The Effect of Cooperative Learning

On Middle School Math Students

A Special Project

Presented to

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FACULTY APPROVAL

The Effect of Cooperative Learning

On Middle School Math Students

Approved for the Faculty

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ABSTRACT

The purpose of this study was to explore cooperative learning and the impact on middle school students overall academic achievement. The study included 47 students from a small private school, ranging from grades sixth through eighth. The researcher examined student perception of cooperative learning, implementation process and the overall impact of cooperative learning groups. The researcher used results from MAP tests, overall grades, observations and students pre- and post- questionnaires. The study found that in the classrooms where cooperative learning was implemented, students had academic growth in math that exceeded the national average, they built strong relationships with their classmates, and they enjoyed working in the cooperative groups. Students in these classrooms expressed a positive impression about math.

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CHAPTER 1

Introduction

Cooperative learning is used throughout classrooms in varying capacities. The use of this instructional strategy in Middle School math classrooms allows for deeper student understanding and less passive learning. The use of cooperative learning in mathematics allows for a more learner-centered atmosphere and moves students away from the traditional passive approach to learning that is often seen in math classrooms. The use of cooperative learning in Middle School mathematics allows for students to listen, share ideas and question one another's thinking. The use of this strategy allows for higher level thinking and questioning among students to take place. This study investigated the implementation of cooperative learning in middle school math classrooms and the impact of this instructional strategy on students' grades, test scores and overall attitude about math.

Background for the Project

"Observational studies of teachers using cooperative methods find that most are using informal versions of the model" (Robert, 1999, p. 74). So the use of cooperative learning groups within a middle school mathematics classroom needs to be implemented with a clear understanding of what cooperative learning is and the effects it can have on students overall mathematical achievement. Understanding that middle school students are creatures of conversation and that they thrive on communicating with others, and, understanding the benefits and positive impact cooperative learning groups can have on their overall academic success is essential. Teachers need to build communities within classrooms that allow for this type of interaction amongst students to take place. Students who are engaged in the learning gain more confidence, understanding and overall self-esteem in math.

The importance of understanding middle school students and how they learn in turn gives information to the educator on how to engage them in the activities and lessons that are the goals of instruction. Allowing time for students to problem solve verbally with their classmates allows for a self-evaluation of what they know and understand. "Cooperative learning is considered one of the key factors of helping with students' success" (Sapon-Shevin, 1994, 183). By training students how to work together and to utilize one another's knowledge, educators help students become problem solvers who are willing to go out and find the answer rather than expect someone to give it to them.

Statement of Problem

Will cooperative learning impact the results of middle school student's math test scores and grades?

Purpose of the Project

The purpose of this study is to explore cooperative learning and the impact on student achievement in 6^{th}-8^{th} grade math classrooms in a small private school in Central Washington State.

Delimitations

One delimitation of the study is the limited number of students. Students were selected from a small private school. While students were selected within a small school setting, looking at all middle school students in grades 6^{th}-8^{th} was considered for the study. The students were selected to provide a range of grade levels, various grade level perspectives and only students from a small private school in Central Washington were considered for participation in the study.

Another delimitation is the data collected was only from the students who participated in the study. No other students within the school or from other middle schools were considered for the study.

Limitations

The limitation of the study is the small number of middle school participants. The researcher addressed this issue by only utilizing students who had guardian permission in participation. The collection of participants test results and overall quarter graded remained confidential. The researcher reassured all parties that all information would remain confidential and reported in pseudonyms. Another limitation of the study is that it used pre-experimental design, comparing MAP test scores to the baseline scores. Experimental design with a control group and randomized assignment to treatment groups was not used. This type of quantitative research - test scores and quarter grades - provides an opportunity to analyze data and determine if cooperative learning in mathematics is having the desired effect on student achievement.

Assumption

The researcher has found that many Middle School teachers assume that students who come into their math classroom have already had experience working in cooperative groups. A further assumption is that low and high performing students do not both benefit from cooperative learning. Students who are high level math students will not get anything from working cooperatively with low achieving students. Finally, the assumption that students who work in cooperative learning groups are more likely to be off task, have more disciplinary problems and are less likely to have higher levels of mathematical understanding. For this study, it was assumed that MAP scores were a valid and reliable measure of student achievement in math. It

also was assumed that the implementation of cooperative groups would be fully implemented into the class as a daily routine to encourage a focused cooperative learning environment.

Hypothesis

Students who work in cooperative pairs or groups show a significant higher academic achievement than their individual counterparts.

Significance of the Project

Understanding the benefits of cooperative learning within a middle school mathematics classroom provides the opportunity to investigate how cooperative learning effects the overall performance of middle school students. The researcher looked at a group of students who had no experience of working in cooperative learning groups and two groups who came into the math class with a year of cooperative learning in a math experience. The cooperative learning was implemented into the entire middle school math program at this private school. This present study could provide data to the private school staff to justify the continued implementation of cooperative learning in the middle school math classrooms.

Procedure

The researcher compared test data from students in grades sixth through eighth grade from their previous school year 2014/15. The data were analyzed to see if a correlation between non cooperative learning and cooperative learning had a positive effect on students overall perception and grades in a middle school math classroom. Student achievement was measured by MAP results from spring and fall of 2015 and winter of 2016.

In addition, students' grades were analyzed from the 2014-2015 school year to the 2015-2016 school year to see if a positive correlation could be seen between the use of cooperative learning and overall achievement.

The researcher collected feedback from the students regarding cooperative learning. The researcher administered an anonymous survey of the students understanding and overall perception of cooperative learning before the study and a few months into the study.

Definition of Terms

Cooperative Learning: A teaching strategy where small groups of teams work together towards a common goal (McCracken, 2005).

Acronyms

MAP: Measures of Academic Progress

CHAPTER 2

Review of Selected Literature

Introduction

Cooperative learning and the impact it has on student achievement is an area of study that started as far back as the 1920's. To understand the impact that cooperative learning has on student learning, a review of literature was done to understand the history of cooperative learning. Understanding the history helps to understand the benefits that cooperative learning groups might have in a middle school math classroom. In order for cooperative learning to be effective within a middle school classroom it is important to understand the teacher/student role in cooperative groups. Looking at the impact of cooperative learning groups provides ways to promote a shift in teaching which moves education from less teaching to more learning for the students, preparing students for a world where they are working collaboratively to solve problems, communicate and listen.

History of Cooperative Learning

Small-scale laboratory research on cooperation dates back to the 1920's. In the 1970's research on specific applications of cooperative learning within classrooms was done. Now research is done all over the world. "Now researchers all over the world are studying practical applications of cooperative learning principles, and many cooperative learning methods have been evaluated in one or more experimental/control comparison" (Slavin, 1991 p. 71). It is essential to look at both experimental and control comparisons to understand the impact that cooperative learning has on the overall individual. "In the laboratory research on cooperation, one of the earliest and strongest finds was that people who cooperate learn to like one another"

(Slavin, 1991). Robert Slavin (1991, p. 71) provides four highlights of the research on cooperative learning.

1. For enhancing student achievement, the most successful approaches have incorporated two key elements: group goals and individual accountability.
2. When groups goals and individual accountability are used, achievement effects of cooperative learning are consistently positive; 37 of 44 experimental/control comparisons of at least four weeks' duration have found significantly positive effects and none have favored traditional methods.
3. Achievement effects of cooperative learning have found to be about the same degree at all grade levels, in all major subjects, in urban, rural, and suburban schools. Effects are equally positive for high, average, and low achievers.
4. Positive effects of cooperative learning have been consistently found on such diverse outcomes as self-esteem, intergroup relations, acceptance of academically handicapped students, attitudes toward school and ability to work cooperatively.

"Cooperative learning usually supplements the teacher's instruction by giving students an opportunity to discuss information or practice skills originally presented by the teacher; sometimes cooperative methods require students to find or discover information on their own" (Slavin, 1991, p. 71-72).

Cooperative Learning Groups in Middle School Math

McCracken (2005) refers to cooperative learning as a teaching strategy where small groups of teams work together towards a common goal. In a cooperative learning classroom the learning environment is structured in a way to ensure students work together and are able to see diverse viewpoints or ideas. Group work is not complete until everyone has mastered the

concept. By starting students out with small amount of times and building to longer periods of time to work as a group will help students feel more confident working with others. Communication is the key and students will learn equal opportunity, to share ideas, give and receive feedback, how no one person takes over and information being original ideas of the group. "Students who are not on task, not challenged enough, or lack confidence to complete a task successfully find other things to take up their time, usually in the form of disruptions" (McCracken, 2005, p.12). Cooperative learning enhances students' interest, motivation, creativity and success. Cooperative learning creates a more positive and tolerant learning environment.

Slavin (1987) writes, "Cooperative learning represents an odd but happy marriage between behavior and humanistic approaches to classroom motivation" (p. 35). Slavin believes teachers need to recognize students' individual learning with flexibility in class grouping and provide students opportunities to work together. The classroom becomes a learning environment which is structured in a way that ensures students work together and are able to see the diverse viewpoints or ideas of their classmates. The richness of cooperative learning compel students to interact, problem solve and build relationships that provide for a positive learning environment for all. Cooperative learning provides a task structure that insist on students working together to solve a problem, work through a situation, promote academic achievements and develop social skills. Students who give and receive elaborate explanation gain the most from cooperative learning.

With students "receiving 900 hours of instruction every year" (Slavin, 1987) and "learning environments for the 21st Century being ones in which students are actively engaged with learning tasks and with each other" (Slavin, 2010, p.10) educators are consistently

developing new ways to motivate students to do schoolwork. Grades are the most widely used but have been found to be the least motivating for students. "The assumption that academic achievement is more important than social skill development, and the mistaken notion that academic achievement is independent of social skills and peer interaction, can make full implementation of cooperative learning at the middle school level challenging" (Sapon-Shevin, 1994, p.6). Cooperative learning promotes the move away from a passive approach to learning allowing students to become stakeholders in their education process. Traditional classroom learning groups are groups assigned to work together and accept that this is what they have to do. Cooperative learning groups are groups that work together to accomplish a shared goal. Cooperative learning enhances students' interest, motivation, creativity and success. Increasing student interaction and relationships creates a more positive and tolerant learning environment.

Slavin (1991) stated research on cooperative learning goes as far back as the 1920's. The specific look at cooperative learning in the classroom began in 1970. Slavin (1991) looked at four cooperative learning models that have the most research: Student Team Learning, Jigsaw, Learning Together and Group Investigation. Student Team Learning techniques were founded and discovered by researchers at John Hopkins University. This model emphasizes team goals and team success. Team rewards and individual accountability are essential in achievement. Jigsaw method was originally designed by Elliot Aronson. The Jigsaw method deals with teams of six, working on materials that is broken into sections. Students learn their section, teach it to others and then take a quiz on the material. Learning Together was developed by David Johnson and Roger Johnson at the University of Minnesota. Students work in heterogeneous groups of four or five to complete a task. The Group Investigation method was developed in Tel-Aviv by Shlomo Sharan and Yael Sharan. Students work to develop a plan together, inquire about the

subject and discuss as a group. Slavin (1991) noted an important by-product of cooperative learning: "In the laboratory research on cooperation, one of the earliest findings was that people who cooperate learn to like one another" (p. 6). By 1991 over 70 high-quality studies had been done on cooperative learning and 67 of them looked at academic achievement. Students find greater liking of classmates and higher self-esteem when cooperative learning is used in the classroom.

Student Benefits of Cooperative Groups

Cooperative learning is considered one of the key factors for helping with student success and involves students working together on a structured learning task. However, there are strategies that make cooperative learning beneficial and strategies that make it less productive if not done correctly. Shapon-Shevin (1994) found cooperative learning is effective in the middle school for five reasons:

1. Meets the social and emotional needs of middle school students.
2. The mixing of students and helping to ensure all students are successful.
3. Teaches cooperation and team-work.
4. Increase in achievement.
5. The ease of transition for teachers.

Students state that it is too late to start in middle school because social groups are already formed. Thus teachers must train students who have not been put in cooperative groups before and not expect that students will just figure it out. All parts of working cooperatively need to be taught explicitly. "An effective cooperative group is not a collection of kids thrown together for a brief activity. It is a team composed of diverse students who cares about helping one another learn and the success of the team itself" (Slavin, 2014, p. 23). Wilkins (1997) states that the

biggest impact on middle school students' attitudes toward mathematics can be influenced the most by the teacher and his/her instruction and attitude. If a teacher has high expectations, holds kids and groups accountable for their work and is consistent with expectations of cooperative groups the overall impact on student learning is greater. Studies have shown that the implementation of group work is in a large portion of classrooms but the implementation of group goals and individual accountability is not as easily implemented. "Observational studies of teachers using cooperative methods find that most are using informal versions of the model, typically lacking group goals and individual accountability. This 'group work' creates the danger that one child can do the work for the whole group, some children will take the 'thinking roles' while the others take the clerical or passive roles" (Robert, 1999, p.74). Robert (1999) believes that much of the problem with implementation of cooperative groups in classrooms is that curriculum is not developed to accommodate cooperative work. Cooperative learning can improve interaction between students, deepen curriculum, and empower teachers and students.

"Seating arrangements have a considerable impact on behavior, and thus on learning" (Ashman, 2014, p.1). Group sitting is most beneficial, however, "social loafing" is a problem with group work - when students sit back and allow others to do the work. Educators know that not all groups are cooperative groups so they need to understand what is not considered a cooperative group. Pseudo learning groups are groups that are assigned to work together but have no interest in doing so. "Seating people together and calling them cooperative groups does not make them one" (Johnson & Johnson, 1999, p. 68). Educators must train students who have not been put in cooperative groups before. Educators should not expect that students will just figure it out. All parts of working cooperatively need to be taught explicitly. More learning takes place if roles and goals are implemented and therefore the importance of ensuring they are

established is essential. Gillies (2014) suggest five key elements for establishing cooperative learning groups:

1. Establish positive environment where groups understand the importance of finishing all work.
2. Each individual is accountable for contributing to the group.
3. Manage their group behaviors.
4. Encourage one another.
5. Give time to process and discuss.

When students "work on high-level cooperative tasks, they demonstrate higher-level reasoning and problem-solving discourse" (Gillies, 2014, p. 134). The teacher has a role of ensuring conditions are set up for higher level thinking and problem solving to take place and roles and expectations are established. Gillies (2014) found that establishing a strong cooperative learning environment allows for less discipline issues. The positive gains for students who are given opportunity to interact, listen, share ideas and question one another are much higher than traditional "sit and get."

High performing cooperative learning groups meet all the criteria of cooperative groups and outperform all other expectations. Johnson and Johnson (1999) state that there are five basic elements to cooperative learning: positive interdependence, individual accountability, face-to-face interaction, social skills and group processing. Leikin and Zaslavsky (1999) discuss four things that are necessary in order to have cooperative learning classroom: small groups of students working together, learning tasks that are engaging, equal opportunity for all group members and a responsibility for every member of the group.

Cooperative learning helps with intergroup relationships, social acceptance and increase friendships among students. While cooperative learning groups are seen both as beneficial and difficult the "outcomes seen in many studies include gains in self-esteem, liking of school, time on task and attendance" (Slavin, 1989, p.3). Students who work in groups of two or more outperform their individual counterparts. Groups of four have shown to outperform groups of two. Individual work requires students to worry only about one-self, groups of two must work on sending and receiving information and groups with more than two have even more relationship interactions to manage. Many students do not have what it requires to work in groups and must be trained how to do so. Working in pairs and fours results in greater academic peer support and higher self-esteem. Gillies (2014) found that when students are working cooperatively they are working together towards a common goal and this helps promote inter-personal relationships among the students.

Teacher/Student Role in Cooperative Groups

A study by Goos (2014) looked at the teachers' role of implementing norms and practices that will encourage mathematical thinking. The study found that "through scaffolding, peer collaboration, and the interweaving of spontaneous and theoretical concepts" (Goos, 2004, p. 282) students can be influenced with the help of the teacher to improve their understanding of mathematics. Interviews of the students in the study found that students who were allowed time to collaborate about mathematics pushed their thinking and tested their understanding of the concept.

When students are given only correct answers to a problem without detailed explanation, students do not have the opportunity to learn and they stop trying to understand. It is the job of the teacher to maintain high quality relationships among the students. The work provided to the

students must be challenging and the teacher must not step in too early to help but rather allow time for students to work together to find the answer. Teachers are facilitators and are responsible for modeling respectful behavior, allow discovery and create a space that allows students to be critical thinkers. In order to make cooperative learning work within the classroom the teacher must first create a safe place for students. "Teachers who are intentional about building successful, dimensional and vibrant classrooms can experience the joy of invested students who understand the value of respecting and challenging competing ideas and experiences" (Greene & Mitcham, 2012, p. 13).

Walshaw and Anthony (2008) discuss how teachers know when students are actively involved in discourse overall deepening their understanding of the concepts. Finding ways to get students talking about mathematics to allow for deeper understanding is essential. The structure of the classroom plays a role. The environment needs to be conducive to students sharing of ideas, a positive place where students can share, reflecting on ideas and feel comfortable and a teacher that hears and listens to students math talk.

> A successful teacher of mathematics will have both the intention and the effect to assist pupils in making sense of mathematic topics. A successful teacher is able to make sense of students' conceptual understandings and is able to determine where those understandings might be heading. Effective teachers plan their classroom discussion with many facts in mind, including the individual students knowledge and experiences and the participation norms established in the classroom. (Walsh & Anthony, 2008, p. 17)

Productive discourse allows students to access, investigate, and use mathematical concepts effectively. The research done by Walshaw and Anthony found that a teacher who sets

up their classroom to allow for discourse has a deeper understanding of their students and their students have a deeper understanding of the math.

Slavin (2014) states that it is essential that the teacher make the groups, the groups consist of four students to provide for flexibility and consist of boys/girls, high achievers/low achievers. The teams should stay together for six to eight weeks and a team name is recommended to allow for ownership. The team needs to set goals, which in turn helps to increase accountability for all. "If kids learn to make appropriate level of effort and to persist, they will build confidence in their ability to improve and learn" (Slavin, 2014, p.24). Cooperative grouping allows for four interpersonal skills to happen: active listening, explaining of ideas and opinions, encourages teamwork and completing a group task.

A study done by Gillies and Hayes (2011) found that students who received training in questioning have more advances in reasoning and problem-solving abilities. Mercer et al. (2004) found that talked-based activities, such as those that occur during cooperative group work, can be useful in scaffolding and development of reasoning and understanding. "There is no doubt that children are more interactive and learn more when they have been taught to communicate as they work on common tasks" (Gilles & Hayes, 2011, p.39). The study showed that students need to be taught how to engage in meaningful arguments and the teacher plays a key role in making this happen. The study also showed the importance of being explicit when implementing cooperative learning in the classroom. If a teacher uses specific strategies within a cooperative learning environment, students are more likely to be engaged in more elaboration and achieve higher test scores.

Peer interaction is the key to cooperative learning. Cooperative learning deals with task structure and requires students to work together. Slavin (1987) stated that providing time for

students to study together does not increase achievement but students who give and receive elaborate explanation gain the most from cooperative learning. Group goals and individual accountability overwhelmingly are two features that make cooperative learning work. "In Student Team Learning, the important thing is not to ***do*** something together but to ***learn*** something as a team" (Slavin 2010, p.2). Slavin (2010) found that students feel more success when working in groups and are more successful working with other types of students. Those students who gain the most out of cooperative groups are those students who are willing to give and receive.

Webb and Farivar (1994) found that students are more aware of which peers need help when working in cooperative groups. Students learn to help others, justify their own theory, view, or strategy, and resolve disagreements. A study by Wentzel and Caldwell (1997) looked at peer relationships and the effect on academic achievement. In the adolescent years friendships appear to influence the levels of involvement in the school and reciprocal friendships seem to have a larger impact. "Children who display helpful and cooperative behaviors tend to be well liked by their peers and earn high academic grades" (Wenzel & Caldwell, 1997, p. 119). The study done by Wenzel and Caldwell found a significant relationship between the types of peer relationships and the Grade Point Average (GPA). This study supports previous studies that students relationships with peers is important and plays a part in their academic success.

Wilkins and Ma (2003) found that students beliefs in mathematics was not a one day decision but something that changed over time. The attitude about mathematics changes slowly for students and those in middle school are more likely to like mathematics than students in high school. "On average, high achieving student did not develop their feeling of effect any faster (or slower) than did low achieving students" (Wilkins & Ma, 2003, p. 60). Students whose parents

pushed the importance of mathematics showed more acceptance of the importance of the subject. The two major areas that had the highest impact on students' attitude were teacher and peer attitudes. Cooper (1999) stated that cooperative learning enhances academics and cognitive and social outcomes and attempts to reduce competition and individualism. Students are able to give a positive contribution to the team allowing for more understanding of one another. Students who work in cooperative groups have a tendency to make friends they normally would not have in a traditional classroom.

"Research on cooperative learning is more than sufficient to justify the practical use of these methods to accelerate students achievement, but much work still lies ahead to understand fully why and how the methods effect student learning and motivation" (Slavin, 1987, p.35). The importance of having both reward and independent accountability help to make cooperative learning more effective. Cooperative learning enhances intergroup relationships, social acceptance, and friendship among students. "Outcomes seen in many studies of cooperative learning include gains in self-esteem, liking of school, time on-task, and attendance" (Slavin, 1989, p.3). With cooperative learning, all students can be successful in a classroom, even high achievers and gifted students. Cooperative learning is beneficial for everyone.

Summary

Slavin (1991) states, "Cooperative learning has been suggested as the solution for an astonishing array of educational problems. (p. 71)" Cooperative learning is nothing new to education and in fact has been part of the educational process and researched as far back as the 1920's. Today's classrooms are less likely to be structured with students sitting in rows and more likely to be structured with groups of students working together. Cooperative learning methods allow for students to work together, to learn to hold each other accountable and ensure

that all members of the groups understand the overall goals. This shift in teaching is moving education from less teaching to more learning for the students, preparing students for a world where they are working collaboratively to solve problems, communicate and listen. Research overwhelmingly points to the benefits of collaborative learning for students of all age groups. The benefits of cooperative learning with students in middle school help to promote a deeper learning of concepts and ideas and builds deeper peer relationships. If collaborative learning is structured correctly and monitored by the teacher, the academic benefits are positive for all groups of students, high achievers as well as low achievers. Providing opportunities for students to discuss, analyze, debate and understand each other gives opportunities for deeper learning to happen. Students are less likely to disengage, more likely to take ownership in their learning, and are more likely to have a deeper understanding of concepts and problem solving strategies. What happens to students who have reached upper middle school with very little cooperative learning experience? Are students able to change their thinking about group work if taught to work collaboratively to achieve a deeper understanding? What is the impact of implementing collaborative learning into a math classroom where students have had little opportunity in the past?

CHAPTER 3

Methodology and Treatment of Data

Introduction

The purpose of the study was to explore the implementation of cooperative learning in math classrooms at a small, private school in Central Washington State. The study explored student perceptions of cooperative learning, the implementation process, and the impact that cooperative learning had on standardized math test scores and student grades. "Learning environments for the 21st Century must be ones in which students are actively engaged with learning tasks and with each other" (Slavin, 2010, p. 10). This study is narrow in focus due to the relatively small number of participants. One of the groups being studied had limited experience working in cooperative learning groups within a mathematics classroom. The other two groups in the study had a year of working cooperatively in math so they came to the study with some knowledge and understanding of the process. The study included four classes - a sixth grade, seventh grade, eighth grade and an Algebra class - and only included one teacher. The teacher had limited experience with cooperative learning groups but expressed the view that cooperative learning is important and essential in building students confidence and the positive impact cooperative learning has on students overall academic achievement.

The researcher analyzed MAP data and quarter grades from the previous school year (2014-15) to have a baseline for the study. The researcher then collected two other data points throughout the current school year (2015-2016) to see if the use of cooperative learning groups within the classroom had an impact on student achievement.

Methodology

The study was done to analyze the correlation between cooperative learning and the effect that it has on middle school math students test scores and quarter grades. The researcher reviewed the previous year's MAP scores to get a baseline for where the middle school students were before cooperative learning was implemented into their math classroom. The researcher also examined the student's previous school year quarter grades. By analyzing these two data points the researcher was able to establish a baseline. The researcher investigated the cooperative learning strategies that the teacher implemented into the classroom and collected student perspectives on the effect of cooperative group work in their math classrooms. The study analyzed fall and winter MAP results for the current (2015-2016) school year in comparison to the baseline data.

Participants

The participants in this study were forty-seven middle school students, grades 6^{th} – 8^{th} grade, in a small private school in Central Washington State. The students were chosen for this study because they had little to no experience of working cooperatively in a math setting.

Instruments

In this study the utilization of test results from MAPS data was gathered from the previous spring school year (2014-2015) and the current (2015-2016) school year. A consent form was distributed to all student participants and only students who returned with consent from the parent/guardian were allowed to participate in the project. All participants were not identified by name and pseudonyms were used.

Design

The researcher started by giving an anonymous survey to students asking what they knew about cooperative learning groups, what experience they had with cooperative learning in math

and what they thought the purpose of cooperative learning is. The MAP data for the spring of 2015 was compared to the fall 2015 and winter 2016. The students overall grades in their math classes were also analyzed. Towards the end of the study the students were given another survey asking about their experience of working in cooperative learning groups and what they gained from the experience.

Procedure

The researcher started by obtaining permission slips from the middle school student's parent/guardian to utilize their data and grades. Surveys were given to the middle school math students in the fall of 2015. The survey consisted of gathering information on what the students knew about cooperative learning in a math classroom and what experience they have had. Data from spring 2015 MAP test were compared to fall and winter 2015/2016 school year. The researcher recorded this information into a spread sheet and compared the growth of each student in the middle school math class. Surveys were also given at the end of the study to compare students overall perception of math and cooperative learning. The researcher was looking for overall growth in students' academic success within a middle school cooperative learning classroom.

Treatment of Data

The data that was collected from the MAP test were put into a spreadsheet and compared to the spring 2015 to fall and winter 2015-2016 results. The surveys given to the students were analyzed, providing an overall understanding of the students perception of cooperative learning groups is. This information was put into categories and analyzed. The students overall grades were compiled from two terms and put into a table to compare the number of each letter grade earned by the students in each grade level over two terms.

Summary

This chapter covered the treatment and methodology of the data collected and used to determine the overall effect of the use of cooperative learning groups in a middle school math class.

Institutional Review

Prior to the start of the project, the Chair of Heritage University Institutional Review Board reviewed this study and determined that the study was expedited and did not require a full board review. Approval for the study was granted by the Chair of Institutional Review Board.

CHAPTER 4

Analysis of the Data

Introduction

This study sought to explore to what extent, if any, cooperative learning groups had on student achievement in a 6^{th}-8^{th} grade math classrooms.

Description of the Environment

This particular study involved a limited number of students from a small private school. The students were selected to provide a range of grade levels and various grade level perspectives. No other students within the school or from other middle schools were considered for the study.

The limitation of the study is the relatively small number of middle school participants. The researcher addressed this issue by only utilizing students who had guardian permission in participation. The collection of participants test results and overall quarter grades remained confidential. The researcher reassured all parties that all information would remain confidential and reported in pseudonyms. This type of quantitative research – test scores and quarter grades - provides an opportunity to analyze data and determine if cooperative learning in mathematics is having the desired effect on student achievement.

Hypothesis

Students who work in cooperative pairs or groups will demonstrate academic growth as measure by MAP test and overall academic grades.

Results of the Study

Forty-seven middle school students in grades sixth through eighth grade participated in the study. The researcher gave a pre-questionnaire to the students to grasp an understanding of the students' knowledge of cooperative learning groups. The results of students understanding

and feeling on cooperative learning groups is shown in the student questionnaire in Appendix A. The survey results showed that students understood what cooperative learning groups were and the purpose behind them but that they found cooperative learning to be difficult due to off task behaviors and unclear expectations/roles from the teacher. The students stated that they enjoyed working with others because it allowed them to share ideas and socialize with classmates/friends.

The NWEA identified national average RIT scores for fall, winter, and spring at each grade level (NWEA, 2015). The average growth from fall in the previous school year to the winter score in the current school year can be seen in Table 1. National average growth norms are 11 points for sixth grade students, 8 points for seventh grade students, and 6 points for eighth grade students. The overall findings within the MAP data (Table 1) showed that 64% of students in the sixth grade, 77% of students in the seventh grade and 56% of students in the eighth grade showed above average growth in their overall MAP scores. This resulted in a 5.33% increase in sixth grade, a 6.52% increase in seventh grade and a 6.87% increase in the eighth grade. The average growth between fall and winter is 3 to 4 points. Students involved in the study had as little as a 2 point gain and as high as a 22 point gain. Students in the study showed an above average increase of 61%. Table 1 shows MAP scores of students in grades six through eight from Fall of 2014 to Winter 2015 as well as the variance from Fall 2014 to Winter 2015.

The impact cooperative learning groups has on grades was not as noticeable. Table 2 shows the overall grades of the students in Term 1 and Term 2 during 2014-2015 and 2015-2016 school year. In 2014 Term 1 79% and Term 2 72% of students had an overall grades of A's and B's. Whereas in 2015 Term 1 88% and Term 2 76% of students had an overall grades of A's or B's.

The researcher also spent time in the classroom observing the students interaction while working cooperatively. In the beginning of the school year, the students held each other accountable to their roles and class expectations, however, as the year progressed the researcher noticed that many of the groups fell away from this. This was in part due to the fact that students were not held accountable by the teacher to ensure that they were following the protocols set in place in the beginning of the school year. Statements made by the teacher were things like, "you know what to do," or "get into groups." This resulted in students being lackadaisical and less likely to follow through on the expectations. Students in the classroom were observed sitting in class, wasting time, and not engaged in the assignment. The students would be overheard saying, "I will just do the assignment later" or going straight to the teacher for help, wanting them to give them the answer. Talking was taking place in the classroom but a majority of the time it was of topic and had nothing to do with math. Observations were made of students talking through the problems asking each other questions like, "how did you get that answer" or "can you help me understand how to do this problem." The researcher observed that students who generally would have been off task and not engaged in the lesson were engaged and involved in the activity. These same students were also observed helping others understand the problem. The students overall observations showed that they enjoyed working cooperatively and though at times got off task overall were working towards completing the task or assignment. The students were engaged in the cooperative learning groups: this was evident when working to put together activities for Pi Day. The students were excited to develop their own ideas, plan the activity, and solve problems together. The students also took ownership for learning to ensure that one another was completing assignments. When studying for a test, they asked each other if

they were prepared. The researcher observed that the students who worked together in cooperative learning groups expressed a positive attitude toward math.

The forty-seven students who took part in the research also took part in a post-questionnaire in order for the researcher to understand the students' outlook on group work after seven months. The results of the students' overall feeling on cooperative learning groups is shown in the student post-questionnaire in Appendix D. The survey results show that students overwhelmingly felt that cooperative group work was beneficial and positive, although one students did state that it does not help at all. Forty-eight percent of students preferred group work because it helped them understand and figure things out, twenty-six percent preferred individual work because they can get more done and twenty-six percent said it depends on if it is something they understand and, if not, then they preferred group work. All students no matter how they felt about group work said they enjoyed having time to talk with their classmates or friends.

Findings

Cooperative learning groups were first used consistently during the 2015-2016 school year in the middle school math classroom at this school. MAP tests were given fall and winter 2014 and 2015. When the results of the MAPs were analyzed the overall impact on students overall growth showed that 87% of the students showed an increase. The data however did not show a significant impact on students overall grades within a middle school classroom where students worked in cooperative learning groups. The biggest impact was on the students overall gain in MAP scores but there was less of an impact on their overall grades.

Discussion

As a result of the project the researcher intended to verify that middle school math students working in cooperative learning groups will demonstrate academic growth as measured by MAP tests and GPA. The researcher wanted to understand the benefits of cooperative learning groups within a middle school mathematics classroom and explore how cooperative learning effects the overall performance of middle school students. In the tradition of Action Research this researcher wanted to provide data to the school staff to justify the use of cooperative learning in the middle school math classroom.

The researcher looked at a group of students who had limited experience of working in cooperative learning groups and two groups who came into the math class with a year of cooperative learning in a math experience. The cooperative learning was implemented into the entire middle school math program at this private school.

The overall impact of cooperative learning groups did have a positive effect on the students overall friendships and communication skills. The overall impact on students grades was not as positive as the researcher had expected. Students did show a positive impact on their overall MAP scores. A large percentage of students showed an above average gain for their grade level on the MAP test. The results can be seen as a positive impact on the students overall academic achievement within mathematics.

Summary

The researcher used the data collected from a student questionnaire, MAP scores and individual grades over two consecutive years. From the data, the hypothesis was supported with limitations. The overall impact on MAP results was seen as positive whereas the impact on students overall grades was not as positive. The overall results do support the importance of utilizing cooperative learning groups in classroom but teachers need to ensure that routines and

expectations are set and understood by all students. The grades of students have many variables and so the connection of overall grades on higher academics is less reliable data than the overall MAP results.

CHAPTER 5

Summary, Conclusion and Recommendations

Introduction

The purpose and nature of the research project was to explore cooperative learning and the impact on student achievement in a 6^{th}-8^{th} grade math classrooms.

Summary

There are several benefits the researcher found while researching cooperative learning groups in Middle School mathematics classrooms. The biggest impact observed was the social interaction needed by Middle School students. The students who were previously unmotivated and unengaged were more motivated and engaged in the math activities when given the opportunity to work cooperatively with their classmates.

There are also some downfalls with the use of cooperative learning groups in mathematic classrooms. The researcher found that it is somewhat of a struggle for teachers to move away from controlling the class and allowing more independent learning to take place. Students also must understand their role in the group and follow those roles to ensure that the group is on task and accomplishing what needs to be done. The researcher will continue to evaluate how to ensure that cooperative learning groups are used effectively in middle school mathematics classrooms.

Conclusion

Results show that cooperative learning groups have a positive effect on students overall interaction with each other leading to positive increase in student overall understanding and problem solving. There was less of a positive impact on students overall GPA which could be due to other factors that were not studied. After analysis of MAP data, the results showed that

the percentage increase made by students ranged from 5% to almost 7%. The hypothesis was found to be partially correct. The findings found that students performed higher overall on their MAP test, built stronger relationships with their classmates and enjoyed working in cooperative groups which lead to a stronger positive impression about math.

Recommendations

Based on the conclusion, the researcher recommends that the study be done with a larger group of participants. In order to ensure that the findings are accurate it would be recommended that a larger participant pool be used to investigate the hypothesis. A recommendation by the researcher is to ensure that if the study is replicated that the participating teacher(s) clearly understand the benefit of group work and how to prepare students to work in groups. Another recommendation would be that the replication of this study be done with a larger group of students in both private and public schools with more than one class at each level to determine if the outcomes would be similar. Another recommendation would be that experimental design with a control group and randomized assignments to treatment group be used along with regression analysis to control for student differences.

The use of cooperative learning groups is extremely beneficial to students overall self-confidence and motivation of Middle School students. The importance of ensuring protocols of group work are implemented and followed through is a key to success. The researcher suggests that the use of cooperative learning groups in Middle School math class be part of the daily routine to provide more in-depth learning to take place for not only struggling students but all students within the math classroom. Implementation of cooperative learning groups will also provide a stronger sense of community and ownership within the Middle School math classroom.

The overall impact of cooperative learning groups in Middle School math shows a strong benefit to ensuring students' engagement and overall view of middle school math.

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Appendix A

Student Questionnaire-Pre

Culminating answers given by students

What is cooperative learning groups?

- Work as a team/group
- Discuss problems/share answers/decide together
- Helping each other find an answer to a problem
- Encourage each other/listen/stay focused
- Respect each other/help other learn
- Roles of individuals
- Groups are groups of 4.

What do you like about working in groups?

- Get work done/talk to friends
- Get help when confused or unsure
- Extra pair of eyes on my work
- Other people to discuss with/opinions
- Different ways of doing something/perspectives
- Someone to check answers with
- Sharing of ideas

What do you not like about working in groups?

- Too much talking/off task
- Slows me down/takes longer/not on my own
- Only one working/not working together
- Not clear roles or expectations
- Arguing about answers

Appendix B

Table 1

6th grade Students	F14	W15	F15	W16	Total increase	Total % increase
FF	226	229	227	233	7	3.10%
GG	226	240	238	245	19	8.41%
HH	196	189	190	187	-9	-4.59%
II	219	217	222	230	11	5.02%
JJ	228	233	235	238	10	4.39%
KK	229	240	241	235	16	6.99%
LL	220	229	221	234	14	6.36%
MM	N/A	N/A	222	227	N/A	N/A
NN	232	246	245	244	12	5.17%
OO	215	234	234	228	13	6.05%
PP	226	234	232	239	13	5.75%
QQ	210	212	221	222	12	5.71%
RR	215	232	226	232	17	7.91%
SS	221	234	230	236	15	6.79%
TT	215	222	223	229	14	6.51%
Average	**219.9**	**227.9**	**227.1**	**230.6**	**11.7**	**5.33%**
National Average	**211**	**217**	**218**	**222**	**11**	**5.21%**

7th grade Students	F14	W15	F15	W16	Total increase	Total % increase
Q	223	229	232	240	17	7.62%
R	211	220	206	231	20	9.48%
S	N/A	N/A	225	233	N/A	N/A
T	232	232	244	249	17	7.33%
U	244	240	246	251	7	2.87%
V	244	243	259	260	16	6.56%
W	218	229	240	233	15	6.88%
X	237	233	241	248	11	4.64%
Y	233	239	248	253	20	8.58%
Z	228	236	241	244	16	7.02%
AA	226	238	233	244	18	7.96%
BB	196	208	191	195	-1	-0.51%
CC	227	239	237	245	18	7.93%
DD	N/A	N/A	203	222	N/A	N/A
EE	225	235	240	244	19	8.44%
Average	**209.1**	**232.4**	**232.4**	**239.5**	**14.8**	**6.52%**
National Average	**218**	**222**	**223**	**226**	**8**	**3.67%**

8th grade Students	F14	W15	F15	W16	Total increase	Total % increase
A	205	212	221	213	8	3.90%
B	226	234	238	245	19	8.41%
C	208	218	211	222	14	6.73%
D	214	232	229	229	15	7.01%
E	210	232	232	237	27	12.86%
F	222	224	238	245	23	10.36%
G	227	241	232	235	8	3.52%
H	221	226	235	230	9	4.07%
I	213	225	216	215	2	0.94%
J	230	244	243	253	23	10.00%
K	220	226	237	236	16	7.27%
L	221	230	229	227	6	2.71%
M	210	226	219	229	19	9.05%
N	220	229	233	237	17	7.73%
O	205	204	214	218	13	6.34%
P	234	231	247	255	21	8.97%
Average	**217.9**	**227.1**	**229.6**	**232.8**	**15**	**6.88%**
National Average	**223**	**226**	**226**	**229**	**6**	**2.69%**

Appendix C

Table 2

2015 -6th Grade	A	B	C	D	F
Term 1	6	7	1	1	0
Term 2	6	3	4	0	2

2014-6th/7th Grade	A	B	C	D	F
Term 1	8	3	1	1	0
Term 2	7	2	3	0	1
2015-6th/7th Grade	**A**	**B**	**C**	**D**	**F**
Term 1	8	4	2	0	0
Term 2	6	4	1	2	1

2014-7th/8th Grade	A	B	C	D	F
Term 1	3	9	2	1	1
Term 2	5	5	1	4	
2015-7th/8th Grade	**A**	**B**	**C**	**D**	**F**
Term 1	4	8	4	0	0
Term 2	4	9	3	0	1

Appendix D

Student Questionnaire-Post

Culminating answers given by students

How do you feel about working in groups in math has helped you as a math student?

- Learn more from others around me
- Get help from my classmates
- Show more work than if I worked by myself
- Problem solving and teamwork
- Find mistakes for me
- Does not help me, end up doing all the work

If you could choose would you prefer group work or individual work?

- 48% prefer to work in groups
- 26% prefer to work individually
- 26% if they get it individually, if they do not as a group