00	4.00	+1.00	3.00	3.50	+0.50	3.71	3.85	+0.14
19	3.66	4.66	+1.00	3.50	4.00	+0.50	3.71	4.14	+0.35
20	4.66	5.00	+0.33	3.50	4.50	+1.00	3.57	3.85	+0.27
Number of students	3	3		2	2		7	7	

Table 3

All three classes displayed a practical difference on item number 1. There was no practical difference between 2nd, 5th, and 6th period on items 2 and 6. The 2nd period treatment group showed the greatest practical difference on items: 15, 16, 18, and 19. The 5th period control group displayed the greatest practical difference on items: 5, 8, 10, 11, 12, and 20. The 6th period control group showed the largest practical difference on item number 6. The 2nd and 5th period classes showed a 1 point or greater increase on items: 3, 4, 9, 13, 14, and 17. The 5th and 6th period control groups showed the greatest practical difference on item number 1. By the end of the second survey the 2nd period treatment group scored a five on both items 8 and 20. This indicates that Caucasian students in the treatment group strongly agreed that working in teams

during class was helpful and fun. The greatest practical difference shown was 2.33. This was by the 2nd period treatment group on Likert item 16 regarding being nervous thinking about doing a math problem. This information indicates that the 2nd period group was significantly less nervous to do math after given the treatment.

Hispanic Students RLP

	2nd Period Treatment			5th Period Control			6th Period Control		
Question	**Fall**	**Winter**	**Diff.**	**Fall**	**Winter**	**Diff.**	**Fall**	**Winter**	**Diff.**
1	2.22	1.44	+0.78	3.14	2.00	+1.14	2.77	2.00	+0.77
2	3.66	4.33	+0.66	2.57	3.71	+1.14	3.77	4.44	+0.67
3	3.22	3.00	+0.22	2.66	2.42	+0.24	3.00	2.66	+0.44
4	2.55	1.44	+1.11	2.85	2.28	+0.57	2.66	1.77	+0.89
5	3.22	1.22	+2.00	3.71	1.57	+2.14	2.55	2.44	+0.11
6	3.66	4.22	+0.56	2.57	4.14	+1.57	3.55	3.77	+0.22
7	2.66	2.22	+0.44	2.28	1.85	+0.43	1.88	1.33	+0.55
8	4.00	4.88	+0.88	3.42	3.42	0.00	3.44	3.44	0.00
9	3.00	4.11	+1.11	3.00	4.00	+1.00	2.77	3.55	+0.88
10	2.66	2.33	+0.33	2.28	1.71	+0.57	3.00	2.33	+0.66
11	3.22	4.44	+1.22	2.71	3.57	+0.86	3.44	3.77	+0.33
12	2.44	1.33	+1.11	3.71	2.14	+1.57	2.44	2.22	+0.22
13	2.44	1.88	+0.56	2.71	1.57	+1.14	3.88	2.55	+1.33
14	3.77	4.44	+0.67	2.14	3.57	+1.43	2.66	3.55	+0.89
15	3.66	4.22	+0.56	3.42	3.85	+0.43	2.77	3.77	+1.00
16	2.11	1.77	+0.34	2.57	1.42	+1.15	3.33	1.88	+1.45
17	2.55	1.44	+1.11	2.28	1.57	+0.71	3.44	2.00	+1.44
18	2.77	4.22	+1.45	2.28	3.85	+1.57	2.88	3.44	+0.56
19	4.66	4.66	0.00	3.00	4.28	+1.28	3.44	3.66	+0.22
20	3.88	5.00	+1.12	4.42	4.14	-0.28	4.11	3.55	-0.56
Number of Students	9	9		7	7		9	9	

Table 4

The information from the data table above shows that Hispanic from all groups observed had a practical difference of one or greater on twenty-three of the sixty Likert items by the end of the winter survey. There was no significant difference between the treatment group and control groups on items 3, 7 or 10. The 2nd period treatment group displayed the greatest practical

difference on Likert items: 4, 11, and 20. The 5th period control group showed the greatest practical difference on items: 1, 2, 6, 14, and 19. The 6th period control group displayed the greatest practical difference on item 15. Both 2nd period and 5th period displayed a practical difference on items: 5, 9, 12, and 18. The 2nd period treatment and 6th period control groups showed a one point or greater increase on item 17. The 5th and 6th period control groups showed a practical difference on items 13 and 16. The 2nd period treatment group scored a five on item 20 after the winter survey. Hispanic students in 2nd period strongly agreed that working in teams during math class was helpful and fun. The 5th and 6th period control groups both agreed with the same statement, but their scores decreased from the fall to winter survey. The 5th period group decreased by .28, while the 6th period group decreased by .56 after the winter survey. The scores on item 20 for 5th and 6th period were not significant due to the fact there wasn't a practical difference of more than one.

Students in 2nd period on a Reduced Lunch Plan in the table below displayed a practical difference on six of the twenty statements between the fall and winter survey. The 5th period control group showed a practical difference on nine items, and the 6th period control group showed a practical difference on two items. All together the treatment group and control groups displayed a practical difference on seventeen of the sixty Likert items. There was no significant difference between the treatment group and control groups on items: 2, 3, 8, 10, 11, and 20. The 2nd period treatment group showed the greatest practical difference on item 4. The 5th period control group displayed the largest practical difference on items: 6, 12, 13, 14, and 19. The 6th period control group displayed the biggest practical difference on item 6. The 6th period control group displayed the biggest practical difference on item 6. (See Table 5)

All Students on a RLP

	2nd Period Treatment			5th Period Control			6th Period Control		
Question	**Fall**	**Winter**	**Diff.**	**Fall**	**Winter**	**Diff.**	**Fall**	**Winter**	**Diff.**
1	2.41	1.41	+1.00	3.00	1.88	+1.12	2.56	1.68	+0.88
2	3.83	4.50	+0.67	2.77	3.66	+0.89	3.81	4.43	+0.62
3	3.16	2.66	+0.50	2.66	2.22	+0.44	2.87	2.12	+0.75
4	2.50	1.58	+0.92	3.00	2.22	+0.78	2.37	1.56	+0.81
5	2.83	1.25	+1.58	3.44	1.55	+.1.89	2.12	1.93	+0.19
6	3.75	4.25	+0.50	2.77	4.11	+1.34	3.68	3.81	+0.13
7	2.33	2.00	+0.66	2.44	2.00	+0.44	2.31	1.31	+1.00
8	4.16	4.91	+0.75	3.33	3.33	0.00	3.87	3.93	+0.06
9	1.50	4.25	+2.75	3.11	4.11	+1.00	3.06	3.56	+0.50
10	2.33	2.00	+0.33	2.33	1.66	+0.67	2.43	2.00	+0.43
11	3.50	4.41	+0.91	2.66	3.55	+0.89	3.56	3.81	+0.25
12	2.33	1.41	+0.92	3.44	2.00	+1.44	2.18	1.81	+0.37
13	2.83	2.00	+0.83	2.66	1.55	+1.11	3.06	2.37	+0.69
14	3.50	4.41	+0.91	2.44	3.66	+1.22	3.18	3.93	+0.75
15	3.33	4.08	+0.75	3.33	3.77	+0.44	3.25	3.75	+0.50
16	2.58	1.75	+0.83	2.33	1.44	+0.89	2.56	1.68	+0.88
17	2.83	1.58	+1.25	2.33	1.55	+0.78	2.62	1.62	+1.00
18	2.83	4.16	+1.33	2.44	3.77	+1.33	3.25	3.62	+0.37
19	4.41	4.66	+0.25	3.11	4.22	+1.11	3.56	3.87	+0.31
20	4.08	5.00	+0.92	4.22	4.22	0.00	3.87	3.68	-0.19
Number of Students	12	12		9	9		16	16	

Table 5

Both 2nd and 5th period showed a practical difference on items: 1, 5, 9, and 18. The 2nd and 6th period groups displayed a practical difference on item 17. The most significant change in attitude was seen on item 9. In the fall students in 2nd period strongly disagreed that math class was the best part of their school day. By the end of the winter survey the 2nd period treatment group showed a 2.75 point practical difference from the fall survey. Both 5th and 6th period control groups also saw increases, but they were not as significant as 2nd period. The 2nd period students also scored a five on Likert item 20 at the end of the winter survey, indicating that they strongly agreed that working in teams during math was fun and helpful.

ELL Students

	2nd Period Treatment			5th Period Control			6th Period Control		
Question	**Fall**	**Winter**	**Diff.**	**Fall**	**Winter**	**Diff.**	**Fall**	**Winter**	**Diff.**
1	2.33	1.50	+0.83	4.00	2.33	+1.67	3.66	3.00	+0.66
2	3.16	4.16	+1.00	1.66	3.33	+1.67	3.00	4.00	+1.00
3	2.33	2.00	+0.33	1.66	1.00	+0.66	1.66	1.33	+0.33
4	3.16	1.66	+1.50	4.00	2.66	+1.34	3.66	2.66	+1.00
5	4.00	1.33	+2.67	4.66	2.33	+2.33	3.66	2.66	+1.00
6	2.83	4.00	+1.17	1.66	4.00	+2.34	2.33	3.33	+1.00
7	2.83	2.16	+0.67	1.66	2.33	-0.67	1.33	1.66	-0.33
8	4.83	5.00	+0.17	4.33	4.00	-0.33	3.00	3.66	+0.66
9	2.83	3.83	+1.00	2.33	3.66	+1.33	2.00	3.00	+1.00
10	2.83	2.83	0.00	3.33	2.66	+0.67	3.66	3.66	0.00
11	2.83	4.16	+1.33	2.00	3.00	+1.00	2.00	3.33	+1.33
12	3.00	1.50	+1.50	4.66	2.33	+2.33	3.33	2.66	+0.67
13	3.66	2.33	+1.33	3.66	2.00	+1.66	5.00	3.66	+1.34
14	3.16	4.16	+1.00	1.33	3.00	+1.67	2.00	3.00	+1.00
15	2.83	3.66	+0.83	2.33	3.66	+1.33	1.66	3.33	+1.67
16	3.50	1.83	+1.67	3.33	2.00	+1.33	4.33	3.00	+1.33
17	3.16	1.66	+1.50	3.33	2.00	+1.33	4.66	2.66	+2.00
18	2.33	4.00	+1.67	1.00	3.00	+2.00	2.33	2.66	+0.33
19	4.50	4.50	0.00	2.00	4.00	+2.00	3.00	3.33	+0.33
20	4.83	5.00	+0.17	5.00	4.66	-0.34	4.66	4.33	-0.33
Number of Students	6	6		3	3		3	3	

Table 6

The data above indicates that the 2nd period treatment group had double the number of ELL students in class compared to the control groups. The information also shows a practical difference for all ELL students on thirty-eight of the sixty Likert statements. The 2nd period treatment group displayed a practical difference of one or more on twelve of the twenty statements after the winter survey. The 5th period control group displayed a practical difference on fifteen of the twenty statements after the winter survey, and the 6th period control group showed the same gains on eleven of the twenty statements completed after the winter survey. There was no significant difference between the treatment group and control groups on items 3, 7, 8, and 20. The 2nd period treatment group showed the greatest practical difference on Likert

item number 18. The 5th period control group displayed the biggest practical difference on item number 1. The 2nd period treatment and 5th period control group showed a practical difference on item number 12. The 5th and 6th period control groups displayed a practical difference on item number 15. All three groups showed a practical difference on Likert items: 2, 4, 5, 6, 9, 13, 14, 16, and 17. The most significant change in attitude occured on item 5 by the 2nd period treatment group. In the fall students in 2nd period agreed that mathematics made them feel uncomfortable, restless, irritable, and impatient. By the end of the winter survey students in the treatment group disagreed with the same statement and had a 2.67 point change in attitude. The 5th and 6th period control groups also witnessed similar gains, but they were not as significant. The 5th and 6th period control groups saw a negative change in attitude on statement 7 about being under pressure during math class. After the winter survey 5th period showed a decease of .67, while 6th period witnessed a decrease of .33. The 2nd period group had a .67 increase in attitude on the same question. The 2nd period treatment group was the only class to score a five on the questionnaire after the winter survey. Students in 2nd period scored a five on items 8 and 20. This means that ELL students in 2nd period strongly agreed that working in teams during math class was helpful and fun. The 5th and 6th period control groups agreed that working in teams was helpful and fun, but decreased in attitude slightly after the winter survey. The decreases witnessed by the 5th and 6th period control groups were not significant and did not show a practical difference in attitude.

Analysis of Data on Normative Test Scores

The Northwest Evaluation Association (NWEA) test was given to students at the beginning of the research project and ninteen weeks later at the end of the research project. In Tables 7, 8, and 9 you will find NWEA scores for individual students in 2nd, 5th, and 6th period.

These scores show how students performed in the fall and winter on the NWEA test, as well as the difference in scores between assessments. The tables also show the current Grade Level Equivalency (G.L.E) a student is performing academically, as well as learning barriers that individual students faced during the research project.

2nd Period Individual NWEA Scores

Students (16)	Fall		Winter		Diff.	Caucasian F&R	All F&R	ELL	Hisp. F&R
	NWEA	G.L.E	NWEA	G.L.E					
V.A	206.00	4.5	216.00	5.5	+10.00		X	X	X
J.A	204.00	4.1	210.00	4.8	+6.00		X	X	X
A.B	218.00	5.9	217.00	5.7	-1.00		X	X	X
R.B	220.00	6.0	223.00	6.4	+3.00		X		X
C.B	233.00	8.5	225.00	6.8	-8.00		X		X
S.C	209.00	4.7	219.00	6.0	+10.00	X	X		
S.H	226.00	7.0	228.00	7.2	+2.00	X	X		
C.K	219.00	6.0	217.00	5.7	-2.00				
R.L	212.00	5.0	217.00	5.7	+5.00				
E.M	211.00	4.8	212.00	5.0	+1.00		X	X	X
J.M	197.00	3.3	208.00	4.6	+11.00		X	X	X
D.M	203.00	4.0	203.00	4.0	0.00		X	X	X
G.O	209.00	4.7	217.00	5.7	+8.00				
C.R	202.00	3.8	210.00	4.7	+8.00		X		X
K.S	216.00	5.5	222.00	6.4	+6.00				
N.T	214.00	5.1	229.00	7.5	+15.00	X	X		

Table 7

The data above indicates that the sixteen students in the 2nd treatment group after the fall assessment had a G.L.E that ranged from 3.3 to 8.5. This indicates a difference of 5.2 grades levels that students were academically performing in the classroom. After the winter assessment the student G.L.E ranged from 4.0 to 7.5. This shows a difference of 3.2 grade levels in which students were academically performing in the classroom. After the winter assessment twelve of the sixteen students showed positive academic growth compared to the fall assessment. This means that four students either showed no growth or negative growth from the fall to winter assessment.

5th Period Individual NWEA Scores

Students (11)	Fall		Winter		Diff.	Caucasian F&R	All F&R	ELL	Hisp. F&R
	NWEA	G.L.E	NWEA	G.L.E					
C.A	200	3.7	207	4.4	+7.00		X	X	X
L.B	209	4.6	240	10.0	+31.00				
J.B	218	5.9	224	6.7	+6.00				
C.C	218	5.9	232	8.4	+14.00		X		X
S.F	228	7.2	229	7.2	+1.00				X
D.G	209	4.7	219	6.0	+10.00		X		X
M.J	222	6.4	220	6.0	-2.00	X	X		
C.L	221	6.2	232	8.4	+11.00		X		X
I.M	209	4.7	217	5.7	+8.00		X	X	X
I.R	217	5.7	227	7.0	+10.00	X	X		
A.M	220	6.0	224	6.7	+4.00		X	X	X

Table 8

The data above indicates that the eleven students in the 5th period control group, after the fall assessment, had a G.L.E that ranged from 3.7 to 7.2. This indicates a difference of 3.5 grades levels that students were academically performing in the classroom. After the winter assessment the student G.L.E ranged from 4.4 to 10.00. This shows a difference of 5.6 grade levels in which students were academically performing in the classroom. After the winter assessment ten of the eleven students showed positive academic growth compared to the fall assessment. One student displayed negative growth from the fall to winter assessment.

The data below in table 9 shows that the twenty-four students in the 6th period control group, after the fall assessment, had a G.L.E that ranged from 3.3 to 7.5. This indicates a difference of 4.2 grade levels that students were academically performing in the classroom. After the winter assessment the student G.L.E ranged from 3.2 to 8.4. This shows a difference of 5.2. grade levels in which students were academically performing in the classroom. After the winter assessment eighteen of the twenty-four students showed positive academic growth compared to the fall assessment. This means that six of the twenty-four students either showed no growth or negative growth from the fall to winter assessment. (See Table 9)

6th Period Individual NWEA Scores

Students (24)	Fall		Winter		Diff.	Caucasian F&R	All F&R	ELL	Hisp. F&R
	NWEA	G.L.E	NWEA	G.L.E					
J.E	229	7.5	232	8.4	+3.00				
B.B	223	6.4	232	8.4	+9.00		X	X	X
K.B	217	5.7	211	4.8	-6.00	X	X		
R.C	224	6.7	229	7.5	+5.00		X		X
B.C	205	4.2	213	5.0	+8.00		X	X	X
E.F	214	5.1	229	7.5	+15.00	X	X		
J.G	214	5.1	226	7.0	+12.00		X		X
M.H	213	5.0	224	6.7	+11.00				
E.H	220	6.0	217	5.7	-3.00				
J.H	219	6.0	223	6.4	+4.00				
C.K	194	3.3	192	3.2	-2.00	X	X		
S.O	216	5.5	223	6.4	+7.00				
C.M	229	7.5	223	6.4	-6.00	X	X		
E.M	208	4.6	216	5.5	+8.00		X	X	X
R.N	218	5.9	223	6.4	+5.00		X		X
S.N	212	5.0	220	6.0	+8.00	X	X		
P.N	218	5.9	220	6.0	+2.00	X	X		
Z.P	227	7.0	225	6.8	-2.00				
J.R	227	7.0	217	5.7	-10.00		X		X
C.T	214	5.1	217	5.7	+3.00	X	X		
A.T	209	4.7	218	5.9	+9.00	X	X		
C.V	218	5.9	222	6.4	+4.00		X		X
D.W	215	5.3	225	6.8	+10.00				
J.Z	221	6.2	230	7.8	+9.00		X		X

Table 9

In the data below you will find a breakdown of NWEA scores by the classes observed and the learning barriers examined during the researchers project. Table 10 shows fall and winter average NWEA scores and the difference between scores for Caucasian students on a RLP. Table 11 shows the same information for Hispanic students on a RLP. Table 12 shows this information for all students on a RLP, and Table 13 shows the same scores for ELL students in the researchers math classes.

Caucasian Students on a RLP

	Number of Students	Fall Score	Winter Score	Difference
2nd Period	3	210.00	217.66	+7.66
5th Period	2	219.50	223.50	+4.00
6th Period	7	210.85	215.57	+4.72

Table 10

According to the data above each class showed positive growth from the fall to winter NWEA assessment. The 2nd period treatment group scored the lowest average on the fall test, but had the largest gain after the second assessment. The 5th period control group raised their average NWEA score by 4.00 after the second assessment and the 6th period control group raised their average by 4.72 after the winter assessment.

Hispanic Students on a RLP

	Number of Students	Fall Score	Winter Score	Difference
2nd Period	9	210.44	213.77	+3.33
5th Period	7	215.00	222.85	+7.85
6th Period	9	217.55	223.11	+5.56

Table 11

Hispanic student averages in all classes increased between NWEA tests. The 2nd period treatment group had the lowest fall score and showed the least improvement, but also have twice the number of ELL students in class as compared to the 5th and 6th period control groups. This class improved by 3.33 points. The 5th period control group showed the greatest improvement by increasing their average 7.85 points, but also benefit from a lower class size compared to both 2nd and 6th period groups. The 6th period control group raised their average by 5.56 points from the fall to winter NWEA assessment.

All Students on a RLP

	Number of Students	Fall Score	Winter Score	Difference
2nd Period	12	210.33	214.75	+4.42
5th Period	9	216.00	223.00	+7.00
6th Period	16	214.62	219.81	+5.19

Table 12

The average score for all students that participate in a reduced lunch plan increased from the fall to winter NWEA test. Students in 5th period saw the greatest improvement on the test by increasing their average 7.00 points, but also benefit from fewer students on a RLP and a smaller class size. The 2nd period treatment group had the lowest scores, but still improved 4.42 points in the four months between assessments. The 6th period control group displayed a 5.19 point increase in growth from the fall to winter NWEA assessment during the four monts the research was conducted.

ELL Students

	Number of Students	Fall Score	Winter Score	Difference
2nd Period	6	206.50	211.00	+5.50
5th Period	3	209.66	216.00	+6.34
6th Period	3	212.00	220.33	+8.33

Table 13

ELL students in the treatment group and control group witnessed an average increase in NWEA scores by at least 5 points. Student averages were highest in 6th period with an increase of 8.33 points, but benefit from having fewer ELL students in class. The 5th period control group displayed the second highest growth in NWEA scores by increasing 6.34 points, but also benefit from having fewer ELL students and a small class size. The 2nd period treatment group had the lowest average after fall testing, but raised that average from a mid 4th grade competency level to a mid 5th grade competency level and 5.50 points between assessments.

Summary of Analysis and Implications for Future Instruction

In this section, a summary from the data analysis will be discussed. I made two conclusions from the data analysis. The first conclusion was that the classroom environment and instructional strategy used by the researcher positively impacted student attitudes towards mathematics. The second conclusion was that relationships between students in 2nd period positively impacted their ability to be academically successful.

Conclusion #1

Learning barriers are variables that affect the opportunity for a student to be successful in the classroom. Students living in poverty, Hispanic students, and ELL students overcome obsticles just trying to get to school. Therefore, it is important for educators to understand the circumstances and reason for attitudes brought into class. In chapter 2, Nieto says that when students do not feel safe, respected by their peers, or included in the democracy of the classroom structure, a negative impact on their opportunity to learn and be successful becomes evident (Nieto, 2003). I began to see a change in attitudes as students became more involved in the classroom structure. When students were given the opportunity create the physical environment and democractically set ground rules for behavior within the classroom it became evident to me that student attitudes were beginning to be positively affected. The 2nd period students that faced barriers to learning proved this by displaying a 4.16 point score and practical difference of 1.33 between surveys on Likert item number 18. The students strongly agreed that they were happier in math class than any other class. The 5th period control group scored 3.77 on the same statement and showed a 1.33 point increase, but their overall agreement was not as high as 2nd

period. The 6th period control group posted a .37 point increase and overall score of 3.62 on the same statement.

One month into the research project I really began to see a positive change in attitude when students realized the objective of STL was a team approach and not individual. Students had an opportunity to work together, learn together, and be successful together. The result of this was that 2nd period students facing learning barriers strongly agreed (4.25) with item number 9, that math class was the best part of their school day. The 2nd period students displayed a 2.75 point increase in attitude on this statement. The 5th period control group agreed (3.68) with the same statement and showed a practical difference of 1. The 6th period control group showed a .50 increase on the same statement and had a score of 3.56 after the winter survey.

As students felt comfortable sharing ideas and letting their teammates know when they did not understand a concept, students in 2nd period that never liked math and thought of it as their most dreaded subject started to have a positive change in attitude. On item number 17 regarding this statement, 2nd period students facing learning barriers displayed a practical difference of 1.25 and disagreed (1.58) with this statment after the winter survey. The 5th period control group showed an increase of .78 and had an overall score of 1.55 after the winter survey. The 6th period control group had a practical difference of 1 after the winter survey and disagreed (1.62) with the statement. Neither of the 5th or 6th period control groups scores were as significant as 2nd period on this question. The 5th period control group had a higher overall score after the winter survey compared to 2nd period, but this class also benefits from a smaller class size and more one on one instruction from the teacher.

A students feeling about mathematics can negatively affect their attitude. It is the teachers responsibility provide a positive learning environment to enhance student attitudes

towards math. The instructional approach of STL can help students overcome feeling uncomfortable, restless, irritable, and impatient as seen in Likert statement number 5. After the fall survey, students in 2nd period were undecided on this statement with a score of 2.83. Upon the completion of the winter survey, 2nd period students displayed a 1.58 point practical difference, and strongly disagreed (1.25) with this statement. The 5th period group showed the greatest practical difference in attitude regarding this statement with a 1.89 point positive change in attitude and overall score of 1.55. The 6th period control group witnessed the smallest positive change in attitude on this statement (.19) and overall score of 1.93 after the winter survey.

The best part of STL is the ability to use the strategies incorporated with it. Student Teams-Achievement Divisions, Team Accelerated Instruction, Jigsaw II, and Teams-Games-Tournaments are great tools to use within lessons and units to enhance the learners academic experience and increase attitudes towards mathematics. In the 2nd period treatment group that experienced STL, students facing learning barriers all scored a 5 on item number 20 after the winter survey. This means that students in 2nd period strongly agreed that working in teams during math class was helpful, and made learning fun. The 5th period control group agreed with the same statement after the winter survey, but their score of 4.22 was not as significant as 2nd period. The 6th period control group had a score of 3.68 after the winter survey, which was a decrease of .19 from the fall survey.

Conclusion #2

Chelan Middle School students vary in ability level, gender, socioeconomic status, ethnicity, and ability to understand a second language. If you walk around the hall you can see that many of these students stay within these boundaries on a social level. The demographics were mostly the same within the three classes. The hallway clicks became classroom groups as

students wanted to stay within these confines for both 5th and 6th period. One problem I observed in both 5th and 6th period was that students were not willing to get help from other students outside their peer group. Therefore, students that did not understand a topic and didn't want to go out of their way to ask questions, talked to someone else in their peer group that most times did not know either. The Hispanic and ELL students preferred to ask questions and talk to each other, and high ability students mostly socialized academically with other high achieving students. Overall, I believed these interactions did not help individuals become as academically successful as they could have been. The 2nd period students did not have a choice when deciding who they wanted to work with academically. The reason I believed this is that STL is a highly organized way of heterogeneously grouping students by ethnicity, gender, and ability levels. During the research project I first noticed a social change among students working in teams before any academic change. This change can be attributed to the development of relationships among the different types of learners in the classroom and the use of STL. During the research project I witnessed 2nd period treatment students from different clicks socializing before and after class, in the halls, at lunch, and after school. The social relationships developed among students in 2nd period promoted an opportunity for academic success by allowing academic relationships to take place. Unlike 5th and 6th period, students in 2nd period worked in groups that varied in ability level. Since students felt safe working together, they also felt comfortable asking questions and helping each other master learning tasks. When students can work successfully in learning groups there is a greater opportunity for academic success (Slavin, 1985). The twelve students facing learning barriers in the 2nd period treatment group had the lowest fall MAP score of 210.33, and were performing at a mid fourth grade level. The nine students facing learning barriers in the 5th period control group scored at a middle of fifth grade level with a 216 after the

fall assessment. The 6th period control group consisting sixteen students that faced learning barriers performed at a mid fifth grade level and had a score of 214.62 after the fall assessment. I believe a contributing factor that helped the low performing 2nd period students reach a middle of fifth grade level after four months was the opportunity to work together and build relationship with all types of students during class. After the winter MAP assessment, the same students in the 2nd period treatment group had a 4.42 point increase in achievement. The 5th period control group was the highest performing after the fall assessment and gained seven points after the winter assessment to finish with a MAP score of 223, which is equal to a student that was performing at the end of sixth grade level. This group of students had a smaller class size, were already performing higher than the other two classes, and had more opportunities for individual instruction from the teacher which I believe contributed to the higher scores. The 6th period control group with the most students facing learning barriers gained 5.19 points from the fall to winter assessment to finish with a score of 219.81. This would be equivalent to a student performing at the beginning of sixth grade. Overall, the 2nd period treatment group gained less on the MAP assessment from fall to winter, but I feel that the academic relationships made during the research project will carry over into the hallways and become social relationships. The same statement can't be said about the students in the 5th and 6th period control groups.

Barriers to learning that affect student attitudes and academic achievement is not just a problem in my school, it includes many if not all schools across the United States. This research project has shown that STL is an effective way to increase student attitudes towards mathematics. By promoting relationships among students that cross social boundaries, students can create academic relationships that increase achievement and go beyond the classroom.

Table of Contents

Part I

Introduction to Student Team Learning

"Work as a team, accomplish more."

-2nd period math student, 2010-

Student Team Learning

Think back to a time in your life when you were on a sports team of some kind. For myself, I remember being the runt on a little league soccer team when I was just eight years old. I got the ball in the open field with only the goalie in my way for a chance to win the game for my team. I remember looking around at my teammates yelling, "Go jaybird, kick it through." Although I was scared to death, I knew I could do it because my teammates believed and depended on me. The possibility of being the star for a day motivated me to want to do my best. I made the goal and we won the game. My point is that having positive experiences of being on a team, getting to know other kids, and working towards team goals, are memories that I will never forget. I am sure that you have a memory of a time in your life when you were a part of a team, too. Working cooperatively with a group of people you didn't know extremely well, learning the foundations of the sport, having fun, and setting team goals? I bet you do, we all do to some extent which is why teachers can positively incorporate this strategy in their classroom pedagogy. Without knowing it, students in this environment support each other; easily accept each other, and individually work hard to reach team goals. The trick is to take this philosophy and transfer it into the classroom.

Cooperative learning is one way that teachers can begin to incorporate a team approach to their classroom instruction. Cooperative learning is a highly organized small group of learners working together as a team to solve a problem, complete a task, or accomplish a common goal (Miller, C.K., & Peterson, R.L., 2002). As educators we all use cooperative learning in one way or another without even knowing it. You could have students pair up to read a passage and answer questions, find a partner to solve a puzzle, or work with your seat partner to complete an assignment. This type of cooperative learning method works to complete tasks, but you don't always know if a student has mastered the concept or copied it from the partner they are working with. It is only when you start to focus on cooperative learning as an instructional philosophy will you begin to see the benefits of it.

Cooperative learning by itself wasn't enough for me and what I wanted to accomplish in my classroom. I went out and researched the different types of cooperative learning methods until I came across Student Team Learning as an alternative teaching

strategy for my sixth grade math class. I found out that Student Team Learning was a set of instructional techniques based on years of research on cooperative learning at John Hopkins University (Farnish, 1995). It is an umbrella approach to cooperative learning that includes several strategies including Student Teams-Achievement Divisions, Jigsaw II, Teams-Games-Tournaments, and Team Accelerated Instruction. In STL students work in highly organized three to five member heterogeneous groups in which they support each other's learning in a safe environment. Students are not only responsible for their learning, but the learning of the entire group. They have group discussions and together complete learning tasks. The members have a common set of goals. If attained these goals are rewarded with individual recognition and group rewards. Each group is made up of students from different ethnic backgrounds, genders, socio-economic class as well as different abilities. All members are supported in their learning by their peers. Educational research has demonstrated that heterogeneous teams made up of high and low achievers, boys and girls, Blacks, Whites, and Hispanics, can be successfully transplanted from the playing field to the classroom (Slavin, 1991).

I decided to implement STL and the strategies incorporated with it as my instructional philosophy for a sixth grade math class. To do this I adapted the instructional strategies of STL around my curriculum in an attempt to enhance student attitudes and academic success. The reason I used a team approach is because it is something that students can relate to outside of the classroom.

Student Team Learning Strategies

Student Team Learning is a cooperative learning method that can be used in the classroom to enhance student attitudes and academic achievement. It incorporates the strategies of Student Teams-Achievement Divisions, Jigsaw II, Team-Games-Tournaments, and Team Accelerated Instruction. Below is a description of each of these strategies and how they were implemented into to the instructional design of the classroom.

Student Teams-Achievement Divisions

Student Teams-Achievement Divisions (STAD) is one instructional strategy that fall under STL. This model places students in three to five member heterogeneous learning groups based on student performance of a pre-check quiz of material that will be taught. Students in learning teams are mixed in ability levels, gender, and ethnicity (See Part II). In this cooperative model students receive weekly instruction on new lessons and then work in teams to complete tasks. The group is not finished until all members have a firm grasp of the concept. Students are assessed individually on what they have learned, but also receive a team score from the sum of individual scores. Therefore, individual accountability is high to learn the material since their individual score becomes a part of the team score. The main idea behind STAD is to motivate students and encourage them to help each other master skills presented by the teacher. If students want their team to earn team rewards, they must help their teammates learn the material (Slavin, 1995). As students work to complete task, they begin to see learning activities as social instead of isolated, fun instead of boring, and under their own control instead of the teacher's. Students get teams points for completing homework assignment, competing in section review games, and individual post-check quizzes (See Part II). Students are given external rewards for individual improvement as well as external rewards for team championships (See Part IV). External rewards can be as simple as extended free time and certificates of improvement, or as elaborate as a pizza party. In STAD students also receive a new letter that recognizes individual improvement, team championships, and number of team championships each individual have won (See Part IV).

Jigsaw II

Jigsaw II is cooperative learning strategy connected to STL that puts the responsibility of the groups' learning on students rather than the teacher. It is a modification from the original Jigsaw developed by Aronson and colleagues (Slavin, 1991). In Jigsaw II, learning teams are made up of four to five members. The groups are heterogeneous and mixed in ability levels, gender, and ethnicity just like you would see in STAD. For this instructional method all teams work on the same lesson objective, but each member takes one aspect of the objective to become an expert at. Group members with the same lesson objective meet in expert groups to discuss and master the piece of the lesson objective they were given. Group members then come back to their team and teach the piece of the lesson objective to the other members of the team until everyone understands that piece of the lesson's objective. This cooperative learning strategy had to be adapted to fit the instructional approach of the classroom. After students took a pre-check quiz, they were ordered on a number line based on scores for that quiz. The top four performers became the "team captains." The captains are the individuals that participated in the Jigsaw II method of instruction (See Part II). After a group of sections are covered student take a post-check quiz to check for understand. Scores for the quizzes translate into team points that are added to homework points and review game points. The points are then added together to equal team championships. Individual are recognized for individual improvement and teams are recognized for team championships with external rewards that are as simple as extended free time and certificates of improvement, or as elaborate as a pizza party. In Jigsaw II students also receive a new letter that recognizes individual improvement and team championships (See Part VI).

Teams-Games-Tournaments

Teams-Games-Tournaments are another STL strategy that was used in the instructional approach of the classroom. This strategy incorporates the same basic principles of STAD and Jigsaw II until it is time to check for understanding. TGT are classroom competitions among teams to review big ideas for post-check quizzes. Early studies of TGT used competition between teams as a means of motivating students to cooperate within teams (Slavin, 1995). Tournaments are played by similar ability students from each team. Homogeneous grouping of students work best for this strategy. It allows students equal opportunity to be competitive against other students at the same ability

level. Individual players score points that contribute to a team score. These points are then added to the group's overall team score that includes homework points and post-check quiz points. Therefore, the group's success is dependent on each individual's mastery of the concept. After the TGT students take a post-check quiz on the sections covered. The format then followed the same as STAD and Jigsaw II in regards to external rewards for individual improvement, team championships, and a newsletter to recognize them.

Team Accelerated Instruction

Team Accelerated Instruction is a cooperative learning strategy that incorporates individualized instruction and team learning. Like STAD, Jigsaw II, and TGT students are placed in small heterogeneous groups differing in ability, gender, and ethnicity. The big idea behind TAI is creating an individualized mathematics program adapted to a student's individual needs. Teams work together to assist each other, but individuals work at their own level and rate. Students enter a track and are placed in groups based on a pre-check quiz. Students from the same ability group meet with the teacher for individualized instruction and then go back to their teams to work independently on their learning task. This cooperative learning strategy was modified to meet the needs of my students and adapted to fit with the other strategies under STL. The team captains that participated in the Jigsaw II strategy also became the individuals that received the individualized instruction (See Part II). Students involved in TAI monitor their progress by keeping a binder that charts individual assignments, quizzes, and tests (Slavin, Leavey & Madden, 1986). The format then followed the same as STAD, Jigsaw II, and TGT regarding the external rewards for individual improvement, team championships, and a newsletter to recognize them.

User's Guide to STL Strategies

When you begin to look at the strategies incorporated with STL it is important to have a background of where the strategies have been used in the classroom and advantages they have shown to have on students. Below you will find a list of the STL strategies, subjects they have been used for, and advantages they offer students.

Student-Teams Achievement Divisions

Use in grades 2-12 in:

- Mathematics
- Language arts
- Science
- Social studies skills, such as geography, graph reading.
- Foreign language
- Any material with single right answers.

Advantages:

- Frequent quizzes give feedback to students and teacher.
- Relatively quiet, businesslike form of STL.
- Improvement scores challenge students.
- Takes less instructional time than direct instruction.
- Curriculum material available in most subjects.

Teams-Games-Tournaments

Use in grades 2-12 in:

- Mathematics
- Language arts

- Science
- Social studies skills, such as geography, graph reading.
- Foreign language
- Any material with single right answers.

Advantages:

- Students enjoy tournaments.
- Fair competition challenges students.
- Students do most scoring
- Curriculum materials available in most subjects.

Jigsaw II

Use in grades 3-12 in:

- Social studies, when students are learning from books or other readings.
- Literature
- Science
- Any material when information comes from books or other readings.

Advantages:

- Can be used for more open-ended objectives.
- Students take real responsibility for teaching teammates.
- Students exercise reading, teaching, discussing, and listening skills.
- Frequent quizzes give feedback to students and teacher.
- Improvement scores challenge students.

(Slavin, 1991, p. 22)

Team Accelerated Instruction

Use in grades 2-8 in:

- Mathematics

Advantages:

- Individualization provides for needs of all students, gives students success at their own level.
- Students do almost all scoring and manage materials.
- Materials are completely prepared; very little out of class time needed.
- Materials cover skills from addition to algebra.
- Students usually learn math skills rapidly

Part II

Guidelines for Implementation

"TEAM= Together Everyone Achieves More"

-Unknown-

Getting Started:

Summer always seems to fly by too fast. You have big plans to come into the classroom over the summer and get prepared, but things always come up; family and friends come over and the next thing you know it's the last week in August. Implementing Student Team Learning into your classroom practice is not an easy task, but one that is worth putting the time into. What follows are some basic guidelines to keep in mind so that your use of STL will be beneficial for everyone involved.

Preparing for the School Year:

In order to make your STL experience all that it can be you will need to get familiar with each strategy and how they relate to the others. Many teachers already use cooperative learning strategies independently in their classroom. My goal is to help you put the strategies together as a framework for daily instruction. You should know that STL is a highly organized method of cooperative learning that takes time to organize and implement successfully. In order to do this you need to know all you can about Student-Teams Achievement Divisions, Jigsaw II, Teams-Games-Tournaments, and Team Accelerated Instruction. In (Part V) the handbook you will find a list of resources that you can use to locate books on the topic.

After you have become familiar with the strategies it is important that you organize the curriculum that will be used. Look at a calendar and decide how long you want to spend on each section and unit. This will help you plan out the school year. In Part VI you will find a list lesson practice questions, section review sheets, and pre/post-check quizzes. These come from Prentice Hall: Course 1 Mathematics. The worksheets cover the first four units of the book that deal with: Decimal, Algebra, Number Theory and Fractions, and Adding and Subtracting Fractions.

Do you remember the old saying, "Two heads are better than one?" Your students will experience this first-hand while using STL, so why do they get to have all the fun? The STL strategies for this handbook have been blended together and adapted to meet the needs of the students and curriculum you teach. You have the authority to change how you might want to put them together and freedom to work with other teachers and administrators if you have questions. Teachers, young and old get evaluated every year by their administrator. Some teachers get to choose between a short form, long form, and

professional growth plan. If you are a teacher that gets this choice you need to consider a professional growth plan. It provides an excellent opportunity for you to work one-on-one with the administrator that will be observing you. It also shows the administration that you are passionate about what you do and like the challenge of trying something new in the classroom. You will be surprised at how much your administrator will enjoy helping you out with this. It opens up communication that is academic in nature, but also helps create relationships that go beyond the classroom.

Knowing Your Students:

It is important that you know who your students are before you see them the first day of class. If you have an opportunity to meet with the grade level teachers that taught the students you will see, take it! If you are concerned that you do not know these students well enough and there isn't an opportunity to talk with their teachers, sit down with your grade-level teachers and set up a time to meet with your principal to outline your concerns. The administration is usually very supported especially if you will be teaching students that are coming from a different school building.

The next thing you will want to do is take the information you have gathered on each student and find out who you will have in class. This is usually available by the middle to end of August. It is important that you have a good idea of who you're students are because it will help you identify learning barriers that students face.

Learning barriers are widespread and often go unnoticed by teachers unless they do some investigating. It is important to know how many students you will have in class, but it is even more important to know the ability levels, cultural background, language ability, and social-economic status of students in class. You will have a general idea of this from your meeting with previous teachers. The information you don't know, but want to know; here are some ways to find out. If you want to know more about the ability levels of the students you will see go to your principal and ask to look at the incoming student Measure of Student Progress (MSP) scores. This will give you a good indication of how students in your classes have been performing on the state mandated test. If your school participates in other nationally normed assessments like the Northwest Evaluation Association (NWEA) you can look at individual scores for that as well. If your school has an English as a Second Language program (ESL), most do, you can go to the ESL director and

find out who your level one, two and three English Language Learners (ELL) students are. They will also have the level four students that have successfully transitioned out of the ESL program. Lastly, it is important to know the socio-economic status of students that will be coming into class in the fall. You can get a good indication of this from who is on a Reduced Lunch Plan (RLP). To get a hold of this data go and see your school secretary, they will point you in the right direction. All of this information will help you not only set up your STL experience; it will also help you begin to identify students that can and will struggle without your added knowledge of their situation.

Setting the Tone

It doesn't matter what teaching style you bring to the classroom, as educators we all know how important it is to set the tone at the beginning of the year. This begins with the classroom environment. The environment includes such aspects as the physical, cultural and social relationships found within a classroom. The physical environment of the class consists of the organization of the room, temperature, room preparation, and arrangement of furniture. Following the principles of STL it is important that you make this process democratic. The goal is to get students involved in the decision making so that they begin to feel comfortable sharing ideas in a safe, supportive environment where everyone has ownership in the decision making. To accommodate the diversity of learning styles, theorists suggest that students work together to develop group standards for the physical environment of the classroom (Marzano, 1992). Make it known as students suggest how they would like to set-up the room that they will be working cooperatively in teams of three to five members throughout the year, so the physical environment needs to provide opportunities for this to happen. Give each student a piece of graph paper for them to draw out how they would like the tables to look. Don't forget to mention that you will need at least as many seats as there are students in class. Student will have fun with this and it's a good opportunity to introduce a little problem solving as well.

You are in charge of creating a culture of success where students feel like they are involved in the decision making. Democracy in the classroom also involves students helping set group norms, rules, and expectations for daily operations. As you begin your STL journey, do everything you can to get you students involved in the decision making process. At the beginning of the year you will have your own expectation for the

classroom structure, but remember that excellent teachers find ways to focus on equity and democracy as part of their pedagogy (Nieto, 2003). By being a part of the decision making students feel safe and supported. When students feel that they are an integral part of the classroom, they feel comfortable which allows positive relationships to develop. You already know that positive relationships support learning. This is backed up with research that says the best relationships for learning are those in which the other people feel their needs are being met (Kottler, Zehm, Kottler, 2005).

As stated above, an important factor in student success is the relationships they develop with other members of the class. Think back to the beginning of the handbook. It started with an analogy of a person being on a soccer team. Going for a goal, supported by teammates, feeling important, and having an experience in life they will never forget. As you begin to implement STL into your classroom you should make the idea of being a part of a "team", a central theme to your classroom practice. You can do this by first asking students if they have ever been a part of a team. Have students talk about their experiences and how they felt about working with others. Write down team rules and expectations that students on teams had to follow on a whiteboard. This will help your class begin to generate a list of team rules they will have to follow during the STL experience. Ask, "What would this list of rules look like if it were a team working together in a classroom?" Write these ideas down on a whiteboard as well. Once students have generated enough ideas you can have them vote for the most important rules. When you have a final draft you should write these on poster paper and put them up on a wall in the classroom for everyone to see. Some examples of these rules might include: your team captain is in charge, pay attention so you don't miss out on important information, listen closely to your captain and other team members, be helpful, support your teammates, cooperate with your team daily, and do your own work.

Measuring Student Attitudes

A student's attitude towards math tends to develop during late elementary and middle school. You have an opportunity to find out first hand if implementing STL into your classroom practice changes student attitudes towards math. In Part IV of this handbook you will find a five point Likert scale questionnaire. This questionnaire was developed by researcher Lewis Aiken and his research on student attitudes towards

learning mathematics. For the survey students state their level of agreement to a statement by choosing one of five Likert points that include: 1. strongly disagree, 2. disagree, 3. undecided, 4. agree, and 5. strongly agree. After students complete the survey you can look at individual scores to measure student attitudes or you can add the scores together from individual statements, divide by the number of students you have in class and find out the overall level of agreement or disagreement from the class on any given statement.

You should provide the questionnaire for students to complete at the beginning of the school year before you begin implementing STL into your instructional practice. Once you are done using STL in your classroom give students the questionnaire again. Take the data from both the pre and post survey and analyze it to see if STL had a positive effect on student attitudes.

Measuring Student Achievement

Depending on how involved you want to get in the implementation of STL, you can measure the difference in student achievement from the beginning of the year until you stop using STL as an instructional method. If you use STL all year you can take MSP scores and compare the difference in student scores between the years you had them in class. This score is generic and probably will not give you the information you might be looking for. If your school uses another nationally normed assessment like NWEA you can talk to your administrator about having your students take the assessment in the fall to get a base line score. After you are finished using STL you can then have your students participate in the assessment again. These scores can show you if students improved academically during the time you used STL, and by how much they improved. You can also compare student scores to a rubric that can show at what grade level they are currently performing at. In Part VI of the handbook is a copy of the rubric to analyze student scores if you choose to use this form of assessment.

Blending the Strategies as a Method of Instruction

The STL strategies that are used for the classroom practices have all been adapted to meet the needs of the students and curriculum the teacher uses. Below you will begin to see how the strategies of STL connect and work together to form and alternative teaching strategy for students in a sixth grade classroom.

Putting Teams Together

It's time! You are ready to finally start implementing STL and the strategies incorporated with it into your classroom curriculum. If you are using Prentice Hall: Course 1 Mathematics, the material you need can be located in Part IVI. For this handbook the units are broken up into two to three sections that include three to four lessons per section. The sections take anywhere from six to eight days to complete without any down time in between. This means that on the day of the post-check quiz you will also be administrating a pre-check quiz to form new teams for the next day.

STL begins to surface when you create small groups of students with different ability levels, gender types, and cultural backgrounds. This approach follows the strategies of STAD, Jigsaw II, TGT, and TAI. You should have the necessary information from the data you gathered at the beginning of the school year on individual students and their learning barriers. To place students in teams you first need to give them a pre-check quiz on the first sections you will teach. All of the pre and post-check quizzes, worksheets, and section review sheets are located in Part VI of this handbook. After students complete the pre-check quiz you need to order their scores from highest to lowest. Depending on how many students you have in class and the number of groups you want will determine how many team captains you need. The students that score the highest on the pre-check quiz will be your captains for the different teams and sections you teach. In regards to the action research conducted on this project, the top four students were the team captains of four different teams. You will then group the other remaining eight middle level students and four other low students and randomly place them into teams. The placement of team members to teams is incorporates all strategies under the umbrella of STL. In Part IV you will find more directions on how to specifically place team members to teams.

Now that you have created your learning teams it is time to get in touch with your team captains. Touch base with your captains and have them come in during lunch. Not all of them will want to do this, so you will have to give them some incentive. Candy always works. Having students come in for individualized instruction follows the STL approach associated with TAI since you have a group of students coming in with the same ability level, learning together, discussing the topic as a group, and mastering the section at hand. Once you have broken down the lesson into smaller steps, discussed strategies for solving problems, answered questions, and gone over examples; give students five example problems to complete that night and have them bring in the following morning to check their understanding of the lesson's objectives. A list of example problems for each section can be located in Part VI of this handbook.

Remember that not all students know how to be leaders. This must be taught and it has to be a class norm for all students to follow. Don't worry, you can use the classroom rules that were developed around the "team" approach that was created and posted by students at the beginning of the school year. In order to help your team captains become the leader you want them to be teach them a game the first time they come in and see you for lunch. Captains are then going to use their newly formed leadership skills and knowledge of the game to teach students how to play the following day. You could consider this a Jigsaw II approach to STL. There is a list of games that you can teach students in Part IV of the handbook.

Seeing STL Come to Life

Your day will begin bright and early as your team captains come in and have you check over there example problems from the night before. If a captain does not have the correct answers work with the student to correct any misconceptions they have about the lesson (TAI). As students enter class have them find their assigned seat if that is how your classroom is set-up. Start class with a Problem of the Day (POD), or another entry task to get students thinking mathematically. After the entry task you should explain what will happen next. This being that students will be getting into their teams, following the classroom rules set at the beginning of the year, and listening to their team captain as they teach students a game (Jigsaw II). As students listen and learn from the team captain you should be able to tell who is in charge. If this is not the case, please talk to the students in

that group or as a class as a whole regarding the classroom rules. Have teams begin to take ownership of their teams by creating a team name that will be posted on the wall. Each team needs to be visible on a wall chart so that they can always look and see how they are performing individually and how their team is performing compared to the other teams in the classroom (TAI).

Once students have played the game and gotten to know each other it is your turn take the lead and talk specifically about STL and how it will look in class. The following guidelines should help you make this clear to students:

STL in Class

- Students will be learning cooperatively in teams.
- Students will be checking example questions and homework questions with the other team members, but need to do their own work.
- The team captain is in charge of his/her team and the successful mastery of each team member and the lesson at hand.
- Students are only as strong as their weakest member.
- Students need to support each other's learning and make sure that everyone has mastery of each lesson objective.
- The teacher is considered the "coach" that oversees the team captains and each team.
- Students need to follow the classroom rules that were set at the beginning of the school year.
- Students will be turning in homework assignment for individual and team points.
- Students will independently take pre-check quizzes every three to four sections which will be used to determine what the teams will be.
- Students will independently take post-check quizzes for an individual score and team points.

- Students will play a team game before each post-check quiz against other teams for team points.
- At the end of each section team points from homework, the game, and post-check scores will be added up to determine the Outstanding Improvement Award Champions.
- Students need to individually keep track of their own pre, post, improvement, team scores, and chapter reviews in a binder provided by the coach.

Now that you have outlined the guidelines that students will follow during their STL experience it is time for you to put on your teaching hat and get to business. Have students go back to their assigned seat for the day's instruction. For most teachers that work in middle school classes it seems to work best to give students information in a direct way. This is due to the fact that state expectations are high and a direct approach seems to be the best way to get students the information they need to know in a timely manner. The direct approach you choose will not take as long as normal because you have team captains that have already mastered the lesson's objectives. Therefore you will be simply giving a brief introduction into the lesson and then let your team captains take over. Start by stating the objective for the day, and then review any prerequisite skills students should know. Model the concept or skills using a PowerPoint or other visual aid. During this time of instruction, frequently assess student comprehension by asking questions. The instruction should last 15-25 minutes before the team captain takes over.

Next, have students get into their teams and let the captains take over. In each learning team the captain will give students the list of questions they successfully completed the night before. The captain starts by modeling how to solve the first question while students watch, learn, and listen (Jigsaw II). The second problem is an open discussion between team members as they solve the problem together (STAD, TGT). The third through fifth problem is independent practice for each team member (TAI). After students solve these problems independently the team captain marks a star next to the problem if it is correct, or have the team member check their work if it is wrong. As the teacher and coach you will be walking around the room facilitating the group work, answering questions, and identifying students that might need extra help (STAD, Jigsaw, TGT, TAI). Once all five questions have been answered correctly by everyone in the group,

the team captain raises there hand to have you come over. If everyone agrees that they have mastered the lesson for the day give students there assignment to complete independently in their group (TAI). During the remainder of class students work on the assignment, check each other's work, talk about questions they have, and answers they have come up with (STAD, TGT, TAI). At the end of the period the assignment becomes homework if it is not finished.

When students come in the next day, correct the assignment from the previous night. Keep track of the number of assignments that students turn in. You will use this data for team points that go towards team improvement awards. For this research project, students that turned in their assignment completed with at least fifty percent of the questions correct received a point for their team. After you correct the assignment begin the lesson of the day and start all over again.

Assessing Student Mastery

The day before you give a post-check quiz, have students work in their teams to complete a review sheet provided to you in Part VI of the handbook. This review needs to be facilitated by the team captain and completed by everyone in the group (STAD). Students work collaboratively to complete the review sheet in preparation for the post-check quiz. Once teams start finishing the review sheet give the team captain an answer key to check for accuracy. It is up to the captain to determine if their team has mastered the content. If the captain believes there are gaps in student knowledge and the content being covered it is your job to step in and bridge the gap until everyone on the team is confident in their understanding. If the captain believes their team is ready for the quiz, team member take the review sheet and place it in their binders and spend the rest of the day playing the game they were taught by the captain at the beginning of the section.

On the day of the post-check quiz have students get into their teams to compete in a math review game that covers the sections they have been learning the last six to eight days (TGT). Have the four team captains sit at a table together. One mid-level performer from each team will sit at another table. The other mid-level performer from each group will sit at a third table, and the low performer from each group will sit at a fourth table together. A map of how you will set up the team competition can be found in part IV of the handbook.

Except for the team captains being at the same table, only you will know why the other students are sitting together. The reason you set it up this way is to give each student an equal opportunity to compete and be successful against other students of the same ability levels. If you have mini whiteboard, place them at each table for students to put their answers on. If not, students can come up to the whiteboard as a table group when it is there turn to answer a question. Each table group will answer a question independently from the other groups. There are two rounds that are played, meaning each table will have two questions and there will be a total of eight questions given during the game. You will be up front in charge of the game. Write questions for each table group on the board so they can visually see the problem. Once students have answered the question have them raise their hand and give them a number from one to four. There is no time limit for answering questions during the game. After everyone has answered the question give a point to the first student with the correct answer. By far this is every student's favorite part of STL. Getting an opportunity to play a game, while learning, having fun, and supporting each other is a memory they probably won't forget. As students answer questions don't forget to keep a tally of team points on the board. At the end of the competition the winning team receives five points towards their team score, 2nd place receives three points, and 3rd place receives one point.

After the game is played have students return to their assigned seats and independently complete a post-check quiz on the sections covered (STAD, Jigsaw II, TAI). All quizzes are ten questions and consist of multiple choice and short answer problems. Once students have completed the post-check quiz, have them turn the page over and complete the pre-check quiz for the next sections. Post-check quizzes are counted towards the student's individual grade, while all the team members' scores are summed up for a team score. All quizzes are provided to you in Part VI of the handbook.

You need to remember that after a section is taught, teams will change depending on the new pre-check scores. You will have new team captains and the process of bringing them into class during lunch will repeat itself. The reason you will want to do this is so that all students have an opportunity to work with each other and so everyone at some point has an opportunity to be a team captain.

Celebrating Success

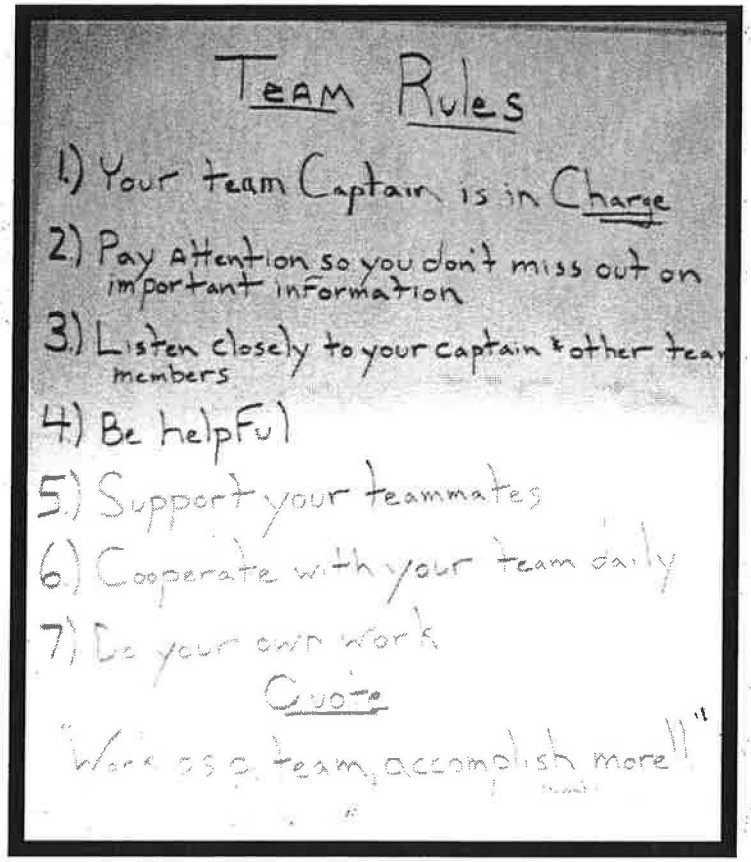
This will be your favorite part of STL. You get an opportunity to reward individuals for positive improvement as well as celebrate with teams that win the team championship (STAD, Jigsaw II, TAI). To calculate the team scores you will need to add up the homework points, game points, and post-check quiz points for each team during the sections covered. The team with the most points is your champion. You should reward this group with something special. A team trophy filled with M&M is a good idea because it represents everything a team strives to achieve. The team members will look at the trophy and think about the positive experience they had from the STL experience. In Part V you will find resources for local trophy shops if this is something you would like to try. You should also award individuals that show the highest improvement from the pre to post-check score. A good way to reward these students is with certificate that recognizes their hard work. In Part VI you will find copies of certificates that you can duplicate and use in your classroom. A newsletter is another good way to recognize students that show the highest improvement, team champions, students that have a 100% homework completion rate and individual students that have won the most team championships (STAD, Jigsaw II, TGT, TAI). You will find a sample newsletter in Part VI of the handbook for you to check out.

Monitoring Student Progress

It is important that students monitor their own progress throughout their STL experience. When students can visually see the progress they are making it positively affects their ability to learn as well as the attitude they bring to class (TAI). You can do this by providing students a binder they can update after each section with pre-check scores, post-check scores, game points, and team placing's. Students can also use the binder to keep track of review sheets, and as a place to put certificates of improvement. To help students reflect on their scores you can have them complete a line graph to compare pre and post-check scores. An example of the line graph is located in Part VI of the handbook.

Part III

Information for Teachers and Principals



"Coming together is a beginning.

Keeping together is progress.

Working together is success."

-Henry Ford-

Note to Teachers on Student Team Learning

When you begin to start thinking about the idea of implementing STL as an alternative teaching strategy in your classroom, there is a lot to consider before you jump in. Below are some questions you should ask yourself and guidelines that may make your life easier.

Reality Check: Thing to think about

- How much time can you devote to the planning and implementation of the instructional method?
- How involved do you want your students to be?
- How involved do you want to be?
- How involved do you want your administrator to be?
- What instructional approach will you use to introduce lesson objectives?
- Do you have a classroom management plan in place to deal with behavior?
- How creative do you want to get with the strategies of STL?
- What do you want to do with the data you generate from the student attitude survey?
- Are you ready for democracy in the classroom?
- How do you feel about students deciding how the physical environment of the class will look like?

A Range of Possibilities:

- If you feel overwhelmed by implementing all of the strategies at once, start with one.
- Make STL your own creation by adapting it to what will work best for you and the students you teach.

- Although most of the STL strategies are meant to be used in a math setting, don't be afraid to adapt them to other content areas as well.
- To cut down the work load, get rid of the team captains, it will save you a ton of time and still make the learning experience worth the time.

Words to the Wise:

- A well designed STL plan can be the most meaningful thing you do all year.
- If you put everything you have into making it a memorable experience, you will see a positive change in student attitudes.
- It has the potential to be something that your students will remember for the rest of the school career.
- The relationships that students develop with each other will go beyond the classroom.

Note to Principals on Student Team Learning

Below you will find a list of suggestions for your building principal to think about as you begin to use STL in your classroom. Please feel free to share these suggestions with your principal as soon as you get time.

- Student Team Learning is a highly organized method of cooperative learning that will take the teacher time to implement in the classroom. Please support the teacher in every way you can.
- The teacher will need to identify student learning barriers before the beginning of the school year. Please get the teacher that implements STL into their classroom all the information they might need about students as soon as you can.
- Work together with the teacher as they start to use STL in the classroom, the cooperative learning experience shouldn't be limited to just students.
- During late start days when the staff meets, communicate with the teacher implementing STL to see if they need time in their classroom organizing a lesson.

- Encourage other teachers to observe the instructional strategies the teacher is implementing in their class.
- Think about how these strategies could benefit other programs in the building like the ESL program, Special Education program, and ASB.
- Student Team Learning encourages students to turn in assignments. Communicate this with teachers in the building that are having a hard time getting students to complete assignments in class.
- Student Team Learning encourages students to come to school. For students that are constantly absent this can be used as a possible intervention to high absentee rates.

Note to Parents on Student Team Learning

Before you begin implementing STL in the classroom it's important make parents aware of the procedures and expectations you will have for students in class. Below are some recommendations for you to think about as you go about doing this.

- Parents should know that Student Team Learning is a highly organized method of cooperative learning for teaching math that will place students in heterogeneous learning teams that emphasize; group goals, individual accountability, academic relationships through social interactions, and team recognition.
- It's a good idea to contact parents over the phone and talk to them specifically about your goals for individual students and the classroom as a whole. This should include an emphasis on student attitudes and academic achievement through the use of STL strategies.
- Ask for parent input as you talk to them about how you plan to implement STL in the classroom. They might have valuable information about their child which will help you further understand specific needs they might have.
- Talk to parents about ways they can get involved in their child's classroom experience at home. This should include inquiry on a daily basis about what is happening in class.
- Parents can do this by asking their child; "What happened in class today?", "How is your team doing?", "What are your individual goals for the current sections that

are being covered?", and "Do you think your team can win the championships for the current sections you are covering?"

- As you talk with parents tell them that individual and team recognition plays a big part in STL and that it provides equal opportunities of success for everyone.
- Let parents know that students will be receiving individual improvement awards for achievement and team awards for group success. Encourage parents to ask their child about these awards as well as see them if students are awarded a certificate or trophy. Students will be excited to show parents the successes they are having in class, especially if the interest is coming from the parent.
- Send the parents a copy of the newsletter home with their child after the post-check quiz. This will be a good conversation started between the parent and child regarding the sections that were just completed. To ensure this was done you can have the parent sign it and send it back to school with the student.
- It is important to keep parents as involved in their child's education as you are. By involving parents in the procedures of the classroom structure you are promoting student accountability at school and home.

Note to Students on Student Team Learning

Before you begin implementing STL in the classroom it's important that students know the procedures and expectations you will have for them in class. Below you will find a list of things you should go over with students.

- Students will be learning in cooperatively in teams.
- Students need to follow the classroom rules that were set at the beginning of the school year.
- Students will be checking example and homework questions with other team members, but need to do their own work.
- The team captain is in charge of his/her team and the successful mastery of each team member and the lesson at hand.

- Students are only as strong as their weakest member.
- Students need to support each other's learning and make sure that everyone has mastery of each lesson objective.
- The teacher is considered the "coach" that oversees the team captains and each team.
- Students will be turning in homework assignments for individual and team points.
- Students will independently take pre-check quizzes every three to four sections which will be used to determine what the teams will be.
- Students will independently take post-check quizzes for an individual score and team points.
- Students will play a team game before each post-check quiz against other teams for team points.
- At the end of each section team points from homework, the game, and post-check quizzes will be added up to determine the Outstanding Improvement Award Champions.
- Students need to individually keep track of their own pre, post, improvement, team score, and chapter reviews in a binder provided by the coach.
- Students will be required to bring their parent a copy of the section newsletter provided by the coach. The return of the newsletter signed by the parent is up to the coach.

Troubleshooting Problems You Might Experience with STL

As you begin to use STL in your classroom you might experience problems. This is a natural consequence for someone that is trying something new. Below are a list problems that you might encounter and possible solutions for those problems.

Problem: Student not getting along

This problem often comes up in the first week or two when you place students in learning teams. Remember, a team is made up of an unlikely combination of students that differ from one another in ability, gender, and ethnicity.

Solution:

The best solution to this problem is time. Some students will be unhappy about their team assignment initially, but as soon as they realize that they will be working together for a week or longer, get their first team scores, and see the trophy their team can win at the end, they realize they really are a team and find a way to get along. For this reason it is important not to allow students to change teams. Being a part of a team mean you have to learn to get along even if they don't initially care for each other.

Problem: Misbehavior

This problem usually comes from the same students regardless of which team they are on. Remember that it isn't something you are doing wrong, or a problem with the instructional practice. It is a problem with students that just can't seem to behave in an academic setting.

Solution:

Make sure you have a classroom behavior plan in place that is something other than sending the student down to the office. Each team relies on all its members to be present in class for the instruction, practice, and mastery of the lesson objectives. If you send students out of class they are sure to fall behind and ruin the cooperative learning opportunities for the group. Instead, give teams extra points for daily behavior, cooperativeness, and effort. The misbehaving students will feel pressure from their teammates to adjust their behavior and begin to feel good about themselves as there team starts to earn these extra points. It is also important for the teacher to identify misbehaving students so that they can walk around and check on how they are doing. The teacher can help correct bad behavior by giving positive reinforcement to the individual and teams they are on.

Problem: Absences

Student absenteeism can be a major problem in a STL class because students depend on one another to contribute points to the team.

Solution:

The first solution is to simply talk to the student and tell them you are concerned about the amount of time they are missing from class. Make it a point to let them know they are a big part of their team success, or failure, and that their team members count on them to be in class. If the problem persists you can use the class average score for homework, pre, and post-check quizzes to award the team.

Problem: Ineffective use of team practice time:

This problem begins to develop when students decide not to use time within their team wisely. They might want to talk about topic other than math, or they want to work independently while the team captain is trying to give instruction to team members.

Solution:

The first solution is to be visible in the room, walking around to each group, and talking with group members while also looking at other groups at the same time. If the problem continues you can give the team captain fewer example sheets for student practice. By doing this you are requiring students within teams to pair up to complete the example problems and hopefully they can keep each other accountable. This will take stress off the team captain, and lets someone else in the group give the ineffective student a behavior check.

(Slavin, 1991)

Why Use Student Team Learning at the Mid-Level

There are many reasons why you should consider using STL as an alternative teaching strategy. Below you will find reasons why you should seriously consider this method of instruction if you teach at the Mid-Level.

- Middle school students are entering a time in their lives where they are searching for their identity, STL provides students to an avenue to help them discover the type of person they are and want to be.
- STL allows students to socially interact with other students on an academic level.
- Students begin to develop relationships with other students outside their peer groups.
- STL provides students in middle school an opportunity to move around in class without the teacher getting upset.
- STL provides a safe environment for new students and students coming from another building like an elementary school.
- It helps students that are entering their teenage years an opportunity to become more responsible.
- STL helps students get comfortable in a new environment.
- It helps students learn to be accountable to themselves and others.
- It helps middle school students learn to be democratic.
- The STL experience can positively change a student's attitude towards math.
- Middle school students love competition and STL is full of competition.
- STL can positively increase student achievement in mathematics.
- Learning is student centered and not teacher directed.

- It's a method of instruction students can relate to coming from the elementary school.
- It allows students and teams an opportunity to win awards and receive prizes.
- It builds self-esteem among middle school students.
- The individual accountability to the team encourages students to turn in homework more often
- STL is a possible intervention for students that miss a lot of school

Benefits to Students

The benefits listed below for STL come from action research performed to put this handbook together. You will find that some of data focuses on students that face barriers to learning as they come to school. The learning barriers researched include: ELL students, Hispanic students, low income students, and ability levels. You will also find information that describes the whole class. I hope this data gives you good insight to what you might experience if you decide to use STL in your classroom.

Attitudes:

- Student attitudes began to change within a month as students became more involved in the classroom structure.
- When students were given the opportunity to create the physical environment and democratically set ground rules for behavior within the classroom it became evident that student attitudes were beginning to be positively affected.
- All students that face barriers to learning showed a practical difference of 1.33 on Likert scale item eighteen. This means that after the second survey students strongly agreed that they were happier in math class than any other class during the school day (4.16). In Part IV you can find the Likert scale questionnaire.
- Students that face learning barriers strongly agreed (4.25) with the statement, "this math class is the best part of my school day," by the end of the second survey. This showed a practical difference of 2.75 between surveys.

- All students that face barriers to learning showed a practical difference of 1.25 on Likert scale item seventeen. This means that after the second survey students strongly disagreed with the statement, "I have never like math, and it is my most dreaded subject (1.58)."
- Students that face learning barriers strongly disagreed (1.25) with the statement, "mathematics makes me feel uncomfortable, restless, irritable, and impatient," by the end of the second survey. These students displayed a practical difference of 1.58 between surveys.
- By the end of the second survey all students that participated in STL strongly agreed with a perfect score of 5 that working in teams during math class is helpful, and makes learning fun.

Student Achievement:

- Students that faced barriers to learning started the school year at a middle of fourth grade competency level (210.33). This is according to NWEA scores that were given to students at the beginning of the year. There is a rubric in Part VI to help you read and further understand how to analyze NWEA scores.
- After four months of STL in the classroom students that face learning barriers witnessed their math competency jump 4.42 points. This is equivalent to a student performing at a beginning to mid fifth grade level.
- Students that face learning barriers jumped in math competency almost one grade level in four months

Homework:

- During the four months that students participated in STL homework assignments were turned in 91% of the time.
- Caucasian students on a reduced lunch plan turned in homework 95% of the time.
- Hispanic students on a reduced lunch plan turned in homework 90% of the time.
- Students on a reduced lunch plan turned in homework 91% of the time.

- ELL students turned in homework 87% of the time.

Attendance:

- During the four months that students participated in STL the attendance rate was 97%.
- The attendance rate for Caucasian students on a reduced lunch plan was 97%.
- The attendance rate for Hispanic students on a reduced lunch plan was 98%.
- The attendance rate for all students on a reduced lunch plan was 98%.
- The attendance rate for ELL students was 99%.

Relationships:

- STL encouraged students to build relationships with others outside their peer group.
- The social relationships between students that participated in STL transferred to the hallways and lunch room.
- The social relationships developed among students allowed academic relationships to take place in the classroom
- As students began to feel safe working in teams, they also felt comfortable asking questions and getting help from their team members.

Suggestions for Adapting STL to Other Content Areas

STL and the strategies incorporated with it are not limited to a math classroom. You can implement these strategies in other content areas as well. Below you will find a list of suggestions for how you can adapt each strategy into other subject areas during the school day.

Student-Team Achievement Divisions:

1. Language Arts: You can place students in heterogeneous learning groups to study vocabulary words, write an essay together, or study for a future test. Students can stay in this group for a particular section you are studying or for a whole unit.

2. Science: This strategy works well for students planning and conducting an investigation using the scientific method.

3. Social Studies: This strategy works well for students learning social studies skills, such as geography and graph reading.

Teams-Games-Tournaments:

1. Language Arts: You can use this strategy to play vocabulary games. It makes the competition fair among students of different ability levels and challenges everyone involved.

2. Science: Use this strategy to play a game to assess student comprehension of an essential question you have been studying in class. It provides fair competition that will challenge students while also helping you decide if it is time to move on or correct misconceptions that students still have.

3. Social Studies: You can play a game to assess student knowledge of the different states and capitals in the United States. Split the teams by ability levels and have them pass a map of the United States around to each group, having each individual fill in one state and capital at a time until the team is finished or cannot think of anymore. The team that placed the most states and capitals on the map will be your winner.

Jigsaw II:

1. Language Arts: You can use this strategy to have students teams read a common narrative, such as a book chapter, a short story, or biography. Give each student a topic to become an expert at and those students meet with other students from different groups to discuss the topic further, and then have them return to their team to teach their teammates what they have learned.

2. Science: Have students read an investigation that they will participate in. Give each student a piece of the scientific method to become an expert at. Those students then meet with other students from different groups to discuss the piece of the investigation further, and then have them return to their team to teach their teammate what they have learned. After this is accomplished everyone in class should be on the same page and groups will be able to conduct the investigation.

3. Social Studies: You can use this strategy to have students teams read a common book chapter, autobiography, or worksheet. Give each student a topic or question to become an expert at and those students meet with other students from different groups to discuss the topic or question further. Then have students return to their team to teach their teammates what they have learned.

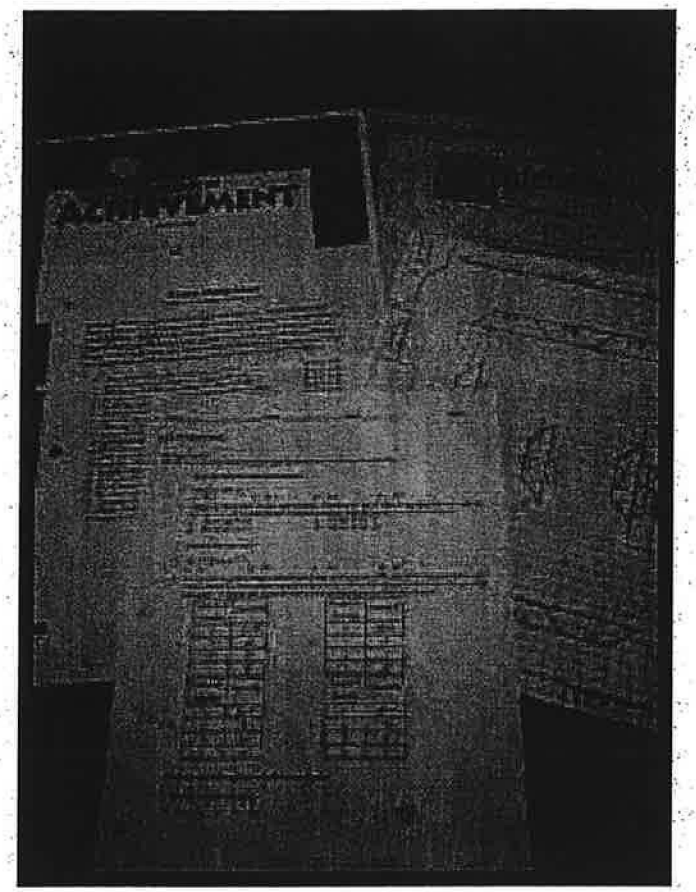
Team Accelerated Instruction:

1. Language Arts: You can place students with the same reading comprehension in groups to read and study a narrative, short story, or biography. You can then go around and give these groups individualized instruction on the material they are studying. Each group would get their own assignment to complete.

2. Science: Place students of the same ability level in teams together to complete an investigation. Modify the investigation for the different ability levels you have in class.

Part IV

Questionnaires, Instructions, Games, and Maps



"The strength of the team is each individual member....the strength of each member is the team."

-Coach Phil Jackson-

Math Attitude Questionnairre

Directions: Please write your name in the upper right hand corner. Each of the statements below expresses a feeling that a person might have toward mathematics. You are to express, on a five point scale, the extent of agreement between the feeling expressed in each statement and your own feeling. The five points are: Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A), and Strongly Agree (SA). You are to circle the letter which best describes how closely you agree or disagree with the feeling expressed in each statement AS IT CONCERNS YOU.

1. I do not like mathematics, and it scares me to have to take it.	SD D U A SA
2. Mathematics is very interesting to me, and I enjoy math courses.	SD D U A SA
3. Mathematics is better when I get to work out problems by myself.	SD D U A SA
4. My mind goes blank and I am unable to think clearly when working math.	SD D U A SA
5. Mathematics makes me feel uncomfortable, restless, irritable, and impatient.	SD D U A SA
6. The feeling I have toward mathematics is a good feeling.	SD D U A SA
7. I am always under a lot of pressure in a math class.	SD D U A SA
8. I like to work in a team with other students during math class.	SD D U A SA
9. This math class is the best part of my school day.	SD D U A SA
10. I get bored and zone out in math class when the teacher talks in front of class.	SD D U A SA
11. Mathematics is something which I enjoy a great deal.	SD D U A SA
12. When I hear the word math, I have a feeling of dislike.	SD D U A SA
13. I have a fear of not being able to do mathematics.	SD D U A SA
14. I really like mathematics.	SD D U A SA
15. Mathematics is a course in school which I have always enjoyed.	SD D U A SA
16. It makes me nervous to think about having to do a math problem.	SD D U A SA
17. I have never liked math, and it is my most dreaded subject.	SD D U A SA
18. I am happier in a math class than any other class.	SD D U A SA
19. I like my math class this year better than last year.	SD D U A SA
20. Working in teams during math class is helpful and makes learning fun.	SD D U A SA

(Adapted from Aiken, L. R. (1963). Attitude towards mathematics. *Reveiw of Educational Research*, p. 588)

Math Attitude Questionnairre (Spanish Version)

Direcciones: Por favor de escribir su nombre en las esquina derecha. Cada declaración abajo expresa un sentimiento que la gente tiene sobre las matemáticas. Usted debe de expresar su opinión, usando una calificación de cinco puntos, el intento del argumento es la diferencia de los sentimientos de otros con los sentimientos de Usted. Las cinco calificaciones son: No de Acuerdo Fuertemente (NAF), No de Acuerdo (NA), Sin Igual (SI), Acuerdo (A), De Acuerdo Fuertemente (DAF). Usted debe de circular lo que mejor describa sus sentimientos acerca con las declaraciones COMO LE PRETIENE A USTED.

1. No me gustan las matemáticas, y me da miedo tomas clases de matemáticas. NAF NA SI A DAF
2. Las matemáticas son muy interesante para mí, me gustan matemáticas. NAF NA SI A DAF
3. Las matemáticas es mejor cuando yo puedo trabajar en problemas solo. NAF NA SI A DAF
4. Mi mente se borra, y no puedo pensar claramente cuando estoy trabajando en las matemáticas. NAF NA SI A DAF
5. Las matemáticas me hacen sentir sin a gusto, irritable y impaciente. NAF NA SI A DAF
6. El sentimiento que yo tengo a cercas a las matemáticas es bueno. NAF NA SI A DAF
7. Yo siempre estoy bajo mucho estrés en clase de matemáticas. NAF NA SI A DAF
8. Me gusta trabajar con otros estudiantes durante me clase de matemáticas. NAF NA SI A DAF
9. Esta clase de matemáticas es la mejor parte de mi día escolar. NAF NA SI A DAF
10. Me aburo en la clase de matemáticas cuando el maestro está hablando al frente de la clase. NAF NA SI A DAF
11. Las matemáticas es algo que me gusta mucho. NAF NA SI A DAF
12. Cuando escucho la palabra matemáticas, tengo un sentimiento de disgusto. NAF NA SI A DAF
13. Tengo un sentimiento de miedo y creo que no puedo hacer las matemáticas. NAF NA SI A DAF
14. Me gustan las matemáticas. NAF NA SI A DAF
15. Las matemáticas es un curso que siempre me a gustado estudiar en la escuela. NAF NA SI A DAF
16. Me pongo nervioso nada más de pensar en tener que hacer matemáticas. NAF NA SI A DAF
17. Nunca me han gustado las matemáticas y es mi curso menos apreciado. NAF NA SI A DAF
18. Estoy más feliz en mi clase de matemáticas que otras clases. NAF NA SI A DAF
19. Me gusta mi clase de matemáticas este año mejor que la del año pasado. NAF NA SI A DAF
20. Trabajando en equipos me ayuda más, y aprender es divertido. NAF NA SI A DAF

(Adapted from Aiken, L. R. (1963). Attitude towards mathematics. *Reveiw of Educational Research*, p. 588)

Assigning Students to Teams

	Pre-check score	Team
Team Captains	7 7 6 6	1 2 3 4
Middle Level Students	5 5 5 5 4 4 4 3	Students in this group are randomly assigned to teams 1 -4
Low-Performing Students	2 2 1 0	Students in this group are randomly assigned to teams 1 -4

After students take a pre-check quiz you will rank the students based on the score they received. Remember the pre and post-check quizzes are out of ten points. The students that receive the top four scores are you team captains for teams 1-4. Take the next eight middle level students and put their names in at hat and randomly place them in groups 1-4. Next, take the four low performing students and put their names in a hat and randomly place them in groups 1-4.

Introducing Team Member with Math Card Games

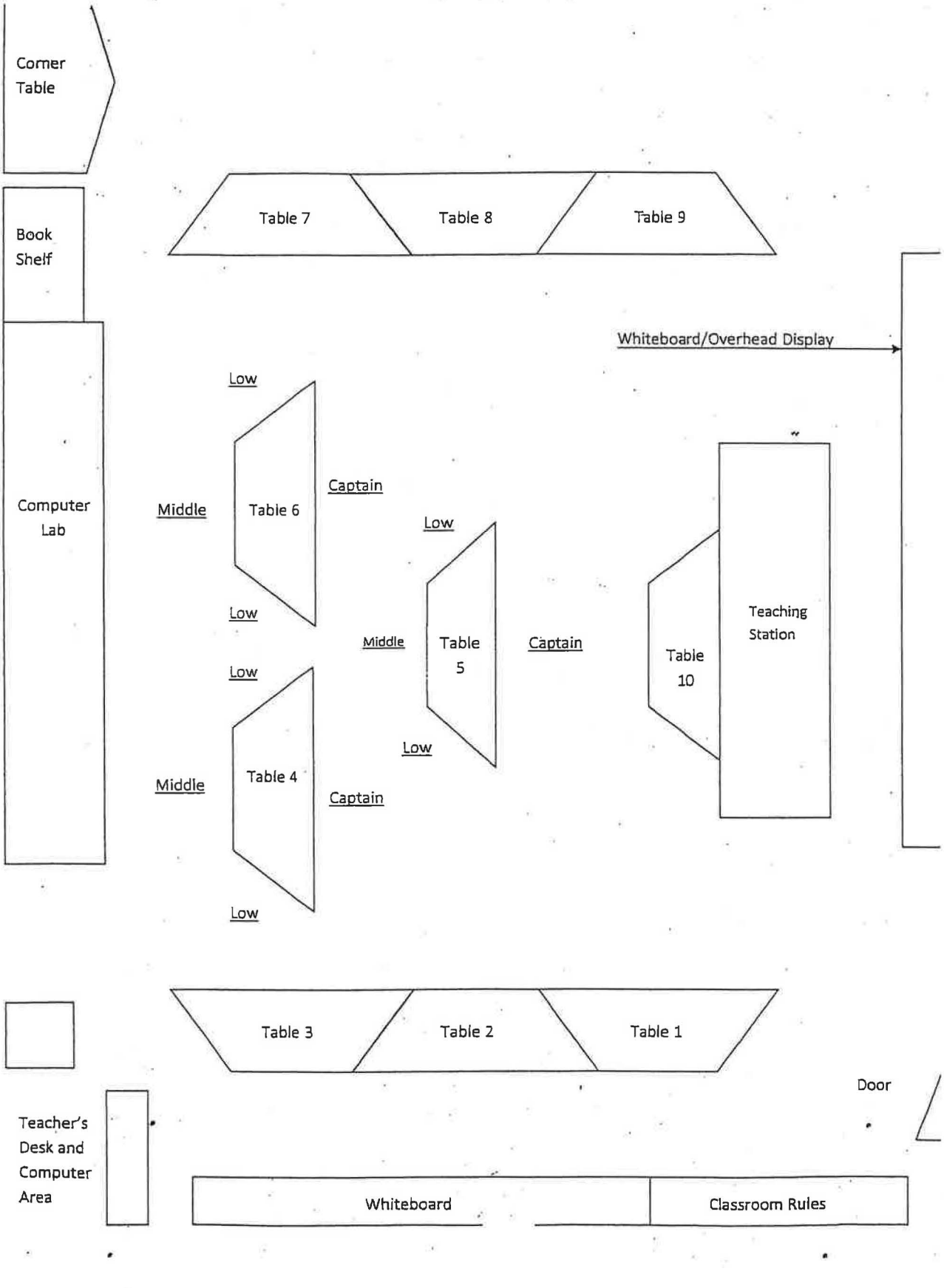
You want to set the tone for STL in the classroom. One way you can do this is by having the team captains teach members of their group how to play a game. This will show the members of the group who is in charge. It will also let team members practice the team rules that were put in place at the beginning of the school year. It is also an excellent opportunity in a friendly environment for team captains to start using their leadership skills. Below you will find a list of games that you can implement into your STL practices.

- **Addition Quick Draw**
  - Getting ready: Deal out all the cards to the four players
  - Play the game: Have the team members pair up. One player calls, "Draw" and both players place the card in between them; the first player to quickly add up the two cards wins both cards. Have the two players that win face off and play each other while the other two players play each other.
- **Multiplication Quick Draw**
  - Getting ready: Deal out all the cards to the four players
  - Play the game: Have the team members pair up. One player calls, "Draw" and both players place the card in between them; the first player to quickly multiply the two cards wins both cards. Have the two players that win face off and play each other while the other two players play each other.
- **Subtraction Quick Draw**
  - Getting ready: Deal out all the cards to the four players
  - Play the game: Have the team members pair up. One player calls, "Draw" and both players place the card in between them the first player to quickly subtract the two cards wins both cards. Have the two players that win face off and play each other while the other two players play as well. This is a good game if you are working with integers at the time.
- **Make 25 With 5**
  - Getting ready: Each player is dealt 5 cards to hold in their hand. The remaining cards are placed face down in a pile in the center. The top card is turned over and placed beside the pile.
  - Play the game: The aim of each round is to create a hand of 5 cards that add to 25. Players take turns to pick up the top card of the pile or the top card of the discard pile. Each player finishes their turn by discarding a card onto the top of the discard pile. The first player to have a set of 5 cards that

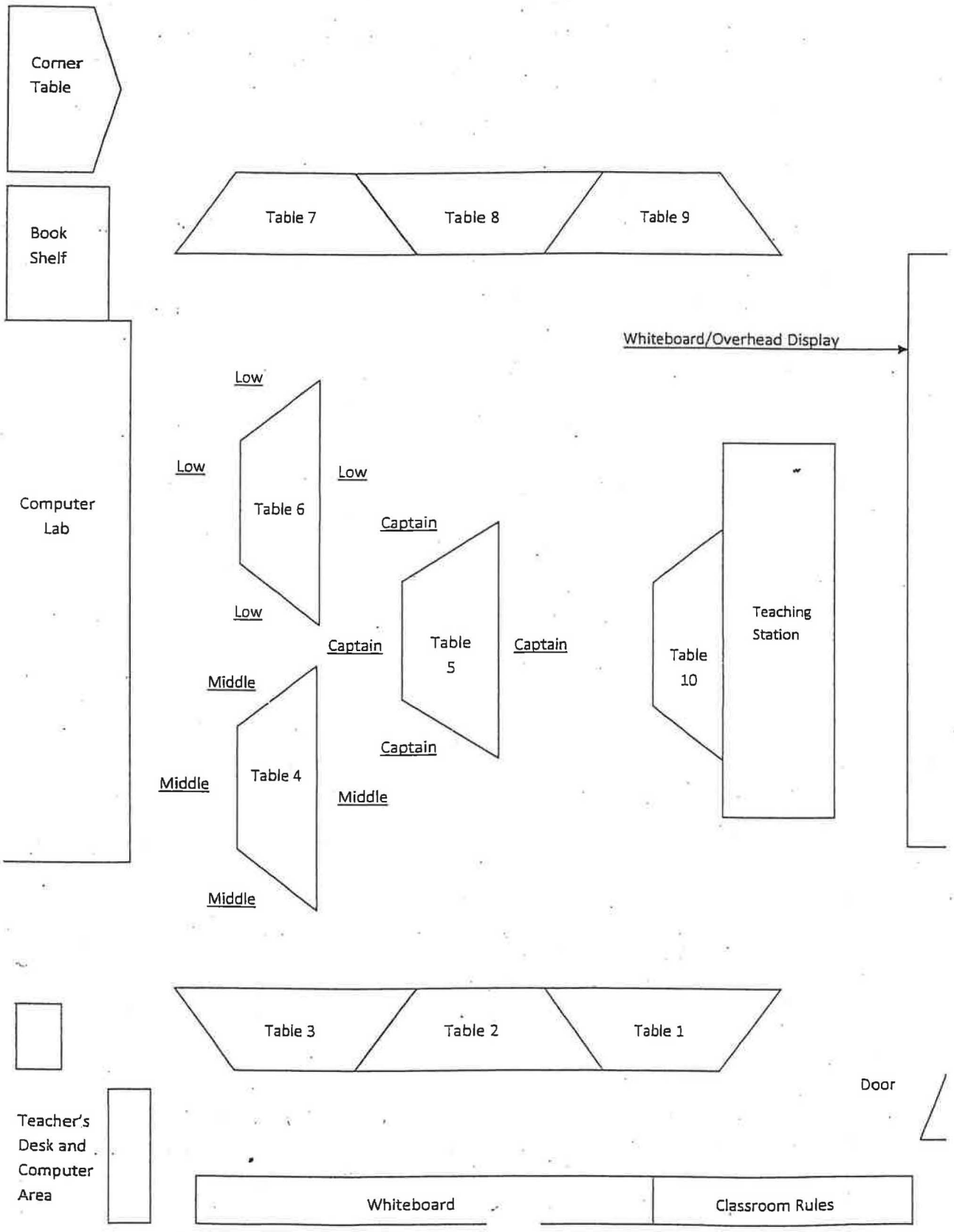
(makingmathmorefun.com)

- **Make a Multiple of 9 Multiplying 4**
  - Getting ready: Each player is dealt 4 cards to hold in their hand. The remaining cards are placed face down in a pile in the center. The top card is turned over and placed beside the pile.
  - Play the game: The aim of each round is to create a hand of 4 cards that multiplied together equal a multiple of 9. Players take turns to pick up the top card of the pile or the top card of the discard pile. Each player finishes their turn by discarding a card onto the top of the discard pile. The first player to have a set of 4 cards that are a multiple of 9 calls out, there answer and is the winner of that round if they have a correct answer. Keep score of how many rounds each player wins. The winner is the player who wins the most rounds.
- **Match**
  - Getting ready: Place all of the cards face down
  - Play the game: Players take turns flipping two cards over. If the cards match by number and color the player wins the cards and turns two more cards over. If the cards do not match, the players puts the cards back face down and the next player goes. The game is played until all of the cards have been matched up. The winner is the player with the most cards.
- **Rollin Around Multiplication**
  - Getting ready: Give each player 3 dice and a whiteboard. (The team captain facilitates the game and checks student answers with a calculator)
  - Play the game: All players roll their dice at the same time. Then they multiply the numbers together on the whiteboard. Once students are finished the facilitator checks individual answers with the calculator. Students that get the correct answer get a point. The first student to get 5 points wins.

Topography of Student Team Learning Teams



Topography of Competition Review Format



Part V

Resources

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Part VI

Appendixes

Teamwork divides the tasks and multiplies the success.

-Unknown

Course Content Go to Prentice Hall Mathematics: Course 1 2008/10 Student Home Page

Please note: Content on pages 47-90 was removed from this scan due to copyright concerns.

Name _____ Class _____ Date _____

Chapter Test

Form A

Chapter 1

Chapter Test (continued) Form A

Chapter 1

Please note: Content on this page was redacted due to copyright concerns.

Name _____ Class _____ Date _____

Chapter Test Form A

Chapter 2

Name:

Student Data Sheet

Chapter 1: Decimals 1.1-1.3							
Date	Pre-test	Post-test	HW	Improvement	Competition	Final Team Score	
Secton 1.4-1.7							
Section 1.8-1.10							
Chapter 2: Patterns and Variables 2.1-2.3							
Section 2.4-2.6							
Section 2.7-2.9							
Chapter 3: Number Theory and Fractions 3.1-3.4							
Section 3.5-3.8							
Chapter 4: Adding and Subtracting Fractions 4.1-4.4							
Section 4.5-4.8							

2nd Period Student Pre/Post Quiz Scores

Name:

10											
9											
8											
7											
6											
5											
4											
3											
2											
1											
0											
		1.1-1.3	1.4-1.7	1.8-1.10	2.1-2.3	2.4-2.6	2.7-2.9	3.1-3.4	3.5-3.8	4.1-4.4	4.5-4.8

Sections Covered

Key:

Pre-Check score is labeled in green

Post-Check score is labeled in black

2008 READING STATUS NORMS (RIT VALUES)

Grade	Beginning of Year Median	Beginning of Year Mean	Middle of Year Median	Middle of Year Mean	End of Year Median	End of Year Mean
K	146	147.6	151	152.4	155	156.3
1	160	160.2	167	166.5	173	171.9
2	179	179.7	186	186.0	190	189.6
3	192	191.6	197	196.3	200	199.0
4	201	200.1	205	203.7	207	205.8
5	208	206.7	211	209.6	212	211.1
6	213	211.6	215	213.8	216	214.8
7	217	215.4	219	217.3	219	217.9
8	220	219.0	222	220.6	223	221.2
9	222	220.9	223	221.9	224	222.6
10	226	223.9	227	224.9	228	225.4
11	227	225.2	228	225.6	227	225.6

2008 MATHEMATICS STATUS NORMS (RIT VALUES)

Grade	Beginning of Year Median	Beginning of Year Mean	Middle of Year Median	Middle of Year Mean	End of Year Median	End of Year Mean
K	148	149.5	152	153.1	158	158.1
1	164	163.4	171	169.9	178	176.7
2	179	179.5	186	186.5	191	190.8
3	192	192.1	199	198.0	203	202.4
4	203	203.0	208	207.6	211	211.4
5	212	211.7	216	216.0	220	219.2
6	219	218.3	222	221.4	225	223.8
7	225	224.1	228	226.4	230	228.3
8	230	229.3	232	230.9	234	232.7
9	233	231.6	234	232.5	236	234.0
10	237	235.2	238	235.9	239	237.1
11	239	237.1	240	238.5	241	239.8

2008 LANGUAGE USAGE STATUS NORMS (RIT VALUES)

Grade	Beginning of Year Median	Beginning of Year Mean	Middle of Year Median	Middle of Year Mean	End of Year Median	End of Year Mean
2	180	181.2	188	188.3	192	191.5
3	193	192.6	199	198.0	202	200.5
4	202	201.0	206	204.9	208	207.0
5	208	207.2	211	210.2	213	211.8
6	213	211.7	215	214.0	217	215.1
7	217	215.1	218	217.3	219	217.7
8	220	218.4	221	219.8	222	220.4
9	221	219.4	221	220.0	222	220.8
10	223	221.6	224	222.3	225	222.9
11	225	223.6	226	225.1	226	224.6

In the samples, each district's base school calendar was used to determine instructional days. Using the instructional days data, time frames for beginning of year tests, middle of year tests, and end of year tests were established. The centers of these time frames were roughly 20 days, 89 days, and 153 days from the beginning of the academic year of the student's school for the fall, winter and spring terms, respectively.

2008 GENERAL SCIENCE STATUS NORMS (RIT VALUES)

Grade	Beginning of Year Median	Beginning of Year Mean	Middle of Year Median	Middle of Year Mean	End of Year Median	End of Year Mean
2	184	184.7	187	187.2	189	189.7
3	191	191.0	194	193.6	196	196.3
4	196	196.6	199	198.8	201	200.9
5	201	201.1	203	203.0	205	204.9
6	205	204.4	207	205.7	208	207.0
7	208	207.7	209	208.7	210	209.6
8	211	210.5	212	211.5	213	212.6
9	213	212.4	214	212.8	214	213.3
10	216	214.9	217	215.9	218	216.8

2008 SCIENCE CONCEPTS STATUS NORMS (RIT VALUES)

Grade	Beginning of Year Median	Beginning of Year Mean	Middle of Year Median	Middle of Year Mean	End of Year Median	End of Year Mean
2	180	181.2	184	184.2	187	187.2
3	189	189.2	192	191.9	195	194.6
4	195	195.2	198	197.4	200	199.6
5	200	200.0	202	201.9	204	203.7
6	204	203.7	205	204.7	206	205.7
7	207	206.9	208	207.8	209	208.6
8	210	209.6	211	210.4	212	211.2
9	212	211.4	213	211.7	213	212.1
10	214	213.3	215	214.0	216	214.8

Tables based on between 2000 and 2009 cases are shaded to reflect caution when using these values.

SUPER TEAM OF THE WEEK

A NUMBER ONE TEAM !

Date

Student

GREAT TEAM

Team

Did a GREAT JOB this week

Date

GREAT TEAM

Team

Did a GREAT JOB this week

Date

GREAT TEAM

Team

Did a GREAT JOB this week

Date

Certificate of Achievement

Awarded to

_____

for superior achievement and excellence in

_____

this ____ *day of* _____

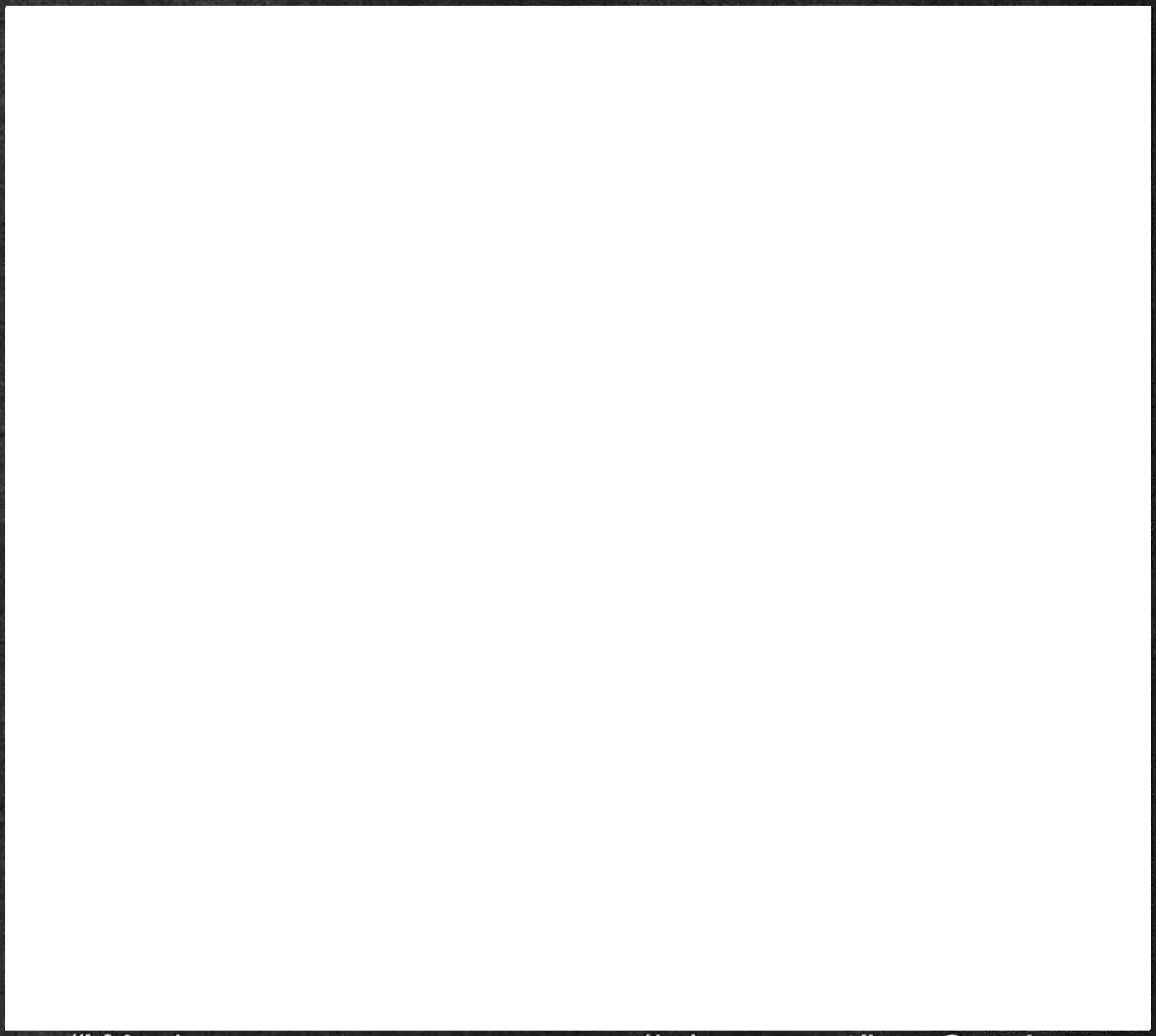
in the year _____.

Signed _____

Student Team Learning:
A Teacher's Guide to Making it Happen

1. Your team capatain is in charge. 2. Pay attention so you don't miss out on important information. 3. Listen closely to your captain and other team members.

4. Be helpful. 5. Support your teammates. 6. Cooperate with your team daily. 7. Do your own work.



"Work as a team, accomplish more!" - Student

Please note: An image on this page was redacted due to FERPA concerns.

THE GOOD NEWSLETTER

Mr. McGuffin 2nd Period Math Class November 10th, 2010 Chapter 1.8--1.10

Team, "Awesome of the Awesome" Rule!!!

It's official! Team, Awesome of the Awesome has won the coveted Outstanding Improvement Award for their overall achievement in conquering sections 1.8 to 1.10. Their hard work mastering multiplying and dividing decimals by 10, 100, and 1,000 was nothing less than brilliant. They way they worked to divide decimals and stay organized through the process was truly beyond words. And, their ability to master the order of operations by relating the words to something meaningful to remember almost makes me want to cry. I want to personally congratulate Garrett, Ryan, Carlos, and Edgar for all their hard work and more importantly for working together as a team throughout the sections. Good job and keep up the good work as we begin the next sections.

Team scoring for sections 1.8-1.10

Awesome of the Awesome	45
The Barbies	44
The Team to Beat	41
Better Than the Team to Beat	36

It's all about the improvement!!

I am very happy to announce that every single one of you showed improvement from the pre-check to the post-check assessment. Of those I want to personally congratulate Cameron Krombaugh and Nick Thompson for improving 8 points. You have come a long way in the last two weeks. Keep up the good work. I also want to congratulate Edgar for improving his pre-check score by 7 points. It shows that you have put in a lot of time into your academics the last couple of weeks. Other people that deserve some props include: Rafael, Sam, Ryan, and Katy for improving 6 points on their pre-check scores. All of you keep up the hard work and I promise you will see positive results.

Homework is a huge component to winning the Outstanding Improvement Award. It says a lot about your work ethic and how much you care about your team. I want to personally congratulate the following people.

100% Homework Completion

-
-
-
-
-
-
-
-

Ranking of Trophies Won

3
2
1
1
1
1
1
1
1

What's ahead

We will soon begin working in Chapter Two. This chapter is titled, Patterns and Variables. You have taken a pre-check quiz and I will be placing you in teams tomorrow. During these next three sections you will be learning how to describe a pattern, understand what variables and expressions are and how to evaluate them. As well as write algebraic expressions using variables. If you get a chance please look over this section tonight so that you can come to class prepared tomorrow.

CHAPTER 5
RECOMENDATIONS

Math scores on state tests have fallen behind reading and writing scores 91% of the time since the inception of the WASL. For the first time Chelan Middle School was placed on AYP due to insignificant progress by English Language Learners in math, Hispanic students in math, and low income students in math. For this project I decided to change the instructional method used in a sixth grade math classroom. The strategies involved cooperative learning as a means to break down learning barriers that students face when they come to school. The specific instructional approach used for this was Student Team Learning, a highly organized method of instruction that involved students in heterogeneous learning teams working together, learning together, and being successful together. The goal of this project was to find and test a method of instruction to improve student achievement and attitude in a 6^{th} grade math class. Below are recommendations for teachers school districts that come from the conclusions made during the research project.

A suggestion for this study is that the researcher and the school district work to create a classroom environment that fosters positive relationships between students and teachers. When relationships are created among students and their teacher, a positive affect on student attitudes has been seen to develop. This can be achieved by improving student/teacher communication and providing opportunities for students to become more involved in the democracy of the classroom structure. Characteristics of this include student participation in creating the physical environment of the classroom, the open discussion and cooperative development of a set of classroom rules that will be followed by all students, and by keeping lines of communication open for all students and the teacher.

The researcher and school district should encourage cooperative learning. Instructional strategies that use learning groups in the classroom improve student relationships, attitudes towards the subject, increase academic engagement, and promote individual accountability. The learning groups must be highly organized to include students from different ability levels, gender, race, and social class. Ownership of the group must be shared among members and goals for the group need to be addressed. This is developed by creating a group name and a philosophy that group success originates from shared learning, not individual mastery. Academic tasks that help monitor this include; time spent reviewing learning tasks, time on task within the group, enthusiasm among group member, mastery of the learning tasks by all group members, engagement during group games, completion of homework assignments, and individual accountability among group members.

The last recommendation for teachers and the school district is to encourage relationship building while creating lesson objectives. Teachers and administrators often forget the importance of this while trying to get through their curriculum during the year. Characteristics of positive academic relationships among students within lessons include; increased understanding, motivation, engagement, language development, and academic achievement. Academic achievement takes place when student feel safe and comfortable around the people they are working with, allowed to share ideas without judgement, and are encouraged to succeed by the people they are working with. Teachers in the school district need to think about the academic relationships students build in the classroom while focusing on student thinking, mastery of learning objectives, and assessment of those objectives.

One way the researcher can help the school district improve student attitudes and academic achievement is to create a handbook that includes the instructional strategies used in

class. This handbook could be used in all of the schools math classes and adapted to be used in other classes as well. It should include an introduction to Student Team Learning and the strategies it incorporates. There should be guidelines for implementation for teachers that are new to STL, but eager to try an alternative teaching strategy in their classroom. It is important that the handbook also include ways to troubleshoot problems that teachers might encounter and reasons why STL works well at the middle school. The handbook should also provide teachers copies of worksheets, instructions, data forms, and certificates so they don't have to worry about creating this themselves.

Further Suggestions for Further Research

If this research were to be repeated the following things should be taken into consideration:

1. Survey items on the Likert Scale Questionnaire should be changed to single stemmed where possible so that student responses reflect the single stem that is being asked. This will eliminate any confusion a student might have about the positive, negative, or neutral value the survey item might have.
2. Make sure the positive, negative, and neutral value of statements on the Likert Scale Questionnaire are balanced. This means that if you have a twenty item survey, make sure you have an equal number of statements that are positive, negative, and neutral. This will elimate any bias towards one particular feeling a student might presumably already have. If you have a balance of these type of questions, your base line data will more crearly reflect a students attitude towards mathematics.

3. When possible make sure the class sizes of the students you compare are consistant in size. This means that if you have one class with twenty students and another class of ten students, see what you can do to even these class sizes out.

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APPENDIXES

CENTRAL WASHINGTON UNIVERSITY

August 25, 2010

Jay McGuffin

Dear Mr. McGuffin:

Thank you for submitting an HSRC application for your study, *The Effects of Peer Instruction on Student Achievement and Attitudes in a 6th Grade Math Class.* The application as submitted was screened for exemption status according to the policies of CWU and the provisions of the applicable federal regulations. Your research was found to be subject to CWU oversight but exempt from federal regulation because it involves research conducted in an educational setting involving normal educational practices [see 45 CFR 46.101b(1)]. This certification is valid for one year (through August 24, 2011) so long as the approved procedures are followed.

We have enclosed a stamped approved informed consent forms. These forms carrying the approval date should be considered the official form for your study. Please use them for all copies needed.

Your responsibilities with respect to keeping this office apprised of your progress include the following:

1. File a Project Modification Request form for HSRC approval before modifying your study in any way except formatting of documents (e.g. any change in recruitment, subjects, co-investigators, consent forms, any procedures). If there is a major change in purpose or protocol, you may be asked to submit a new application. Please call if you have questions.
2. File a Termination Report form with this office upon completion of your study.
3. Immediately contact the HSRC for further guidance should you encounter unanticipated problems with your research. Follow up with an Unanticipated Problems report may be required.
4. Provide a current contact address and phone number if either should change prior to termination of the study.

All of the HSRC forms are available on our website. Please refer to your HSRC study number (H10118) in all related future correspondence with this office. If you have questions or concerns, feel free to contact me.

I have appreciated working with you; may you have a productive research experience.

Sincerely,

Sandra M. Martinez, M.A.
Human Protections Administrator

c: HSRC File
Dr. Leo D'Acquisto, HSRC Chair
Dr. Keith Salyer, Faculty Sponsor
Graduate Studies and Research

Chelan Middle School

Parental consent form for the research project titled:

The effects of peer instruction on student achievement and attitudes in a 6th grade math class

Investigators: Jay McGuffin, 6th grade math teacher at Chelan Middle School, room 107, school contact number is

Faculty Sponsor: Dr. Keith Salyer, Teacher Education Programs at Central Washington University. The contact number for Dr. Salyer is

What you should know:

- This will be my 4th year teaching math and science at Chelan Middle School
- I will be studying the impact of peer instruction and student achievement.
- You can allow your child to be in this study, or not.
- You can ask questions now, or later.
- You can decide about your child being in the study after your questions are answered.

Why is this research being done?

The purpose of this research project is to investigate the types of instruction students receive in their 6th grade math class. I want to know more about the way students learn from each other and the benefits from this type of learning. To do this, I will use one type of peer teaching in my classroom for the first three units of our math book, Prentice Hall: Course 1 Mathematics. I hope this research will help teachers think about the type of learning techniques they can use in their classroom and help them get creative when making lesson plans that may be different from what they already use to teach our kids.

What will happen if you give permission for your child to join this study?

I will be using a student led peer teaching strategy called Student Team Learning in my classroom for the first three unit of our math book. This kind of instruction involves students teaching math lessons to other students in small groups. It is a great way for students to learn from each other, talk about math, and work together. At the beginning of each set of lessons students will take a pre-test. The students that do well on the pre-test will be peer teachers for two weeks. Peer teachers will meet with me either before school, at lunch, or after school to go over the math lessons and strategies they might want to use to teach other students. The peer teacher will then be grouped with three to four other students in the class. During the next two weeks the peer teacher will work with his/her group and teach the math lessons that they have learned from the classroom teacher. At the end of the two weeks all students will take a test on the three sections that were taught in class. The tests that are used for this research project come from our math book and would be used to assess what students have learned even if I were not doing this research. All information will be given to the student and will be available to you as well.

Will your child benefit from joining this study?

Your child will benefit from this study in two ways. First, your child might be a teacher for two weeks. This is a great way for students to gain fully understanding of math lessons, become a leader in class, and develop confidence talking in front of other students. Second, your child may be in a group where math lessons are being taught and talked about. This kind of instruction helps students that may not like to talk in front of class. Students in these groups feel safe to open up and talk

about math because they do not feel threatened and know they are in a safe environment with other students that share the same questions.

What other things should you know?
You can choose to have your child be in this study, or not. If you give permission, I will explain the study to your child and ask if he or she agrees to be in the study. I will only include your child if they agree.

I will keep the information private. I will not use your child's name when I write my report.

Who should you contact if you have questions?
If you have questions about the study, call Jay McGuffin at , ext. . If you leave a message, be sure to give your phone number so I can call you back.

If you are concerned about your rights or your child's rights as a participant in research, you may call the CWU Human Protections Administrator at 509-963-3115.

What does it mean if you sign this paper?
Signing this form means you have been able to ask questions so that you understand what the study is about and you give permission for your child to decide if they want to be in it. You can ask more questions if you think of them later. You can change your mind later and tell me not to include your child in the study. What you decide will not affect how your child is treated in Mr. McGuffin's class.

Signature of Investigator

9-1-10
Date

Tear off here Tear off here
****

Parent's Statement (Choose Yes or No):

☐ Yes, I give permission for my child to participate in this study.

☐ No, I do not want my child to participate in this study.

Parent's signature Printed name Date

Please tear off above, sign and return this form to Mr. McGuffin.

HSRC Approval Date:	8-25-2010
Do not use after this date:	8-24-2011

Escuela Secundaria de Chelan

Forma del consentimiento del padre para el proyecto de investigación llamado: **Los efectos que tienen la instrucción de estudiante a estudiante para la clase de matemáticas del sexto grado**

Investigador: Jay McGuffin, maestro de matemáticas del sexto grado en la escuela secundaria de Chelan, salón 107, número de teléfono en la escuela

Patrocinador del investigador: El Doctor Keith Salyer, maestro de los programas de educación en la Universidad Central de Washington. El número de teléfono para el Doctor Salyer es

Lo que usted debe saber:

- Este año será mi cuarto año ensenando matemáticas y ciencias en la escuela secundaria de Chelan.
- Yo voy a estudiar el impacto que tiene la instrucción entre estudiantes.
- Usted puede permitir que su hijo/hija participe o no.
- Usted puede hacer preguntas ahora o después.
- Usted puede decidir si quiere que su hijo/hija participe en el estudio después de hacer preguntas.

¿Por qué estoy haciendo esta investigación?

El propósito de este estudio es para investigar diversos tipos de instrucción que su hijo/hija recibe en su clase de matemáticas del sexto grado. Yo quiero saber más sobre las maneras que estudiantes aprenden de cada uno y los beneficios de este tipo de aprendizaje. Para hacer esto, yo voy a usar un estilo de ensenar en mi clase para las primeras tres unidades de nuestro libro de matemáticas, Prentice Hall: Course I Mathematics. Yo espero que este estudio pueda ayudar a otros maestros pensar sobre los estilos de aprendizaje que se pueden usar en las clases y ayudarlos a ser más creativos cuando hacen una lección con diferentes maneras de ensenarles a los estudiantes de matemáticas.

¿Qué va pasar si yo doy permiso para que mi hijo/hija sea parte de la investigación?

Yo voy a usar una estrategia de aprendizaje cooperativo llamada aprendizaje de maestro/alumno en mi clase para las primeras tres unidades de nuestro libro de matemáticas. Es una buena oportunidad en que estudiantes pueden aprender de cada uno, hablar sobre las matemáticas y trabajar juntos. Al empezar de cada lección los estudiantes van a tomar una prueba. Los estudiantes que hagan bien en esta prueba van hacer maestro/alumnos por dos semanas. Los maestro/alumnos tendrán que juntarse conmigo antes de la escuela, en la hora del almuerzo o después de la escuela para explicarles la lección de matemáticas y como pueden ensenarles la lección a los demás estudiantes. Los maestro/alumnos luego serán divididos en grupos de 3 a 4 estudiantes en la clase. Durante las dos semanas los maestro/alumnos van a trabajar con su grupo y ensenarles las lecciones de matemáticas que han aprendido del maestro McGuffin. Al final de las dos semanas todos los estudiantes van a tomar una prueba sobre las secciones que hemos cubierto en la clase. Las pruebas que vamos a usar para esta

investigación vienen de nuestro libro de matemáticas e iban hacer las mismas pruebas que usamos si no estuviera haciendo esta investigación. Toda la información es disponible para los estudiantes y para usted también.

¿Hay una ventaja para su hijo/hija si es parte de la investigación?

Su hijo/hija va a recibir una ventaja en dos maneras. Primero, su hijo/hija podrá ser maestro/alumno por dos semanas. Esta es una buena manera que su hijo/hija puede completamente entender las lecciones de matemáticas, ser líder en la clase y ganar confianza hablando enfrente de otros estudiantes. También, su hijo/hija puede ser parte de un grupo en cual están hablando y ensenando las lecciones de matemáticas. Esta clase de instrucción ayuda a los estudiantes que no les gusta hablar enfrente de la clase. Estudiantes en este grupo se sienten cómodos hablando de las matemáticas y no se sienten tan asustados sabiendo que su grupo tiene las mismas preguntas y que pueden hablar y trabajar juntos.

¿Qué más debo saber?

Usted puede decidir si su hijo/hija puede ser parte de la investigación o no. Si usted da permiso, yo voy a explicarles a los estudiantes y preguntarles si están de acuerdo o no. Solamente voy a incluir a los que están de acuerdo.

Toda la información es privada y no voy a usar el nombre de su hijo/hija en mi informe.

¿A quién le debe llamar si tiene una pregunta?

Si usted tiene alguna pregunta sobre la investigación llame al maestro Jay McGuffin al 682-4061 ext 107. Si deja un mensaje, por favor deje su número de teléfono para poder llamarle.

Si tiene alguna pregunta sobre los derechos de usted o su hijo/hija como participante de la investigación, puede hablar con el administrador de los derechos humanos de la Universidad del Central de Washington al (509)963-3115.

¿Qué quiere decir si firma este papel?

Si usted firma este papel quiere decir que usted puede hacer preguntas y entiende la razón de esta investigación y da permiso que su hijo/hija decida si quiere participar. Puede hacer preguntas a cualquier tiempo. También puede decidir que no quiere que su hijo/hija siga participando en cualquier tiempo. Como usted decida no tendrá que ver en como su hijo/hija es tratado en la clase del Señor McGuffin.

9-1-10

Firma del investigador Fecha

Cortar aquí

La decisión del padre (Escoja Si o No):

☐ Si, yo doy permiso que mi hijo/hija participe en la investigación.

☐ No, yo no quiero que mi hijo/hija participe en la investigación.

Firma de padre Nombre de padre Fecha

Por favor firme y regrese a el Señor McGuffin.

HSRC Approval Date: 8-25-2010
Do not use after this date: 8-24-2011

Chelan Middle School

Assent For Minor Subjects

Project Title: **The effects of peer instruction on student achievement and attitudes in a 6th grade math class**

Investigator: Jay McGuffin, 6th grade math teacher at Chelan Middle School, room 107, Central Washington Graduate Student

I am doing a research study about the different ways 6th grade student learn math. A research study is a way to help teachers understand how students learn best. If you decide that you want to be in this study, you may be asked to participate in two ways. One way you might be asked to participate is as a student learning from a peer teacher in a small group with 3-4 other students. The other way you might be asked to participate is as a peer teacher. A peer teacher for this study will be a student that teaches other students math lessons in the same small group setting with 3-4 other students. This study will last for the first three units of our math curriculum, which will be approximately three to four months. This format will be used to teach the class even if you decide not to participate. It is important for you to know that everything you do in class is a part of the math curriculum taught at Chelan Middle School and that the pre-test and tests that are given will be used to assess what you have learned even if I were not doing this research project.

There are some things about this study that you should know. Peer teachers will meet with Mr.McGuffin outside of class time to learn each math lesson and tools for teaching these lessons to your group members. You will be the leader of your group for the sections you teach. I understand that sometimes it can be a little bit uncomfortable to talk or give directions to someone you do not know very well, but you might also find that being a student teacher can be fun. Students participating as learners in each group will be working cooperatively and openly within the small groups. As a participant in a group you will need to be able to take directions from the student teacher, listen as the student teacher explains what to do, and help all group members with daily tasks. This can be a challenge for participants that like to work alone or for those that do not like to talk in front of others, but I think that once you get comfortable working in a small group you will realize it can be a safe and fun environment to work in.

I think that everyone who participates in this study will benefit in one way or another. A benefit means that something good happens to you because of the study. The most likely benefit to you for being in this study is your ability to learn math concepts from your peers and grow in your math knowledge by teaching and learning from your friends. You will also get a chance to work with manipulatives and play math games, some of which you might not have seen before.

When I am finished with this research project, I will write a report about the effects of this teaching strategy and the growth you have shown in your math knowledge during the study. This report will not mention your name or that you were in this study.

You do not have to be in this study if you do not want to be. If, after we begin, you want to stop, that's okay too. Just come and talk to me and I will not include your assessment scores in my report.

If you decide you want to be in this study, please sign (or write) your name.

I,_____ want to be in this research study.
(Print your name here)

_____ _____
(Sign your name here) (Date)

HSRC Approval Date:	8-25-2010
Do not use after this date:	8-24-2011

Escuela Secundaria de Chelan

Asentimiento para los temas menores

Título del proyecto: **Los efectos que tienen la instrucción de estudiante a estudiante para la clase de matemáticas del sexto grado**

Investigador: Jay McGuffin, maestro de matemáticas del sexto grado en la escuela secundaria de Chelan, salón 107, estudiante de la Universidad Central de Washington

Yo estoy haciendo una investigación sobre las diferentes maneras que los estudiantes del sexto grade aprenden las matemáticas. Esta investigación es una manera para ayudar a los maestros de matemáticas entender como aprenden mejor los estudiantes. Si usted decide participar, hay una posibilidad de participar en dos maneras. Una manera que usted podrá participar es como un estudiante aprendiendo de un maestro/alumno en un grupo pequeño de 3 a 4 estudiantes. La otra manera que podrás participar es como maestro/alumno. Un maestro/alumno es un estudiante que les ensena matemáticas a otros estudiantes en grupos pequeños de 3 a 4 estudiantes. Esta investigacion va a durar las tres primeras unidades de nuestro plan de estudio de matemáticas que es como tres o cuatro meses. Es importante que usted entienda que todo lo que hagas en la clase es parte de las clases de matemáticas en la escuela secundaria de Chelan y que las pruebas antes y después de una unidad van a ser parte de la investigación para ver lo que has aprendido.

Hay algunas cosas que debes saber sobre esta investigación. Los maestro/alumnos van a tener juntas con el Señor McGuffin afuera de las horas de clase para aprender cada lección de matemáticas y las maneras de ensenar estas lecciones a los miembros de su grupo. Usted será el líder del grupo para las secciones que ensenes. Yo entiendo que puede ser un poco incómodo hablar o dar instrucciones a alguien que no conoces bien pero también vas a ver que es muy divertido ser un maestro/alumno. Los estudiantes participando en cada grupo van a trabajar juntos en sus grupos pequeños. Como participante en un grupo tendrás que recibir instrucciones del maestro/alumno, escuchar y poner atención cuando explica la lección y ayudar a todos los miembros del grupo cada día. Esto puede ser difícil para los participantes que les gusta trabajar solos o que no les gusta hablar enfrente de otros, pero yo pienso que después que se sientan más cómodos trabajando en sus grupos pequeños, ustedes van a ver que es muy divertido y fácil.

Yo pienso que hay un beneficio para todos los que van a participar. Un beneficio quiere decir que algo bueno te va a pasar por medio de la investigación. El mejor beneficio es que vas a aprender maneras de hacer las matemáticas con tus compañeros y también aprender más sobre las matemáticas por medio de tus grupos. También tendrás la oportunidad de jugar juegos de matemáticas.

Cuando termine la investigación, yo voy a escribir un informe sobre los efectos y el conocimiento que haz ensenado durante la investigación. Este informe no va a mencionar tu nombre.

No tienes que participar en la investigación si no quieres. Si decides participar y después de empezar, tú decides no participar, está bien. Solamente necesitas hablar conmigo y no incluyo tus resultados en mi informe.

Si tú decides participar en esta investigación, por favor firma o escribe tu nombre.

Yo, _____ quiere ser parte de esta investigación.
(Escribe tu nombre aquí)

_____ _____
(Firma tu nombre aquí) (Fecha)

HSRC Approval Date:	8-25-2010
Do not use after this date:	8-24-2011

Chelan Middle School

Math Attitude Student Questionnaire

Directions: Please write your name in the upper right hand corner. Each of the statements below expresses a feeling that a person might have toward mathematics. You are to express, on a five point scale, the extent of agreement between the feeling expressed in each statement and your own feeling. The five points are: Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A), and Strongly Agree (SA). You are to circle the letter which best describes how closely you agree or disagree with the feeling expressed in each statement AS IT CONCERNS YOU.

1.	I do not like mathematics, and it scares me to have to take it.	**SD D U A SA**
2.	Mathematics is very interesting to me, and I enjoy math courses.	**SD D U A SA**
3.	Mathematics is better when I get to work out problems by myself.	**SD D U A SA**
4.	My mind goes blank, and I am unable to think clearly when working math.	**SD D U A SA**
5.	Mathematics makes me feel uncomfortable, restless, irritable, and impatient.	**SD D U A SA**
6.	The feeling I have toward mathematics is a good feeling.	**SD D U A SA**
7.	I am always under a lot of pressure in a math class.	**SD D U A SA**
8.	I like to work in a team with other students during math class.	**SD D U A SA**
9.	This math class is the best part of my school day.	**SD D U A SA**
10.	I get bored and zone out in math class when the teacher talks in front of the class.	**SD D U A SA**
11.	Mathematics is something which I enjoy a great deal.	**SD D U A SA**
12.	When I hear the word math, I have a feeling of dislike.	**SD D U A SA**
13.	I have a fear of not being able to do mathematics.	**SD D U A SA**
14.	I really like mathematics.	**SD D U A SA**
15.	Mathematics is a course in school which I have always enjoyed studying.	**SD D U A SA**
16.	It makes me nervous to even think about having to do a math problem.	**SD D U A SA**
17.	I have never liked math, and it is my most dreaded subject.	**SD D U A SA**
18.	I am happier in a math class than any other class.	**SD D U A SA**
19.	I like my math class this year better than last year.	**SD D U A SA**
20.	Working in teams during math class is helpful, and makes learning fun.	**SD D U A SA**

(Adapted from Aiken, L. R. (1963). Attitude Towards Mathematics. *Review of Educational Research, p. 588)*

Chelan Middle School

Sentimiento que la gente tiene sobre las matematicas

Direcciones: Por favor de escribir su nombre en las esquina derecha. Cada declaración abajo expresa un sentimiento que la gente tiene sobre las matemáticas. Usted debe de expresar su opinión, usando una calificación de cinco puntos, el intento del argumento es la diferencia de los sentimientos de otros con los sentimientos de Usted. Las cinco calificaciones son: No de Acuerdo Fuertemente (NAF), No de Acuerdo (NA), Sin Igual (SI), Acuerdo (A), De Acuerdo Fuertemente (DAF). Usted debe de circular lo que mejor describa sus sentimientos acerca con las declaraciones COMO LE PRETIENE A USTED.

1.	No me gustan las matemáticas, y tomas clases de matemáticas.	NAF NA SI A DAF
2.	Las matemáticas son interesante, me gustan los cursos de matemáticas.	NAF NA SI A DAF
3.	Las matemáticas es mejor cuando yo puedo trabajar en problemas solo.	NAF NA SI A DAF
4.	Mi mente se borra, y no puedo pensar claramente cuando estoy trabajando en las matemáticas.	NAF NA SI A DAF
5.	Las matemáticas me hacen sentir sin a gusto, irritable y impaciente.	NAF NA SI A DAF
6.	El sentimiento que yo tengo a cercas a las matemáticas es bueno.	NAF NA SI A DAF
7.	Yo siempre estoy bajo mucho estrés en clase de matemáticas.	NAF NA SI A DAF
8.	Me gusta trabajar en equipo con otros estudiantes durante me clase de matemáticas.	NAF NA SI A DAF
9.	Esta clase de matemáticas es la mejor parte de mi día escolar.	NAF NA SI A DAF
10.	Me aburo en la clase de matemáticas cuando el maestro está hablando al frente de la clase.	NAF NA SI A DAF
11.	Las matemáticas es algo que me gusta mucho.	NAF NA SI A DAF
12.	Cuando escucho la palabra matemáticas, tengo un sentimiento de disgusto.	NAF NA SI A DAF
13.	Tengo un sentimiento de miedo y creo que no puedo hacer las matemáticas.	NAF NA SI A DAF
14.	Me gustan las matemáticas.	NAF NA SI A DAF
15.	Las matemáticas es un curso que siempre me a gustado estudiar en la escuela.	NAF NA SI A DAF
16.	Me pongo nervioso nada más de pensar en tener que hacer matemáticas.	NAF NA SI A DAF
17.	Nunca me han gustado las matemáticas y es mi curso menos apreciado.	NAF NA SI A DAF
18.	Estoy más feliz en mi clase de matemáticas que otras clases.	NAF NA SI A DAF
19.	Me gusta mi clase de matemáticas este año mejor que la del año pasado.	NAF NA SI A DAF
20.	Trabajando en equipos me ayuda más, y aprender es divertido.	NAF NA SI A DAF

(Adapted from Aiken, L. R. (1963). Attitude Towards Mathematics. *Review of Educational Research, p. 588)*