7-2007

Increasing Student Confidence and Knowledge through Student Presentations

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Math in the Middle Institute Partnership
Action Research Project Report

in partial fulfillment of the MA Degree
Department of Teaching, Learning and Teacher Education
University of Nebraska-Lincoln
July 2007

Confidence and Student Presentations

Abstract

In this action research study of a 9th grade Algebra classroom, I investigated the influence of having students present homework solutions and what effect it had on student learning and student confidence. Students were asked to present solutions to homework problems each day and were rated on how well they did. The students were also surveyed about their confidence and feelings about mathematics. Students were also observed for information about who they asked questions of when presented with a math problem they did not understand. In this classroom, two teachers were involved in instruction and this study examines what affect this had on student learning and who was asked for help. As a result of presentations, students' confidence increased and students reacted positively to both the presentations and their own mathematical learning. The students felt the presentations were a benefit to the class and watching their peers solve mathematical equations helped them to better understand the mathematics.

Introduction

I would like to start off by saying I did not consider myself a math teacher before starting the Math in the Middle experience. I was a special education teacher who just happened to work with a lot of students who struggled with math and I wanted a better way to get my students to retain what I was teaching them. My view of mathematics and myself has changed drastically as I have participated in Math in the Middle. I can now see we are all responsible for educating our students to the best of our ability. I am not just a special education teacher. I am a teacher and I need to give all students opportunities to understand and develop mathematical reasoning skills.

I teach in the Shelby Public School district. It is a rural, Class III, school located in Shelby, Nebraska. Shelby is a town of 700, located in the east central part of Nebraska. The major industry is agriculture. The school serves a student population of 289 students in grades K-12. Grades K-12 are located in one building. The Nebraska School Activities Association classifies Shelby High School as a D1 school. Shelby Public School has an outstanding tradition of academic excellence and community support.

Our school district employs 22 certified staff and I am one of two special education teachers. My assignment is as the 7th through 12th grade special education teacher. The district's student population is slightly above the state average for free and reduced lunch but below the state average with regards to students who learn English as a second language, mobility rates of students, and numbers of special education students. Mathematics graduation requirements state a student complete 20 credit hours and the required courses are Algebra and Geometry.

As part of a more inclusive special education philosophy and my own increased knowledge of mathematics, I was given the tremendous opportunity to become a part of the 9th grade Algebra class offered at our school. I was able to see how many students interact in a

classroom setting and be a support for all students in the class. Previously, I worked with students in a "pull out" setting. They received primary instruction in the regular education classroom and then came to my room for additional support. I did not see their interaction with others and I did not hear the instruction they were given. I involved this Algebra I class in my action research project in hopes of increasing student knowledge and improving my own teaching skills.

The class consisted of 26 students, 11 boys and 14 girls, with 13 participating in the research project. The class included six students with identified disabilities who had previously received special education support in an alternate classroom. The other teacher (Mr. H) of the class is the only mathematics teacher for 7^{th} through 12^{th} grades and had taught this group of students both in 7^{th} and 8^{th} grades. The class was taught in Mr. H's normal classroom and I joined them most days. As an observer in the classroom, I was able to see many positive and some negative things were going on in the classroom.

As part of Mr. H's teaching style, students were asked many questions throughout instruction time. These questions were answered mainly by someone just yelling out answers when they knew them. Rarely were students given time to think about answers and then given a chance to respond. It was very easy for me, as an observer, to see over time that only about the same five students were giving answers. They were the students who followed and understood quickly.

All students were not required to actively participate in class with Mr. H. Many students were easily out-voiced by others in the class. These students knew there was someone else in the classroom who would answer. There were other students who often had the correct answer but did not speak loud enough to be heard. There were students who would not even try to answer

questions. When asked in class and informally, some students responded they just were not sure if they were right and did not want to be embarrassed.

I was given many opportunities to contribute to the class and the third day of the school year, I was asked to teach the class. I did not have many decision-making opportunities but Mr. H was very open to new ideas and opportunities. For example, I did not decide the pace or schedule of the class, nor did I determine homework. However, I was able to try new instructional techniques. This willingness to allow me to incorporate new ideas into the classroom is a major reason why this action research project could be completed. Had I not been in a classroom with someone willing to try new things, the behavior of the students and of the teacher would have remained the same.

When teaching there are many times teachers may think 'I wish I could do this over and over' because of how successful a particular lesson or activity was. Then, there are many times teachers may think 'I hope I do not have to do this again.' There are also times when a teacher wishes things could have gone just a little bit better. Teachers want to be able to improve their instruction to improve student learning. When thinking about these times several things came to my attention.

First, I wish my students were more confident. Students complete a homework assignment, but often they do not seem to really understand the concept. They do only the minimum amount of work and do not really learn the idea. Second, I wish there was a way to show students that there is more than one way to solve a problem. I can show them several examples but they do not always take the time to try them. I also do not have all the answers. Many times students come to me with a question or problem they have looked at differently than I did. I want all of my students to be exposed to these different solutions. Lastly, I would like to

know if having two teachers in the classroom explaining the work in different ways has improved students' comprehension and understanding of the topics. I want students to be comfortable enough to ask either of us a question and know we are going to be able to explain it to them in a way they will understand. After taking time to look at these issues I feel I can focus on one problem. I would like to see students' knowledge and confidence in mathematics increase and their dependence on teachers for problem solving decrease by having them present solutions to problems and explain their solutions to the class.

I am a special education teacher. My role in the school is not that of a math teacher. I have been assigned to "co-teach" in this Algebra I classroom. I look at this assignment as positive for both the students and myself. I hope it is considered positive for the regular education math teacher also. When I say my classroom, I am talking about this Algebra I class. I am responsible for teaching sections of the class but I do not determine what is taught or the order it is taught. I am able to make changes in the classroom now after discussing them with the regular education teacher. There are many things cannot be changed but I want to focus on those things I can.

In looking at this classroom, one important thing jumped out at me: only a very few students answer questions in class. Questions are asked and answers are yelled out. Only students who really understand the concept or those following closely ever answer these questions. This group happens to be a group of about 5 boys. Occasionally, a few female students will answer but only if the question is repeated or a different answer is requested. I know there are students who understand what is being taught but they are not confident enough or quick enough to answer. I also know there are students who are not following and do not understand what is

being taught. I feel all students need to contribute in the class. I also feel if students are given an opportunity they will succeed in completing these problems.

With my experience in Math in the Middle, I have seen how beneficial it is for students to show what they have completed to other students. I have learned so much from my classmates I may not have learned otherwise. I have seen ways to solve problems that would have never occurred to me. I was never confident in what I was being asked to present and there were many times when I hoped I would not be asked to present solutions at all. The further I got in my studies and the more times I was asked to make presentations of my solutions, the more confident I became over time. I became more willing to try problems when I was not 100% confident the answer I had was correct. I was given an opportunity to increase my learning while hopefully helping my other classmates. I want to be able to offer these experiences to my students as well. I want them to experience the confidence I felt in completing something I was sure I would not be able to do. I want them to have the opportunities to help others in the classroom by explaining what they have completed in different ways than I or the other teacher may be able to. I want them to know other people in their class can be great sources of information.

Many questions come to mind when I start to think about this problem. How can I incorporate the students more into the class? How can I make them more active? Do I have the time to do it? Are the students going to be able to complete what I ask? Do I have them work in groups or individually? If I have them work in groups how do I determine the groups? How can I grade these? Do I grade them? How do I know if their confidence is increasing? How do I know if their knowledge is increasing? How do I implement this without causing too much disruption in the class? There are many questions that can be asked about this problem. The one that most

concerns me is how do I determine if this is a benefit to students? Are they becoming more confident and is their knowledge increasing?

There are several possible interventions that can be used to make this goal possible. Having students be responsible for presenting a homework problem everyday is a strategy I have started. Two students are chosen and each given one problem. At the beginning of the period the next day, they are asked to explain to the class how they completed the problem. I am struggling with the time it takes to get these done. I am feeling pressure from the other teacher and I wish we were able to do more. We are not grading the problem at this time yet the students seem to be working hard to get the answers correct and explain what they have done. They are still really concerned when the regular education teacher or I ask them a question. They think they have done something wrong when really we just want them to clarify what they have done. Students come into class and start writing the problems on the board. They then sit down in their seats and explain their solutions from their desks. I wish they would come to the board. This is something I can work on.

There are many things I still need to learn about this issue. I need to study and find out if other teachers have seen a benefit in having students present solutions. I also need to look at the benefits and drawbacks to co-teaching. What can I look for in my classroom? Making sure all students are able to participate in the class is going to improve their learning. What more can I do to help them?

The purpose of this study is to see if my students' knowledge and confidence in mathematics increases while their dependence on teachers for problem solving decreases by having them present solutions to problems and explaining their solutions to the class. All students are currently not required to participate in the classroom. Only students who grasp the

topic or are comfortable with the math content respond. Making the classroom one that requires all students to participate and take an active part in their own learning will benefit them and is a goal of this project.

Literature Review

How many teachers know how many students will raise their hands to answer a question before teachers ask a question? How many teachers know what students will not raise their hands at all? Every teacher has students who are willing to answer every time they are asked questions. In my class, there are students who will answer correctly every time also. There are also students who would not say anything all year if permitted. There are many reasons why there is this range of students. Some students truly understand what is being discussed and understand what the teacher is asking of them. Some of the students are ones who struggle academically or just do not have the confidence to answer in front of the whole group. They also may just be afraid they are going to answer incorrectly.

Getting students to participate in class discussions is often difficult. Teachers may also get into a rut and allow the same students to answer. The challenge for teachers is to make sure an environment is created conducive to having students participate in class. Teachers have an obligation to make sure students understand the expectations and how to achieve them. Teachers need to show students the answer is not always the only thing to be learned from solving a problem; understanding the process used to solve a problem may be even more helpful than knowing the right answer. Teachers are obliged to help increase confidence of students so they are comfortable with what they can contribute to the classroom. Teachers must show students the importance of communicating what they know is just as important as just knowing the

information. Teachers need to show all students teachers are not the only experts in the class; peers offer a valuable wealth of knowledge other students can use.

Problem Solving

Students are asked to solve problems everyday in math class as well as other classes. Most times, these problems are computational rather then conceptual. Students should be allowed to make the subject problematic. "Allowing the subject to be problematic means allowing students to wonder why things are, to inquire, to search for solutions, and to resolve incongruities" (Hiebert, Carpenter, Fennema, Fuson, Human, Murray, Olivier, & Wearne, 1996, p. 12). Allow students to work through problems gives them problem solving skills they will use through out their lives. "Students should have frequent opportunities to formulate, grapple with, and solve complex problems that require a significant amount of effort and should then be encouraged to reflect on their thinking" (NTCM, 2000, p. 52). Giving students opportunities to solve problems increases their understanding and comprehension of topics.

NTCM (2000) defines problem solving as a "means of engaging in a task for which the solution method is not known in advance" (p. 52). In the past, students have traditionally been given the skills needed to complete a task and then asked to do it. The conceptions of problem solving have been colored by a distinction between acquiring knowledge and applying it. "The distinctions suggest that computation procedures should be acquired first and then applied to solve problems" (Hiebert et al, 1997, p. 13). When giving students all the skills they need to solve problems we do not allow them time to formulate their own strategies. "By working through problematic situations, students learn how to construct strategies and how to adjust strategies to solve new kinds of problems" (Hiebert et al, 1997, p. 17). When confronted with different problems in different situations, students who have been given the opportunity to

develop their problem solving skills are more likely to be able to work through a new problem effectively and efficiently.

Hiebert et al (1996) suggests strategies for solving problems. "One is the particular procedures that can be used for solving particular problems. The second is the general approach or ways of thought that are needed to construct the procedures" (Hiebert et al, 1996, p. 17). Giving students several strategies to use helps them determine what will be most effect to solve problems. "Students should acquire ways of thinking, habits of persistence and curiosity, and confidence in unfamiliar situations that will serve them well outside the mathematics classroom" (NTCM, 2000, p. 52). Students are not only able to solve mathematical problems, they are able to work through all types of problems.

Interaction with Peers

"Learning with understanding can be further enhanced by classroom interactions, as students propose mathematical ideas and conjectures, learn to evaluate their own thinking and that of others, and develop mathematical reasoning skills" (NTCM, 2000, p. 21). Many students look to the teachers to have all the answers. Many students do not see the great wealth of knowledge among peers. Students must begin to understand their peers, and what their peers know, can transform their learning experiences. Blumenfeld (1996) states peer learning is a way to improve attitudes toward school, foster achievement, develop thinking skills, and promote interpersonal and intergroup relations. Students can benefit in many ways using peer learning. Blumenfeld also feels "peer interactions can promote (a) student exchanges that enhance reasoning and higher-order thinking; (b) cognitive processing such as rehearsing, organizing, and integrating to others' ideas; and (c) perspective and encouragement among those involved with work" (p. 38). Many others have seen the benefits of peer interaction. Lampert (1986) stated

social interaction can be used to promote the recognition of connections among ideas and the reorganization of knowledge. She continues to say by having students talk about their informal strategies, teachers can help them become aware of, and build on, their implicit informal knowledge (Lampert, 1996). Teachers must be aware of what they are asking their students to do. "Cooperative learning has been consistently found on such diverse outcomes as students' self-esteem, intergroup relations, acceptance of academically handicapped students, attitudes toward school, and ability to work cooperatively" (Manswell Butty, 2001, p. 22). Fostering student interactions can benefit students in many ways.

Bentz (1996) shows the importance of student collaborations looking at the development of student.

> The importance of having students work with each other relates to what Vygotsky termed as the "zone of proximal development." The zone of proximal development is the difference between what a child can do independently and what the child can do with the help of others. According to Vygotsky, merely exposing students to new materials through oral lectures allows neither for adult guidance nor for peer collaboration. Based on the role of dialogue and language in instruction and cognitive growth, Vygotsky's work emphasizes the importance of having students work with one another in addition to receiving instruction from adults. (p. 202)

Students can learn many beneficial things from their peers but we must remember that they are still students and must have instruction.

Attitudes and Confidence

Many things influence the attitudes of students. If one asks students to explain why they do or do not like mathematics, some will say they are just not good at it and others will say they are not confident. One factor that can affect student attitudes is experiences they had when they were younger. "Changes in attitude occur between primary school and secondary school; in primary school it was acceptable to be considered 'good at mathematics,' but at secondary

school it may become necessary to hide such talents" (Jones, 1995, p. 158). These attitudes greatly effect the choice students will make when choosing mathematics course they take. "Early experiences with mathematics, here defined as school experiences at the primary level, and parental attitudes towards the subject may have had a strong influence on the self-concept profiles" (Relich, 1996, p. 191). All of these attitudes affect the performance of students.

Another affect on students' attitudes can depend on their gender. "There is considerable evidence that males are more positive about personal aptitudes in mathematics when compared to females, despite the fact that similar performance differences are not substantial by research evidence" (Relich, 1996, p. 179). Girls feel they are not as knowledgeable when asked about mathematics. "Girls tended to attribute their failure to lack of ability, whereas the boys blamed their failure on lack of effort" (Jones, 1995, p. 160). Boys feel that they can do the mathematics if they try. "The greatest difference between boys and girls can be found in their attitudes to and self-confidence in mathematics rather than in actual achievement"(Relich, 1996, p. 180). The self-confidence of students can be seen in the classroom. "Bright girls demonstrate a 'fear of success' in mathematical situations in far greater numbers than boys" (Jones, 1995, p. 158). Others have seen the affect of attitude on gender groups. "Girls have confidence in their female peer group, but have less confidence in their own ability" (Jones, 1995, p. 160). Teachers must remember students' attitude can be dependent on their gender.

"Teachers' attitudes in mathematics may have an influence on how students perceive their own abilities to deal with mathematics" (Relich, 1996, p. 180). Teachers can show students that they are able to solve problems and have mathematical ability. "When students work hard to solve a difficult problem or to understand a complex idea, they experience a very special feeling of accomplishment, which in turn leads to a willingness to continue and extend their engagement

with mathematics. Students learn more and learn better when they can take control of their learning by defining their goals and monitoring their progress" (NTCM, 2000, p 21). When teachers have a positive attitude students are more likely to have a positive attitude.

Knowledge and Understanding

Teachers want to have every student completely understand the conceptual ideas presented to them in our mathematics classrooms. Many times students want a formula or process to follow without caring about the reasons why a particular formula or process is appropriate. Increasing students' knowledge and conceptual understanding is very difficult. "In recent decades, psychological and educational research on the learning of complex subjects such as mathematics has solidly established the important role of conceptual understanding in knowledge" (NTCM, 2000, p. 20). Teachers must stress to students that conceptual learning is important.

Manswell Butty (2001) states students must first be provided with opportunities, encouragement, and assistance before they can engage in thinking, reasoning, and sense making in mathematics. Consistent engagement in such thinking practices should lead to a deeper understanding of mathematics as well as increased ability to demonstrate complex problem solving, reasoning, and communication skills upon assessment of learning outcomes. (Manswell Butty, 2001, p. 23) One way to acquire this conceptual understanding is the use of real-life situations. Hiebert (1996) states mathematics acquired in realistic situations will be perceived by students as being useful, rather than acquiring knowledge that is isolated from real situations, students will acquire knowledge that is connected to such situations, and they will be able to apply this knowledge to a range of real-life problems.

A second way to help with conceptual understanding is to require students to engage in testing. "Testing has a powerful positive effect on future retention. If students are tested on material and successfully recall or recognize it, they will remember it better in the future than if they had not been tested" (Roediger, 2006, p. 249). Students that are required to understand a topic because they will be tested on it are more likely to work hard and gain conceptual understanding.

Teacher and Student Roles

Each person in the classroom has a responsibility. The teacher's role is of a leader. "The teacher's actions are what encourage students to think, questions, solve problems, and discuss their ideas, strategies, and solutions" (NTCM, 2000, p. 18). Teachers need to take the time to teach the students how to work in groups and how to communicate their ideas. "Students may not know how to help effectively and may require special training to learn how to elaborate their thinking" (Blumenfeld, 1997, p. 38). Hiebert (1996) explains the role of the teacher and students share the responsibility for developing a social community of students problematizes mathematics and shares in searching for solutions. "It is the teacher responsibility to select and present tasks and it is the students' responsibility to share the results of their inquiries and for explaining and justifying their method" (Hiebert et al., 1997, p. 16). Students are more likely to be engaged in an activity if the class had established a culture in which students knew they had the freedom and responsibility to develop their own methods of solutions.

Communication

NTCM (2000) states "communication is an essential part of mathematics and mathematics education. It is a way of sharing ideas and clarifying understanding" (p. 60). Students need to be given an opportunity to express what they have learned and communicate

how they have completed a problem to their peers. Adler (1999) found pupil verbalization in the mathematics classroom is a resource. "Verbalization is a tool of thinking and a display of mathematical knowledge. If pupils could clearly say what they were thinking, then they knew the mathematics under consideration" (Adler, 1999, p. 54). Requiring students to verbalize what they have learned can be a powerful tool for understanding. "Teachers have found that being explicit about mathematical language benefited all pupils in their mathematics classes" (p. 48). Teacher must model what they expect of their students. "Students gain insight into their thinking when they present their methods for solving problems, when they justify their reasoning to a classmate or teacher, or when they formulate a question about something that is puzzling to them" (NTCM, 2000, pp. 60-61). When students must communicate what they have learned or ask a question they must be able to express to others what they specifically need.

Communication of mathematical ideas not only benefits the speaker but also the listener. The person listening forces the student speaking to be concise and clear. Listening to others' explanations gives students opportunity to develop their own understanding. "Collaboration is a key to help students construct knowledge and to introduce them to disciplinary language, values and ways of knowing" (Blumenfeld, 1996, p. 39). Requiring students to learn from each other forces them to be explicit about what they are learning. "Students who have the opportunities, encouragement, and support for speaking, writing, reading, and listening in mathematics classes reap dual benefits: they communicate to learn mathematics, and they learn to communicate mathematically" (NTCM, 2000, p. 60). Students and teachers can now communicate within the same context.

Helping students to understand how to communicate mathematically is something we as teachers must do. Giving students opportunities to show what they know and how they achieved

their answers is important. Teachers are obligated to create learning environments that allow students who may not have confidence to participate and excel. Teachers must show all students the answer is not always the most important thing and how we solve a problem is helpful. Lastly, we are required to show students we are not the only experts in the classroom and they can turn to their peers for help when needed. Achieving all this will not happen in one day, but taking time to look at your classroom can help to increase these activities.

Purpose Statement

The purpose of this study is to see if students' knowledge and confidence in mathematics increase and their dependence on their teachers for problem solving decrease by having them present solutions to problems and explaining their solutions to the class. Will the students benefit from seeing someone other than the teacher solve problems? Will they begin to see there are several ways to solve problems and one way is not always the "right" way? Can they look to their peers as problem solvers and help them with questions they may have?

The questions I will be specifically looking at are:

1. What effect does requiring students to be more involved in the presenting of the mathematics have in their confidence in solving the mathematics?
2. How do I show improvement in their mathematics when asked to present solutions?
3. How many times do the students ask the teacher for help as compared to asking other students and does having two teaching in the classroom help?

Method

The first step I took to beginning the action research was to send parent and student permission slips out. They were sent out on February 6, 2007 to all 26 parents of students in Algebra I class. Parents were instructed to return the signed permission slips to the school and

specifically the high school principal. Students in the class were told the permission slips were being sent and they could choose not to participate if they wanted to. The students were told exactly what would be expected of them and participating or not participating would in no way affect their grades. They were informed the only change that would occur would be the collection of data and I would be making copies of what was needed.

The research project began on February 12, 2007 by giving the students a pre-test (Appendix A) and a survey (Appendix B). The survey was divided into two sections, a rating scale and short answer questions. Each section was aimed at asking the students about math and how confident they feel. There were also questions that asked students who they went to with questions. They were asked how they felt about the classroom presentations and about having two teachers in the classroom. The students were told they could answer this survey honestly without repercussions and could give an honest opinion.

The pre-test that was given covered the next four chapters to be covered in class. There were three multiple-choice questions from each chapter, two review questions, and one challenge question, making 15 questions in all. Students were told that they were taking a pre-test and given a class period to complete both the pre-test and survey. I wrote the pre-test with input from Mr. H., making sure the test did not include something that would not be covered.

During the first week of the study I also observed students during their "study time" at the end of the class period to record how many students asked questions and who they asked. This was completed by keeping tally marks for each student who asked Mr. H. or me a question and when students asked other peers in the class. I did this two other times during the course of the research project to determine if students were more willing to ask others questions.

The bulk of the data collection came at the beginning of each class period when two students were asked to present solutions to problems they had been assigned the previous day. The students were asked to complete the problem on paper which I collected each day, and then write their solutions on the board and describe what they did for each problem to their classmates. As each student presented their problem, I evaluated then using an evaluation form (see Appendix C). I created this evaluation form for use in this research project. It includes a 1 to 5 rating scale with 5 being the highest score. It also allowed me to write about what I felt went well, what went poorly and the overall impression of the presentation. The form was also used to do weekly journaling about the presentations, reflect on the week and how things went. This was occasionally difficult to write because I often felt there were many times things could not be changed. Not being the primary teacher, in this situation, was very frustrating.

Another source of data collected were quizzes. Students were given quizzes at least once a week, and during at least one week of the project, three quizzes were given. Each of these quizzes was very short in length, from two to six questions. The quizzes were written and graded by Mr. H and then given to me for use in this research project. The quizzes covered the topic students had been given a homework assignment over and they were able to ask questions if they had any.

Interviews were conducted with five students, chosen at random, in the study (see Appendix D). The interviews were conducted in my special education classroom with no one else in the room. The interviews were tape recorded for the purpose of allowing me to review what was specifically said. Interviews were conducted both during class time and after school. No student was required to stay after school; they chose an appropriate time to be interviewed. The students were honest in answering the questions and gave sincere, thoughtful answers. I

thought this because they took time in answering. Class grades were also collected for use in the study. I used the classroom teacher's grade book after school was completed to analyze growth from the beginning to the end of the study.

The last data looked at was standardized testing data. Shelby Public Schools uses Iowa Test of Basic Skills and Iowa Test of Educational Development as its norm referenced tests. Data was gathered from the 2005-2006 and 2006-2007 school year. During this time period, the district updated to a more current form of the test. The students in the study were tested within the whole school testing period and data was gathered after school was completed. I had access to the ITBS and ITED test scores including individual, class and school wide data.

Findings

Overall, the students and I felt the student presentations were beneficial, increased their understanding of the material and helped with mathematical learning. The students felt it was important to understand math skills and they would need and use these math skills later in life. Students felt confident when they presented and I believed they had made gains in the mathematics because of their performance both in class and with the homework presentations. The students stated they learned from their peers and they learned new things when other students did their presentations. They also stated they benefited from having two teachers in the classroom. However, student performance on the pre-test and posttest did not show an increase in knowledge. Even though students stated they learned from student presentations they are far more likely to ask a teacher for help than other students.

The first question asked during this study was, can student confidence increase when required to present solutions to problems? Over 75% of the students responded positively when asked if they were confident in the math they were asked to do. The other 25% responded

neutrally. I journaled on February 16th, the first week of the study, "I am glad students are not getting everything correct – I like having other students help them correct. Hopefully students will begin to see their peers as problem solvers."

Many students showed an increase in their confidence, based on my observations. At the beginning of the research, Dave[1] was asked to present a solution on February 21st. During his presentation, I commented he "Explained very fast – could not answer the questions that were asked." I got the feeling that he "…just wanted to get it done as fast as he could." Dave was again asked to present a problem towards the end of the study, on March 21st, and I observed, "Dave first wrote everything very specifically on the board. He then was able to describe each step very specifically. When the teacher asked a question to the whole class no one was able to answer. The teacher then asked Dave and he was able to explain the answer and how he knew the answer."

Henry is another student who showed an increase in confidence. During a presentation on February 19th, I observed Henry as "Not confident – he had the problem correct but was not able to explain." The next time Henry presented, on March 26th, he was able to describe each step and explained what he did very well. He received a rating of a 5, the highest on the scale, and I commented, "He did a very good job".

I observed another student, Ted, on March 5th, as "Not confident/very nervous" when presenting at the beginning of the study. The student was able to explain the steps and what he did very well but did not do it with confidence. Ted was not able to answer questions asked of him about the problem. Again, later in the study on April 5th, Ted did a much better job of presenting and had more confidence. Ted completed a problem the long way. It involved simplifying a fraction with a square root in it and Ted could have cancelled at the beginning.

[1] All names are pseudonyms.

When asked to present, he put his solution on the board and then began to explain. He was able to look at the problem he had written on the board and see how he could have done it differently. He then explained how to solve the problem both ways.

Another student, Jack showed improvements over the course of the study also. His first presentation was hesitant. He was able to explain but needed guidance through a few of the steps. The next time he presented, he had the problem incorrect. As he began to explain, he found his error and was able to problem solve as he explained. He fixed what he had gotten wrong and described the solution correctly. Sally was another student who was able to do this. On April 5th I commented, "She explained what she did very well and was able to find her mistake as she explained."

Sam is a student who stayed consistent throughout the study. He was able to explain his solutions very well and did all the work correct. He received ratings of 5 from me each time he presented. Yet another student did exceptionally well all the times she presented also. On March 15th, I commented, "She showed a lot of details and wrote everything out" and "She explained each of the steps very well."

During the course of the study, I rated a total of 46 presentations. The presenters could receive a rating of 1 to 5 and all ratings were used. The majority of the presentations were rated above a three and the average rating for all presentations was a 4.1. I believe this shows the students were able to complete the presentation without difficulty and improved as the study progressed. At times during the study, both the students and I questioned the difficulty of the problems. On March 23rd during the sixth week of the study, I journaled "I need more time to choose problems – this is not my classroom and it is very difficult to choose a problem without looking through all the possibilities. I chose very hard problems this week and I feel the students

are not benefiting as much as they could." When the students were asked during the interview if there was anything they could change about the presentations, one said "Make the problems easier," while another student responded, "Harder problems."

When the students were surveyed, they were asked if they were confident in the math they were asked to do. Overwhelmingly, students responded with a positive answer. They feel they are confident in what they are asked to do but, when asked when they were least confident, one student specifically wrote, "When I have to do a problem on the board, b/c I don't know if it's right or wrong." I believe students do not make a connection between being able to do their homework and being confident in the mathematics. I also believe students think if they are able to do their homework, they understand the mathematics. Students are not asked to problem solve when given homework. They are asked to repeat steps they have been shown; therefore when they are asked to present a solution, they are not confident because they are asked to explain. This is evident in one response to the question about when a student feels most confident, "When we get homework, because I know the teacher taught me everything I need to know to do it".

The students not making this connection are evident in my journal also. I commented on April 19th during the last week of the study, "The students still think that when we ask questions that they got something wrong – they are not confident in what they have solved." I believe this may be caused by the structure of the room. The classroom teacher does not require a lot of problem solving. The students are expected to reproduce work they have been shown. Although, some progress was gained in the area of confidence, more could be gained with a change in instructional practices.

When looking to see if students had shown improvement through student presentations, the results were not very positive. The student presentations have improved consistently over the

course of this study but grades and quiz scores did not increase consistently. I had a better opportunity to ask appropriate questions and to get students to look for problems in their work. The students responded they liked the classroom presentation and felt they learned from their peers but most of the data does not show an increase in knowledge.

The pretest and posttest the students were given is one example of where an increase in knowledge was not shown. When developing the test, I looked at a variety of problems over a wide range of skills. The first two questions the students were asked were review questions, questions they had just finished a chapter on. When looking specifically at the students participating in the study, nine students missed one or both of these problems. On the pre-test, these students missed a total of 97 problems out of 135. When looking this test over after it was given, I was not overly concerned. After all this was a pre-test. The questions being asked had not been covered and the students had not been exposed to them. Concerns were raised when scoring the posttest. When given the posttest, students missed 93 of the 135 problems. Although this is an increase in the number of problems the students got correct, I was expecting greater increase. The class had just spent the last three months covering this information and I believed the students would do a better job. Although this has been mentioned before, the atmosphere in the classroom allowed for this. Students were expected to learn something so they could pass the chapter test. Once done, they were given permission to forget what they just learned and move on to the next topic. They were never held accountable for remembering what they had learned.

When looking at the weekly quizzes, students showed improvement over the first part of the study. Students were asked problems related to the homework they had just completed. Quizzes were given randomly and were developed by the classroom teacher. Generally, most

students missed one problem on the quizzes. Quiz scores increased from an average of 77% to an average of 91%.

Quiz scores dropped dramatically during the last three weeks of the study. The average score during these three weeks were 55%, 66% and 65% respectively. Students were given two quizzes during the first week of this period and, during the last week of the study, students were given a quiz three of the five days. I believe this drop can be attributed to two reasons. First is the difficulty of the material. The chapter being covered was one on quadratics. Students were asked to work with the quadratic formula and roots and to use those roots to find the quadratic equation. Students had a very hard time determining the uses to quadratic equations and therefore the meaning of them. The second reason being it was the end of the year. There were many times during the course of the study were not full weeks of data collection. Many students were gone for extra curricular activities and many times less than half of the class was there.

I also saw a decrease in overall grades from the 3rd to the 4th quarters. The class average grade of the 3rd quarter was an 85.6%. This included grades ranging from a 100% to a 72%. The 4th quarter class average dropped to an 84.4% overall with the highest grade being a 98% and the lowest being a 69%. Only 2 students increased their grades from the 3rd to the 4th quarter. Again, I believe this can be attributed to the two reasons stated above.

When looking at the norm referenced test given to these students of the last two years a growth is shown. The students increased their scores in mathematics concepts, total mathematics and math computation. The greatest increases were in the scores for mathematical concepts and computation. During the 2005-2006 school year, students involved in the study were 8th graders and received a scaled score of 248.1 on the concept and estimation portion and a 235.4 on the computation portion of the Iowa Test of Basic Skills. During the 2006-2007 school year, the now

9th graders received a scaled score of 260.4 on the math concepts and problem-solving portion and a 250.2 on the computation portion of the Iowa Test of Educational Development. This is an increase of 12.3 and 14.8 respectively. Although the tests given are different, they are created by the same publishers and appear to measure similar topics. The students also increase their total mathematic score from a scaled score of 254.0 in 05-06 to a 257.0 in 06-07. When looking at the individual student who participated in the study, seven of the students showed an increase in their ITBS/ITED test scores. The other six students showed decreases in their scores but none of these decreases were significant. This shows that although I did not see increases in grades over the course of the study, the students are learning and retaining information they need for the future.

Having two teachers in the classroom was seen as an advantage by all students surveyed. Some liked having two teachers because it was faster and easier to get questions answered, while others liked the idea of having different views. The majority of students felt they were able to get help when they needed it. One student wrote, "They both have different ways of teaching and if you don't understand one way then you might understand the other way" and another student wrote, "You get two opinions".

Overwhelmingly, when asked who they ask for help with math concepts, students replied the teacher. When given the survey, one student responded "the teachers they know how to do it." This was the overall theme when I looked at how students got answers to their questions. This was also apparent in my classroom observations. I observed students asking questions at the end of each class period for three weeks during the research time period. During these three weeks, students were given 89 minutes to work on homework assigned. This was a time when Mr. H and I walked around the room helping students. In these 89 minutes, 83 questions were

asked. The teachers were asked 76 of them (see Appendix E). I believe a change in classroom atmosphere would greatly change these numbers. When students are allowed to discuss and work through problems, they are more likely to ask their peers for help when they need it.

I found it very interesting when doing the interviews with students all of them said they learn from watching other students give their homework presentations but none of them replied they would ask their peers for help. All replied if they were not in the math classroom they would either ask their parents or other teachers. Unfortunately, I think the atmosphere in the math classroom is not open to students being teachers. Students feel they must not use their peers because of fear they will get in trouble. It is considered cheating if they do not ask the teacher for help. This is a very unfortunate, and a disappointing remark to make in the research paper. I hope, given a classroom, positive behaviors can be modeled and show not only students but also other teachers in the school district students can and must learn from each other.

Conclusions

Students in this Algebra I class were not always required to participate. They could sit in their desks and let other students answer questions asked by the teacher. They were able to fade into the background and not completely become involved. Requiring students to make homework presentations increased the involvement of students in the class. It made them accountable for their learning. They knew they must know how to complete a problem so they could explain it to the class. Other students were then able to see different ways to solve problems. They were exposed to students making mistakes and solving them. They watched students considered the top students struggle and make mistakes while students who struggled succeed and answer problems correctly.

"Students gain insight into their thinking when they present their methods for solving problems, when they justify their reasoning to a classmate or teacher, or when they formulate a question about something that is puzzling to them" (NTCM, 2000, p. 60-61). This was seen in the classroom and having the students present solutions was beneficial. They were able to grow in their understanding of how to present solutions and became actively involved in the class when asked to do them. Manswell Butty (2001) states students must first be provided with opportunities, encouragement, and assistance before they can engage in thinking, reasoning, and sense making in mathematics. The homework presentations did this. They increased student learning and students' understanding of mathematical concepts. Student responded positively to all they were asked to do and thought the presentation helped them with their mathematical learning. Individual students made great gains while other students were consistently productive throughout the course of the study.

The students understand the importance of mathematics and they need to understand what they are doing to use later in life. They stated they are confident in the mathematics they are asked to do and learned from their peers as they watched them make their homework presentations. Hiebert (1997) states, "by working through problematic situations, students learn how to construct strategies and how to adjust strategies to solve new kinds of problems" (p. 17). The students saw this as other students found and fixed mistakes in their work or found alternate ways to solve the same problems. Having two teachers in the classroom was also seen as a benefit to all students.

Although both the students and I saw positive gains throughout the study, students still do not see a connection between the presentations and their confidence. The students are missing out on what Blumenfeld (1996) states can be learned from peers; "peer learning is a way to

improve attitudes toward school, foster achievement, develop thinking skills, and promote interpersonal and intergroup relations" (p. 37). Students continue to think if they are asked a question about what they are presenting, they have something wrong. They are able to explain what they are doing but not necessarily why they do it. The student presentations have increased the student exposure to how problems can be solved but they continue to look to the teachers when they have problems. As students are exposed to these types of situations, it will help increase their learning. Hiebert et al (1997) state students are more likely to be engaged in an activity if the class had established a culture in which students knew they had the freedom and responsibility to develop their own methods of solutions.

I gained the most information from the surveys and interviews. Students were able to tell me exactly what they saw happening in the class. They overwhelmingly liked doing the homework presentations and felt they could learn from their peers. They like math and consider themselves confident when they were asked to solve mathematics problems, but by the end of the study students still did not see the connection between giving homework presentations and increasing their confidence. They were more concerned about whether or not they got the problem correct or if the teachers were going to ask them a question.

Implications

Having students present homework solutions was very beneficial and needs to be done in more mathematics classrooms. Students must discuss mathematics and how to problem solve daily. They need to be exposed to many different ways to solve similar problems. Students need to be told they must learn from each other and they can look to their peers as great sources of information.

During the upcoming school year, I will be teaching the 7th grade mathematics class. I hope to make my classroom one where students will have the freedom to work together and know they have a wealth of knowledge that needs to be shared with each other. I must remember "the teacher's actions are what encourage students to think, questions, solve problems, and discuss their ideas, strategies, and solutions" (NTCM, 2000, p. 18). I want them to take what they have learned and be able to apply it to many different situations. They will not be given permission to forget. I will expect them to have some understanding of what was taught the first day of class on the last day of class.

This study helped me see the importance of choosing appropriate and significant homework. Students must understand they are not just doing homework for homework's sake. Each problem assigned must have value and apply skills the students must know. Assigning homework problems is not just going to be a chunk out of the book. I am going to take time to review all the problems and look for problems that will challenge the students to use the skills they are being taught.

This study also allowed me to look carefully at my questioning skills. Having the students explain their homework allowed me to hear and see what they were thinking when solving the problems. I was able to ask very specific questions and really get the students to look at specific parts of problems. At the end of this study, the students still felt when they were asked a question they had done something wrong. Next year in my own classroom, I hope to show students that questioning is not a reason to become defensive; it is a way to learn new things. "Teachers' attitudes in mathematics may have an influence on how students perceive their own abilities to deal with mathematics" (Relich, 1996, p. 180). My attitude towards mathematics has changed. I am much more confident in what I am asked to teach. This positive attitude will be

passed on to my students and hopefully give them a positive learning experience. I have learned many positive and negative things over the course of this study and the school year. Hopefully I can maximize the positive and minimize the negative.

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APPENDIX A

Name _____ Date _____

_____1. Simplify (2a + 3)(3a – 7)

A. $9a^2 – 6a + 21$ C. $6a^2 - 5a - 21$
B. $6a^2 + 5a – 21$ D. $6a^2 + 5a + 21$

_____2. Factor $36c^3 + 6c^2 –6c$

A. 3c(3c + 1)(2c – 1) C. 6c(3c – 1)(2c + 1)
B. 6c(3c + 1)(2c - 1) D. 3c(3c – 1)(2c + 1)

_____3. Which of the following is a linear equation?

A. 5x = 17 – 4x C. y = xy + 1
B. $y = x^2 – 4$ D. 2/x + 3/y = 6

_____4. If $g(x) = 3x^2 – 4x + 1$, what is the value of g(-2)?

A. 21 C. 45
B. 29 D. 5

_____5. If a rocket is launched with an initial velocity of 64 ft. per second, its height h(t), in feet, after t seconds is given by the formula $h(t) = 64t – 16t^2$. What is the height of this rocket after 4 seconds?

A. 0 C. 64
B. 128 D. 192

_____6. What is the slope of the line passing through (1,9) and (-3,6).

A. –7/4 C. –25/2
B. –4/7 D. –2/25

_____7. Find an equation of the line containing (2,-5) and (6,3).

A. y = ½x – 6 C. y = 2x +12
B. y = ½x D. y = 2x – 9

_____8. What is the equation of the line whose graph has a slope of –2/3 and a y-intercept of 4?

A. 2x + 3y = 12 C. 3y – 2x = 12
B. 2x + 3y = 4 D. 3y – 2x = 4

_____9. Solve the system $4x + 6y = 8$
$2x – 5y = 1$

A. (17/16, 5/8)
B. (23/16, 3/8)
C. (23/4, -5/2)
D. (17/4, -3/2)

_____10. Solve the system $x = 2y + 3$ by substitution.
$4x – 5y = 9$

A. (2,7)
B. (1,1)
C. (5,1)
D. none of these

_____11. What is the value of x if $x – 5y = 20$
$x + 3y = -4$

A. 5
B. –13
C. 10
D. 80

_____12. Simplify $18 - 54 + 2 \ 50$

A. $13 \ 2 - 3 \ 6$
B. $-4 \ 3 + 4 \ 5$
C. $-4 \ 3 – 5 \ 5$
D. $8 \ 2 – 3 \ 6$

_____13. Solve $3n + 1 + 3 = 7$

A. 13
B. 1/3
C. (–1, 1/3)
D. 5

_____14. What is the length of the diagonal of a rectangle with a length of 12 meters and width of 5 meters?

A. 169 meters
B. 13 meters
C. 17 meters
D. 119 meters

_____15. Solve $3x^2 + 4x – 1 = 0$

A. $\frac{–2 \pm 2 \ 7}{3}$
B. $\frac{–4 \pm \ 7}{6}$
C. (-1, 1/3)
D. $\frac{–2 \pm \ 7}{3}$

APPENDIX B

MATH SURVEY

Please give your honest response to each statement, 1 being low and 5 being high.

1. I like math.	1 2 3 4 5
2. I am confident in the math I am asked to do.	1 2 3 4 5
3. Math skills are important to know and understand.	1 2 3 4 5
4. I am able to show the work required to solve math problems.	1 2 3 4 5
5. I am able to explain to others how to solve math problems.	1 2 3 4 5
6. I like to answer questions asked in math class.	1 2 3 4 5
7. I feel comfortable asking the teacher questions in math if I don't understand a concept.	1 2 3 4 5
8. I feel comfortable asking someone other than the teacher a question if I don't understand a concept.	1 2 3 4 5
9. I like having 2 teachers in the classroom able to answer questions.	1 2 3 4 5
10. I feel comfortable answering questions in class.	1 2 3 4 5

COMPLETE THE FOLLOWING STATEMENTS .

11. This is my favorite math concept and why:

12. One good thing that happened in math is:

13. One not so good thing that happened in math is:

14. What I wish my math teacher knew about me is:

15. Who do I ask for help with math concepts and why?

16. When do you feel most confident in class? Why?

17. I feel least confident - when and why?

APPENDIX C

Presentation of problems for the Week of _____

Monday	
Name Pg # #	Name Pg # #
Rate 1 2 3 4 5	Rate 1 2 3 4 5
What went well -	What went well -
What went poorly -	What went poorly -
Overall -	Overall -
Tuesday	
Name Pg # #	Name Pg # #
Rate 1 2 3 4 5	Rate 1 2 3 4 5
What went well -	What went well -
What went poorly -	What went poorly -
Overall -	Overall -
Wednesday	
Name Pg # #	Name Pg # #
Rate 1 2 3 4 5	Rate 1 2 3 4 5
What went well -	What went well -
What went poorly -	What went poorly -
Overall -	Overall -

Thursday	
Name Pg # # Rate 1 2 3 4 5 What went well - What went poorly - Overall -	Name Pg # # Rate 1 2 3 4 5 What went well - What went poorly - Overall -
Friday	
Name Pg # # Rate 1 2 3 4 5 What went well - What went poorly - Overall -	Name Pg # # Rate 1 2 3 4 5 What went well - What went poorly - Overall -

Weekly summary -

Was there anything I could have changed?

Overall, how do I feel the week went?

APPENDIX D

Interview questions –

1. Do you like math? What is your favorite subject?

2. Do you think math is easy or hard for you? Why?

3. What do you like best about math? Least?

4. Do you like doing homework presentations? Why or why not?

5. How confident do you feel when giving homework presentations? Why?

6. Do you feel that doing the homework presentations makes you more confident in the mathematics you are learning?

7. Do you learn new things by watching other students give their homework presentations?

8. How could the homework presentations be done differently to help you learn more from them?

9. Are you comfortable asking a teacher if you have a question about math? Do you only ask the math teacher?

10. When you are not with your math teacher, whom do you ask for help? Why?

11. Do you consider your peers as a good source of information? (Can they help you when you need it?)

12. When you encounter a difficult problem, what are some things you do to solve it?

13. When working that difficult problem, how confident are you that you can solve the problem?

14. Is there anything else you can tell me about how you feel about math or math class?

APPENDIX E

Observation Data about Questions Asked

	Total time for three week	Number of Questions the Teachers were Asked	Number of Questions Other Students were Asked
Monday	22	26	0
Tuesday	11	7	2
Wednesday	15	11	2
Thursday	22	13	3
Friday	19	19	0
Total	89	76	7