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Oral Presentations: Exploring Presentations of Homework Problems as an Alternative Assessment Tool

Michael Ford
Kearney, NE

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Kearney, NE

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ABSTRACT

In this study of my fifth grade mathematics class, I investigated a method of assessing homework presentations as an alternative means of assessment from the more traditional approach of paper and pencil testing. By changing the number of daily problems assigned in my classroom to include shorter assignments and implementing longer, more difficult story problems, I found that students enjoyed mathematics more and had a deeper understanding of the concepts. Increased retention of material, enhanced abilities to communicate problem solving methods, and improved attitudes were all positive side-effects of this project. As a result of my study, I have changed my methods of assessing homework from traditional methods of assessment to employ the rubric-scored presentations used in my study. Results of the study dramatically changed the way I view homework's purpose in and out of the classroom. Instead of homework being used as my sole tool for reinforcement and assuming more homework is better, I view it as one of the many ways to check for understanding and realize more is not always better.

INTRODUCTION

Beginning just my fourth year as a fifth grade teacher, I have found myself falling victim to a routine that has, in a sense, “lulled” my students to sleep. Days consisting of a mathematics opener and lecture followed by an assignment of 20 or more problems had left my students comfortable and bored. This routine had taken its toll on me as a teacher as well; I felt as though I was an actor reading a script and the script is not entertaining for the students any longer. This predictable and mundane approach to assessments had left the door open for lower achieving students to fall between the cracks and higher achieving students to dread the monotonous daily “homework” assignment. With a lack of years of teaching experience, I had followed quite closely the mathematics book and materials that were used by the previous classroom teacher. This had left me with limited means of student assessment, predominately, a 30-problem daily assignment followed by chapter tests. Deriving a grade for students is not the challenge. However, I was left with the burning question of “How well do my students understand and can they communicate theses ideas and processes?” Some students had the ability to score high on daily work; others may have had homework checked closely by parents. Tests, on the other hand, showed that students who scored well on the homework might have lacked full mathematical understanding. Mastery of skills and concepts requires additional effort on the part of the student. My need, as an educator, to engage students’ thinking and deepen their mathematical understanding was the driving force behind my choice to begin having students do homework presentations.

In this action research project, I explored the potential of homework presentations as a means of assessing student understanding. I wanted to investigate if presentations of homework problems would deepen understanding needed to communicate the ins-and-outs of a mathematical problem to a group of peers while offering me a new means for assessing student understanding. This method of assessment would place more emphasis on student responsibility in regards to complete and understood work. Student accountability was lacking in a number of my fifth graders. Late, incomplete and sometimes ignored homework assignments were all-too-often the effort I received. Even if I did receive completed homework, too many students obtained the correct answer through cheating or parental pre-checking. Because of this, students appeared to have mastered the skill and tested poorly; displaying little or no retention of the concepts assessed. I needed an assessment strategy that would give me results and make sure the work was actually completed and understood by the student.

The goal of my action research project was to avoid situations of dishonesty and apathy. Along with finding an alternative means of assessing student understanding, I also was interested in improving the level of communication (verbal and visual) in the subject of mathematics within my classroom. It is my belief that students' understanding was directly linked to their ability to communicate their thought process. I intended to strengthen my students' abilities to communicate via written and visual communication. Written communication could help students to organize and arrange information in mathematical problems. This compartmentalization turned an overwhelming set of problems into a less daunting task. After arriving at a solution, representations could be utilized to enhance the written information. By combining all three methods of communication, a student should be able to verbally present a problem, enhance the presentation with a written explanation and finally strengthen it further by providing a visual aid.

Lastly, the theme of homework completion was also examined during the project. I chose to investigate the impact of working on daily critical thinking math problems, whose solutions would be presented to the whole class, and giving students shorter daily assignments.

I found I had students who seemed to effortlessly go through the motions of homework, get it done and do it well. However, when asked how they performed certain problems, they struggled to answer clearly, use correct terminology, and explain the process used to answer the questions. This led me to inquire about oral communication and how I could better use homework as a tool to increase communication in my classroom. I also found students that had no drive to complete the assignments given in class. They were content with handing in late work, incomplete work, or no work at all. These students had, typically, been my struggling students; they claimed the homework was too lengthy, repetitive, and boring. The consequence of unfinished or disregarded homework assignments was a significant lack of true conceptual understanding of the material by those students. Since daily work and tests comprised the bulk of my students' grades, those strugglers were averaging sub-"C" level. Therefore, I needed to find an innovative way of assessing my students that would more fully engage them. This had forced me to question if there were alternative assessment strategies to the 30-problem assignments and review tests. Could I maintain the same quality of learning for my students while shortening the daily workload? Communication, alternative assessments, and the examination of students' homework workload became my three main points of interest. I was hopeful that student homework presentations would serve as an all-in-one catalyst to combine these three important representations of mathematical understanding.

PROBLEM STATEMENT

Communication, assessments, and homework were three areas that had the potential to immediately impact my teaching. Improving student communication always had been a goal of mine. In past years I had had students that arrived at the correct solution and when asked how they solved, I received a "why does it matter" look on their faces. But they could talk their way through the problem and if asked to write their thought process out they could that as well. There were other students I had taught in the past that might not have excelled in mathematics, but through the use of pictures, solved problems correctly. I had wanted to put these two types of students together and thought if I did, one would end up with a really well-rounded mathematical student. Past experiences such as these made me think about different types of communication that could be used in math. Knowledge was not extremely useful if communication was inadequate. As set forth in the National Council of Teachers of Mathematics (NCTM), communication had many facets. I not only wanted my students to be able to verbalize mathematical thinking with their fellow classmates, but also I want them to communicate via written and visual forms. This project gave me a great opportunity to explore this area of student learning.

Students' assessments were changing as quickly as the students I taught. Finding new and innovative ways to help students display their level of understanding was a goal upon entering into this project. NCTM affirmed that teachers needed to move past rigid assessment practices where students were either correct or incorrect. This project showed me that there were many levels of understanding and that students could learn equally as much or more from incorrect solutions. Teachers who provided the correct solution to students before a period of exploration shut the door for student investigation. Time given by the teacher for students' trial

and error provided them with the opportunity to understand WHY a solution was wrong. All too often when the correct solution was given beforehand, students never understood why a solution was correct, they just accepted and memorized it. This type of student learning was limited and short term.

My approach and attitude toward the change in daily homework assignments left me anxious and apprehensive. My recent involvement with the Math in the Middle coursework gave me an opportunity to research my previous district's choice of mathematics book selection, which was Saxon Mathematics, a spiraling curriculum that encouraged repetition to reach mastery level. My present district used Heath Mathematics Connections, a book that was set up and taught in chapter form. It offered an intense delivery of concepts, but did little to review past concepts. Investigation into Saxon provided insight into its simple philosophy; students must complete all problems presented in every math lesson within the book to gain full benefits. In my project, I decided to cut the number of daily problems from 25-30, to 12-15. Cutting the number of problems was a conflicting aspect of the project for me. I was a true believer in repetition and "practice makes perfect," but completion rates were at an all-time low and this was at least the beginning of an attempt to combat this problem.

Through homework presentations, I was optimistic that I could create a better classroom environment where the learning process would take center stage. And the final product, or answer, was relegated to its rightful back seat. Providing correct or incorrect feedback would not be my first objective. Evaluating and providing feedback on students' mathematical thinking and processes would. I hoped changes like these would create an atmosphere where students were comfortable to get in front of classmates to communicate ideas and help one another in the learning process. It was my hope that through this process my students would find meaning in

mathematics. If my students could see a purpose in mathematics, and make a connection to the real world, I hoped it might spark an interest in math that some students had not been seen.

LITERATURE REVIEW

Reading through research articles pertaining to my problems of practice, three themes stood out: Oral Communication, Assessments, and Homework. Within my literature review, I addressed these three themes and their relevance in the teaching and learning of mathematics. I first focus on communication and the positive effects it had within a math classroom. Differentiated methods of assessing students' understanding were discussed within the review of literature via several authors. Last, I discussed homework, including its misconceptions and benefits.

Oral Communication

Communication, as described by the National Council of Teachers of Mathematics (NCTM), was stated as, "An essential part of mathematics and mathematics educations" (NCTM, 2000, p. 60). There were many elements of this critical process standard that fell beneath the massive umbrella of "communication." Because of my involvement in the Math in the Middle program, I became very familiar with the NCTM (2000) process standards. Communication, one of the standards, was broken down into various components; two components of communication I addressed in this literature review were written and oral forms. The NCTM (2000) stressed the importance of conversation in its Communication Standard. Teachers needed to strive to "establish a communication-rich classroom in which students are encouraged to share ideas and to seek clarification until they understand" (p. 270).

In my action research project, I used presentations as a means of encouraging communication. I focused my review of the NCTM standards on oral and written communication. Briefly looking at oral communication, according to the NCTM, students were encouraged to ask questions, paraphrase concepts and procedures, and express their thought process using correct terminology. NCTM summarized the different forms of written communications as students being capable of using pictures, diagrams, graphs, and tables to convey their mathematical thinking and using mathematical thinking to discuss and present solutions. The NCTM standards mentioned numerous times that the most critical factors of communication in a classroom were students' safety and a nonthreatening environment.

Butler and Stevens (1997) discussed the interrelationships among teaching, learning and assessment. In their study, which took place in an English classroom, Butler and Stevens examined book reports that were given orally and measured students' growth. They argued that assessment should not be a culminating event; it should be a continual process in which the students had multiple opportunities to be assessed through their demonstration of oral communication. Butler and Stevens (1997) stated:

> An open classroom environment where students are free to use oral language provides teachers with opportunities to monitor how well students are developing their communicative skills. Indeed, it is essential with learning and assessment for teachers to create stimulating classrooms-classrooms where there is talk, lots of it (p.215).

Butler and Stevens (1997) added that classroom environments needed to support all forms of communication. "Students should free to react orally to what they hear or read;

they need to talk to classmates about topics they will later develop in writing" (p. 215). Butler and Stevens noted that there was a need for students to be able to make connections from their thought process, when solving problems in the classroom to a verbal communication. They added, "Knowledge students acquire in all subjects is most valuable when they can communicate that knowledge to others in effective ways" (p. 218). After the students had furthered their understanding, the next step, students took, was transitioning from oral communication to written communication. Through the use of homework presentations, I planned to utilize poster sessions as a means for my students to communicate their thoughts using diagrams, illustrations, or pictures.

Berry and Houston (1995) discussed why poster sessions should be utilized and how to incorporate them as an assessment tool. Berry and Houston's (1995) research showed that student retention was better after poster sessions were implemented. They gave multiple examples of how poster sessions could not only be used as a way of communicating thoughts to peers and teachers, but also could be used as a great assessment tool as well. They sited several examples of professors asking their students to stray from the typical seminar or lecture that would summarize research for the semester and instead have their students conduct a poster session where students would discuss and defend their work. This proved to be a great success. It was concluded that, "students had a very positive attitude toward this activity and that they seemed to learn more about their peers' work from the poster session than from a seminar" (p. 21).

Chris Haines and John Izard wrote a 1994 article and conducted a study that examined how projects and investigations would serve as a means of formally assessing students on

projects at Brighton University. A set of descriptors were given in the article that were used to measure and assess students' presentations. The descriptors were:

1. Rapport with the audience
2. Effective delivery
3. Command of spoken English
4. The structure gets over the main points
5. Clear explanation of the problem
6. Overall planning and organization
7. Appropriate use of visual and other aids
8. Technical quality of visual and other aids

The descriptors given in the article were helpful when I made my final rubrics for oral presentations for my research project. Haines and Izard's projects provided evidence that communication was a key factor in student understanding. Haines and Izard (1994) went on to say, "The experience of gathering, writing a report and making an oral presentation are considered valuable components of assessment" (p. 374). Through the process of using these forms of communication teachers could witness the learning process. There were many indicators an educator could use to determine the level of understanding, but without some concrete proof of understanding or confusion via assessments of some kind, daily work, tests, or presentations, a teacher might have had some students slipping through the cracks, undetected. Taking note of this article when preparing for my own research project, I paid close attention to see if my students displayed these informal indicators of understanding.

Watson (2000) wrote an article that did not promote the use of oral assessments as a great indicator of student understanding. This study consisted of 30 teachers who taught primary,

middle and secondary grade levels. Students in the study were 10, 11 and 12 year olds; they were chosen because they were at the crucial age at which children make the leap from primary, to middle, and finally to secondary schooling. Her study was focused on the informal assessment practices of these teachers in the United Kingdom. She investigated whether these informal assessments gave a true indication of understanding. She argued the point that although many informal assessments could be done through observation, they might not be credible and reliable. An informal assessment consisted of comments during work time or student-to-student conversations about material. Her article stated,

> Oral evidence, though highly valued by all the teachers in the study, was reported to be time-consuming to organize. Language difficulties, diffidence or fear might prevent some students from offering it. It is rare to overhear useful remarks in a busy classroom, although such remarks might give great insight to a student's thought process (p. 84).

Of the teachers in the study, oral evidence was still desired because it was an indicator of higher levels of understanding. However, it was written work and traditional formal assessments that were dependable and reliable for the majority of teachers in the study.

> Written work was regarded as a safe and reliable form of evidence which can be held up to scrutiny, they wanted more 'right' answers in order to be convinced that students understood the work, they wanted oral evidence, or written workings and explanations (p. 84).

I saw written work as a great way of checking understanding. I agreed that written work and traditional pencil and paper indicators were needed, but should not be the sole gauge

of student understanding. I agreed with Watson that oral, visual, and written expression should be taken into consideration when assessing students' understanding.

Communication was a component that was vital in any classroom. Various types of communication were viewed differently by different educators. Homework presentations made it possible for students to be assessed in several ways, including the use of written, oral, and visual communication. Within my own study, communication was the cornerstone. I not only expected my students to be able to communicate their understanding of material verbally, but I assumed they had the ability to convey and strengthen their mathematical argument via visual representation and written expression. Butler and Stevens (1997) conveyed that the use of any and all ways of communication was a positive reliable way of assessing students' understanding. This sentiment was echoed by both Berry and Houston (1995) and Haines and Izard (1994). Both studies relied on oral presentations to verify student understanding and used this type of assessment for classmates to communicate results and finding in projects. Haines and Izard gave guidelines for oral presentations that simplified the grading procedure and allowed the assessor to more easily arrive at a grade. Haines and Izard (1994) listed eight criteria in the article, and I used these criteria as a guiding philosophy in my study. These criteria included:

1. The tasks used to assess what students know and can do need to reflect the tasks they will encounter in the world outside schools, not those limited to the schools themselves.
2. The tasks used to assess students should reveal how students go about solving a problem, not only the solution they formulate.

3. Assessment tasks should reflect the values of the intellectual community from which the tasks are derived.
4. Assessment tasks need not be limited to solo performance.
5. New assessment tasks should make possible more than one acceptable solution to a problem and more than one acceptable answer to a question.
6. Assessment tasks should have curricular relevance, not be limited to the curriculum as taught.
7. Assessment tasks should require students to display sensitivity to configurations or wholes, not simply to discrete elements.
8. Assessment tasks should permit the student to select a form of representation he or she chooses to use to display what has been learned. (p.375).

When creating my rubrics that I used for scoring my students' presentations I kept these eight criteria in mind. These eight criteria encompassed what all assessments should be, how they should be given and how they should be graded. With these criteria in mind, any educator should be able to decipher whether their students understand.

Morgan and Watson (2002) agreed with the other authors on the idea that informal assessment could be a useful tool in determining student understanding. Watson (2000) seemed to contradict herself in saying that informal testing was not enough to conclude that students had mastered material and that teachers needed to stray from traditional forms of testing. She did mention that comments, classroom talk, and interactions with peers gave a teacher better insight into the level of understanding; however, this was not and should not be the sole indicator of comprehension.

Assessment

Since the beginning in the MIM program, I have found that the NCTM (2000) standards were the foremost leader in stating mathematics principles for teaching and learning mathematics. Prior to the MIM program my definition of assessment was to assign my students problems, grade the assigned problems, and accordingly I gave that grade to the student. NCTM had its own definition of assessment and stated:

> To maximize the instructional value of assessment, teachers need to move beyond a superficial "right or wrong" analysis of tasks to a focus on how students are thinking about the tasks. Efforts should be made to identify valuable insight on which further progress can be based rather than to concentrate solely on errors or misconceptions. (p. 24)

This statement in the NCTM has provided the impetuous needed to carefully help me examine the approach I have used in my own classroom assessment and see its limitations. Assessments were not black and white; Haines and Izard (1994) agreed and stated, "Assessment is not a cut-and-dried affair" (p. 380). Assessments needed to be just another building block within the learning process and not a culminating event that either encouraged or discouraged students. Too often grades earned on rigid formal testing in any subject area, including math, left students disheartened and uninterested. If students were informally assessed continually, where feedback was provided daily, students and teachers could approach tests with less anxiety. I had predominately relied on paper and pencil assessments. Other than the board work my students completed, I had no other way to informally assess my students.

Corno (2000) wrote an article which was a compilation of myths about homework, both good and bad. Her article investigated how teachers' techniques of increasing student retention of material might be all for not. Throughout this article, student motivation and homework seemed to be on opposite ends of the spectrum. Students of today were less motivated, harder to reach and more often had a weakened support system at home than their counterparts of 20 years ago. This trend, which Corno mentioned, was what I experienced first-hand in my first four years of teaching. Students' level of apathy, laziness and overall boredom with school was at an all-time high. Although there had always been underachievers throughout every generation, the average number of kids that fit this description had increased and was quite prevalent in my own work as a teacher.

Through presentations, I had the ability to formally assess my students through rubrics and I informally assessed students through classroom discussion. Homework presentations allowed me to correct students, on the spot, who may be on the right track, yet had the incorrect solution. Corno (2000) talked about these types of teaching moments, "Teacher feedback on homework that leads children to understand the source of their errors, but also encourages taking a second try, has been shown in experiments to boost motivation and learning" (p. 539). I gave feedback regularly to my students and it consisted of me asking the same questions: What information did the problem present? What was the problem asking you to solve for? What strategy were you going to use?

Haines and Izard (1994) shared the same sentiment of students' presentations and teacher-student communication, "Use of projects and investigations as assessment tasks has the potential for ensuring that the tasks mirror the desired skills, consistent with the aims and objectives of the activity, hence contributing to valid assessment" (p. 374). As I stated above, students needed to

feel as though they were in a safe and secure environment to be able to take the chance of being wrong in front of classmates and, more importantly, their teachers. Butler and Stevens (1997) stated, “Students’ ability to communicate orally in effective and appropriate ways with family members, peers, and teachers often impact self image” (p. 214). Self image and self-confidence in students was a key factor the success in building a strong individual. Once that was established, mathematics can be addressed. After the teacher had created a safe and inviting environment for communication to exist, mathematical connections then would follow. Prior to my study, students voiced anxiety over getting up in front of the class. I took this into consideration. In my study, I helped students recognize they were in a nonthreatening environment, so I eased them into presentations with a progression. The first days of the study, I modeled quality presentations with acceptable illustrations and explanation. Group work and group presentations followed. Finally, students were given the opportunity to present a problem that was not scored with the rubric. This preceded the first graded presentations. By the time students’ presentations were graded, many of the students’ apprehensions had vanished.

Morgan and Watson (2002) talked about formal and informal assessment in the classroom, but with a twist that I did not find in Butler and Stevens’ (1997) article. They talked about the inequity of traditional methods of assessment in the classroom. Their article aimed to understand assessment practices of teachers in the United Kingdom. Two different studies were conducted. The first study had two educators and 10 students participating. The informal assessment strategies of the teachers were being observed. The second study was conducted with 11 teachers who read and evaluated written work of students on a formal mathematical examination. Both studies concluded with the notion that many factors, other than a true student’s mathematical knowledge, affected understanding. This article intrigued me with the discussion about how

students' reputation in their younger years could predispose them to mistakenly feel failure or competence. When I received students as fifth graders, what many of them needed the most was a clean slate. This article pointed out how external happenings, that were unrelated to assessment outcomes, came into play when teachers formally or informally assessed students.

Morgan and Watson (2002) continued, "Powerful critiques of some traditional methods of assessment in mathematics had identified the inequity inherent in them as well as the poor quality of the information they provide" (p. 79). They went on to add, "reformers have proposed multidimensional forms of assessment to allow all students to demonstrate what they know and can do as well as to ensure the full range of mathematical objectives are addressed" (p. 80). The authors of this article stressed the equity for students and how many aspects could play into how the traditional methods of mathematical assessments were viewed and skewed. Morgan and Watson's aspect of formal and informal assessments included:

1. Teachers' personal knowledge of mathematics and the curriculum including affective aspects of their personal mathematics history.
2. Teachers' beliefs about the nature of mathematics and how these relate to assessment.
3. Teachers' expectations about how mathematical knowledge can be communicated.
4. Teachers' experience and expectations of students' and classrooms in general.
5. Teachers' experience impressions and expectations of individual students.
6. Teachers' linguistic skills and cultural background (p. 84-85).

Too often these aspects of assessment made a negative impact in our classroom. Assessments, both formal and informal, were designed to measure knowledge and retention of the material taught.

Formal and informal assessments of communication within the classroom setting were often addressed in Butler and Stevens' (1997) article. They pointed out that informal assessments in the classroom could be as simple as listening to a student tell a friend about a movie and assessing the form of the explanation, including the use of specific details and proper use of terminology that would be appropriate for the story. Butler and Stevens called this being "communicative competent." They described this communicative competence as the ability to express oneself effectively to others and to understand what others were trying to communicate. This informal assessment of communication in my classroom reminded me of students who stood in front of the class and talked about their "show and tell" or who told about a weekend outing with the family. A more formal setting would be to ask the student to report on a group project in a specific subject area. Butler and Stevens (1997) added, "Activities such as these offer possibilities for integrating ongoing assessments with teaching and learning, this broad-based, integrative approach, captured in oral language profiles, supports the development and assessment of communicative competence across the skill areas" (p. 216). Prior to the study, I had some individuals that had never gotten in front of the class for show and tell; intimidation to be in front of the class was too much for them to bear.

Knowing why that mathematics instruction was moving closer and closer to the NCTM standards, I was excited about a study that was conducted in Colorado. Borko (1997) conducted a study of third grade teachers in Colorado aiming to create and implement classroom-based performance assessments into both their reading and mathematics curriculum. The study was a multi-year project with 14 teachers participating. Over the course of the study, the teachers developed, implemented, and revised scoring rubrics that were used to assess students on solutions presented in class. These rubrics were then used for both formal and informal

assessments for those teachers. Borko (1997) went on to say, “The NCTM identifies assessments as an integral part of teaching and specified that the main purpose for assessments was ‘to help teachers better understand what students know and make meaningful instructional decisions’” (p. 231). I agreed with Borko fully, assessments were a significant part of the educational system, but the rigid nature could make it difficult for some students to perform well. If this happened that the assessments did not serve the purpose that they were set out to, educators would still be wondering what students do and do not know.

Berry and Houston (1995) pointed out that posters were great tools to assess students’ work and understanding in mathematics. They gave descriptors of how a teacher assessed a presentation, just as Haines and Izard (1994) did in their article. A criterion that was given by Berry and Houston (1994) for assessing presentations was very similar to Haines and Izard. Berry and Houston did go on to say, “Formative assessment is an essential component of learning and the poster sessions is an opportunity to assess students’ work and to provide feedback on the quality of that work” (p. 23). I hoped that posters made in my fifth grade classroom would provide students with a visual solution that could serve as a review when students revisited a concept. In my own classroom, if the day’s lecture was solving for the area of a parallelogram, I planned to have a group of students solve and present a poster on finding the area of a parallelogram. This would make it possible for students to view the notes on the poster for the rest of the year, rather than my writing it on the white board and erasing it. During my MIM experience, many of our classes implemented this idea of poster sessions and posters covered the walls. This was a great tool throughout the duration of the program. Because mathematical concepts build upon each other, and retention of material was a process not an

event. This sense of being surrounded by past knowledge nurtured future learning. I hoped poster sessions would help create this kind of learning environment in my fifth grade classroom.

Homework

As I entered into this research course, I thought that I would really like to make a change in my teaching that would affect the motivation of my students. I have had a percentage of students with absolutely no motivation to complete assignments. I thought about researching student motivation and student apathy, but after coming to the realization that my findings may only pertain to this class and this class only, I reconsidered my area of focus. Wanting to ensure that my change would affect me and my students for the future, I chose to focus more on homework. I also decided to shift at least part of my attention to student presentations; therefore, I chose to focus on homework and what I might change about its length and the way it was perceived by my students.

Cooper, Robinson and Patall (2006) wrote about the changes in achievement that homework could have on students. Cooper, Patall and Robinson (2006) summarized a vast collection of educational research pertaining to the achievement levels of students when homework was given or not given in a curricular area between the years of 1987 and 2003. Studies that were conducted and noted in this paper were not restricted to the mathematics alone; studies were done in English, social sciences, reading, literature, and science. Ages of participants in the studies reported in the article varied from K-12.

The argument, “Is homework good or bad?” was discussed in this article. Cooper, Patall and Robinson (2006) stated, “Homework has a significant impact on students’ educational trajectories” (p. 2). They went on to discuss positives and negatives that might have come from

assigning homework. The positive effects that homework could have on students were both immediately and long-term effects. The authors also mentioned negative effects that homework might have on students. These concerns contradicted the earlier stated positive effects including that homework might be stimulating to a point and then became redundant. Homework could lead to emotional and physical fatigue, and could deny students less stressful leisure activities.

Cooper, Robinson and Patall (2006) went on to add that a happy medium needed to be found. He said age made a difference in the level of positive homework outcomes. Nine of the studies reviewed showed that homework given to elementary students showed little to no academic gains. While junior high students did show achievement gains when the homework was under two hours a night, achievement levels dropped from anything longer. For high school students the line of academic gains when nightly homework did surpass the two hour mark, but there was a plateauing effect when it neared three hours.

In my own classroom, I needed to find a happy medium between the workload I could expect my students to be able to handle outside the classroom while reaching the maximum gains of reinforcement and strengthening of skills learned during class. There were always going to be students who did not get the benefits of doing homework. However, the gains were there to be made if homework became a balanced part of one's teaching.

Corno (2000) brought to light many of the same benefits and detriments of work done outside the classroom. Corno (1996, 2000) wrote two articles that specifically shed light on the benefits as well as some of the misconceptions about homework. A great statement made by Corno (2000) was, "Homework has natural reinforcing properties comparable to those of schoolwork, potentially both positive and negative" (p. 530). This statement reinforced what I

taught in my classroom, practice makes perfect. Homework gave my students more opportunities to master the day's concepts at home. Prior to the study and my search through the research literature, I found I had misconceptions about homework. My belief that more homework was better because more repetitions were more practice was wrong. I needed to find a middle ground with homework where I still had the benefits of reinforcement, but did not turn them off the targeted subject with work on too many problems.

Homework completion had been a problem in my classroom with select students. Many factors played a role in both, the completion and incompletion, of homework by these students. One factor that I addressed through my research project was the length of my homework assignments. Through this research project I hoped to observe a positive change in student motivation towards completing every assignment every day. Corno (2000) stated, "For beginning elementary school children, shorter assignments that are easily completed help to foster favorable attitudes toward the whole enterprise of schooling" (p. 539). In past classes, I had noticed that students who completed assignments had a sense of ownership in that assignment and a feeling of achievement; I anticipated similar results in my action research project. I hoped these positive feelings would motivate my students to yearn for that feeling every day with every assignment.

Corno (1996) noted five misconceptions that the public had about homework and followed it with five realities of homework. She listed five misconceptions about homework:

1. The best teachers give homework regularly.
2. More homework is better than less.
3. Parents want their children to have homework.

4. Homework supports what students learn in school.
5. Homework fosters discipline and personal responsibilities. (p. 28)

Corno went on to dissect these misconceptions. Too many teachers gave regular homework as a "time filler." Although homework was intended to reinforce what was just learned, many teachers saw this as a way to quiet the class. The second misconception was that more homework was better. Corno explained that teachers needed to acknowledge the fact that students' home lives were as diverse as the students themselves. The amount of time and help given by parents was going to differ as well. The mixture of classroom work and work done outside school could either build confidence or create discouragement. Rather than reinforcing students' learning, homework overload actually could lead to student-burnout.

Misconception number three was my students' parents' biggest concern, "How much homework can I expect my kid to bring home?" This was a relevant concern. I told my students' parents that I would require my students to work hard during the day and hopefully homework would not need to leave the classroom. Which led me into the next misconception, homework did not always support what was being taught in school. Like I stated before, some homework was busy work that had little reinforcement value. The last misconception was that homework fostered personal responsibility. I did think properly completed homework could foster personal responsibility if students did not get buried in too much work. Students who struggled might not have had a fighting chance to keep their heads above water. If that happened, they might stop trying all together.

Corno, later in the 1996 article, went onto talk about the realities of homework, some of which I have discussed briefly already. Her realities of homework included:

1. Homework is easily misused or abused by teachers and schools.
2. Homework can be the bane of parents' existence in the early grades.
3. Homework can make some students avoid rather than enjoy schoolwork.
4. The best homework may be done at home and brought into school.
5. Policymakers, Educators, and Parents can all benefit from knowing the result of research on homework (p. 28-29).

Corno did go into further detail about some of these realities. She talked about how homework in many situations was used as a discipline tool and not as merely a tool to further investigation or deepen the learning experience. Too often homework was used as a classroom management tool, and students were neither getting the benefit out of the extra work nor were they likely to give an honest effort.

Homework, being the bane of parents' existence, was more a reality than teachers knew. Although I am only at the fifth grade level, I know that extracurricular activities were becoming more of a priority to my students. Student as well as parent apathy might have been settling in, and students were not likely to miss an activity for a quiet night at home studying. Even in the younger grades, with easier homework assignments for parents to help out with, much of what did not get done by the student in normal school hours was not being completed in an appropriate manner at home. Some students completed homework with great help from parents, and for some students, homework was getting done solely by parents and with some it was not getting done at all.

Homework might never be an enjoyment to students, but Corno was correct when she said it could make some students avoid rather than enjoy school. I liked a statement she made

where she said, “Generally, homework is not supposed to be fun, although the right combination of challenge and skill can make it gratifying” (p. 530). As both a teacher and coach, this statement was true. I saw it in athletics as much as I saw it in the classroom. If I had incorporated a certain amount of fun into an activity, both students and athletes would work hard unknowingly.

The next reality that homework was work done at home and brought to the school was a great point. Corno (2000) had a great statement, “Homework is a bridge for knowledge to travel back and forth between school and home” (p. 533). Corno (2000) pointed out that students brought tales of fishing trips, family outings, soccer games, and service projects to school. “The idea is to start with the child’s own interests, thus eliminating the need for enticements from a teacher” (p. 533) Making real world connections with your students, which extend past the confining walls of the school, were essential. Every time that I made a connection out of the book with an example that my student could relate to personally, their interest level would spike. That was how I grabbed their attention as many times as possible.

Lastly, Corno talked about teachers, administrators and parents benefiting from knowing the results of research based on homework. She talked about how all of us in education needed to be on the cutting edge of new research and ready to change and improve our current practices. This was why programs such as MIM were making our teachers more efficient, effective and proficient in our classrooms.

Both articles came to the conclusions that homework, when used as a tool for concept reinforcement might have had two completely different effects on students. Both articles concluded that age was a factor in the homework equation. There was a direct link between age

and the effectiveness of homework. Age would have an enormous affect on the helpfulness of homework, with the older the students, the greater their gains from appropriate homework. I would not omit homework from my daily routine.

CONCLUSION OF LITERATURE REVIEW

Communication in the classroom was an essential part of a good and healthy learning environment. I spoke about two forms of communication that I brought into my fifth grade classroom. Through my action research study, I hoped to increase the level of communication between me and my students and see a rise in student-to-student communication as well. Alternative assessments were seen as innovative ways to test what students know and do not know. Poster sessions would serve as different ways to extrapolate my students' knowledge. Through the use of several rubrics, presentations would be evaluated for thought process opposed to traditional right or wrong answers. I knew students were competent in the subject matter when they could present solutions with clarity and confidence. Berry and Houston (1995) echoed this, "The one who teaches learns twice" (p. 23).Through the action research study, I hoped to increase the level of mathematical understanding and improve the use of correct mathematical language among my students and better myself as a teacher along the way. My views of homework had been changed through this review of literature and I was anxious to use these changed views in the project.

PURPOSE STATEMENT

Finding an effective means of determining the depth of my students' mathematical understanding was the key goal of my research project. Although alternative means of assessment and students' view of homework were outlined as secondary components,

communication was the area of focus studied with the most intensity. Attaining knowledge was a key ingredient to students' success, but the ability to communicate what had been learned was essential. Although homework and tests could provide concrete scores to make assumptions about understanding, I was not sure that they would be adequate evidence to show that the learning process had taken place; retention was in question as well. Homework presentations appeared to be an all-in-one catalyst to explore mathematical understanding through students' communications, ensure homework assignments were completed, and allow informal teacher assessments to happen on a more individual basis. This hopefully would result in a more complete understanding of students' comprehension of mathematical concepts.

My interest in homework was to address student apathy toward math and foster mathematical explorations both inside my classroom and at home. Assignments were handed in late, incomplete, or not turned in at all from an increasing number of students. This was a concern that I wanted to directly address within my project. A combination of shorter assignments with an increase in more difficult problem solving questions was my solution to tackling this growing problem. I also was seeking to answer the following research questions:

- What will happen to the students' level of mathematical knowledge, reasoning abilities and understanding after implementation of homework presentations?
- What will happen to the students' view of homework after the implementation of homework presentations?
- What will happen to my teaching after implementation of homework presentations?

METHOD

I began my research project on February 16, 2009, and concluded the study on April 24, 2009, using my fifth grade class. After getting late approval from the IRB, my study began much later than previously planned. During the first two weeks of February, the project was slow to begin due to permission slip delays and missed days of school with the birth of my second son. Upon my return to school, I explained the changes that would be taking place within the daily math class routine to my fifth graders. The changes I made involved the addition of homework presentations and rubrics used in scoring presentations. I also shortened daily assignments.

Selecting students to present was never a source of conflict in my room. Many of my students would have chosen to present every day if they were given the opportunity. My biggest concern was found in the notion that the students who did not understand were the students who lacked good communication skills. From the beginning of the project, the same 15 people volunteered to present homework problems. It was not until I was sure that everyone had presented that two of my students said that they had not gone to the board to present a homework problem yet. These were the students that fell through the cracks because they did not communicate well. Rather than let me know when they did not understand, they would rather just not ask. From that day on, I made a chart of who had and had not presented. I stated that each student would present at least twice throughout the duration of the project.

Student interviews, both group and individual, were intended to give the students opportunities to verbally express their thoughts about the project. I interviewed students in a random order. The interviews of language delayed students yielded little useable data and many responses were left to my interpretation because one word responses were often all I could draw out of these students when I asked them very intricate and detailed questions. After the first

attempt, I could see that the task of talking one-on-one about school, their learning and my instructional approach was just too daunting of a task for my slow-processing students. After that initial try of one-on-one interviews, I relied on group interviews. These provided the information I needed and my students felt more comfortable giving honest answers with a friend or two in the room.

Throughout the duration of the project, I kept a personal journal on my computer that included daily entries and my own insights on the day. In these journals, I included the day's activities, daily surprises, and comments made by kids about math or any happenings pertaining to my project. This journal became a useful tool for observation of the bigger picture and helped me see if I was accomplishing my goals of the project. In addition to my personal journal, I gave my students the opportunity to write personal journals. Here, students could reflect on the project. Sometimes students were prompted to write about specific aspects of the project and express an overall response to the project.

Student work, daily and test grades, and a pre- and post-project survey were the last of the data collection tools used in the experiment. Rubrics used to score presentations were gathered throughout the project to track student progress. This was the only student work collected. Students' grades were organized into three categories: daily work, test grades and Stars Math Assessment. The Stars Math Assessment was a computer generated test that I gave at the beginning of the year, at the beginning of my project, and again at the end of the project. This data allowed me to observe any changes in understanding and overall knowledge by using this consistent and uniform test. The first of the two surveys was given on February 6 and the post project survey was distributed on April 24 (see Appendix A). This survey allowed me to see

changes that may had taken place in student views of themselves, mathematics, and in my teaching. Figure 1 summarizes all of the data collected during the project.

Figure 1: Summary of Data Collected

Data Type	**Dates Collected/Recorded**	**Quantity of Data Collected**
Teacher Journal	Daily 2/2/09-4/24/09	58 entries
Student Journal	Bi-Monthly 2/2/09-4/24/09	9 entries
Group Interview	Bi-Monthly 2/2/09-4/24/09	7 Interviews
Student Survey	Twice Pre-Post Study	2 per student
Scored Rubrics of Presentations	Two per Student 2/16/09-4/24/09	2 per student minimum, some up to 6 rubrics
Daily and Tests Grades	2/2/09-4/24/09	45 daily-8 test

FINDINGS

My findings are organized and will be addressed in the order that my research questions appeared above. I analyzed my data beginning with my students' change in level of understanding, student view of homework and last I addressed what changes had come to my teaching practices from having performed this action research project.

Understanding

My first research question asked if students' understanding and reasoning abilities would be affected by the homework presentations. My answer to that question was a confident, "Yes." Much of the data I collected showed that students did gain a deeper level of mathematical

understanding and that their abilities to solve critical thinking problems changed drastically since the introduction of the problems of the day. Data providing evidence for this assertion came from student surveys, daily scores, test scores, presentation rubrics, personal journal, student journals, and student interviews.

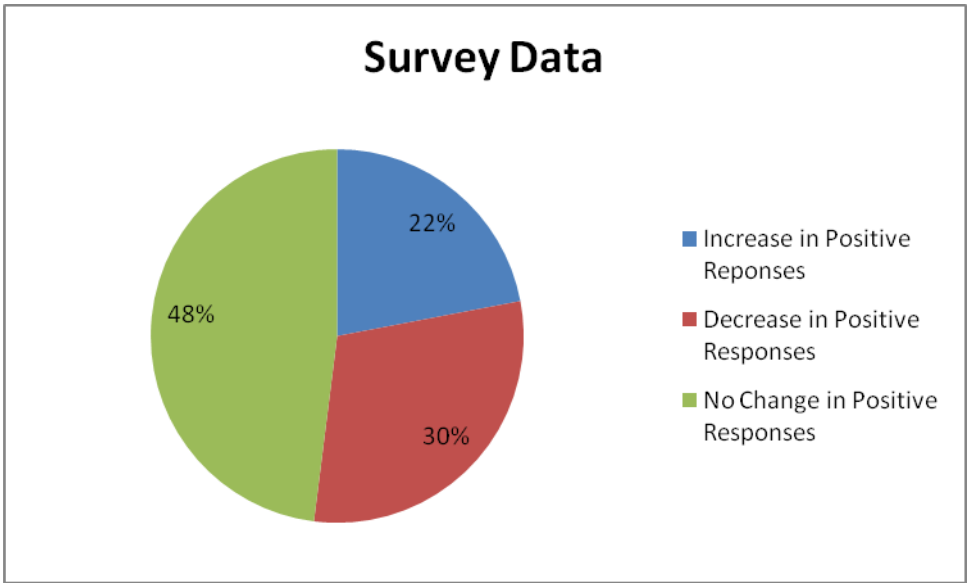
Measuring understanding was quite difficult. Many teachers had that gut feeling of how the class or individuals were performing and might not have any numerical data to validate this notion. Throughout the project, I have had this gut feeling that my students were becoming better mathematicians by the day. However, in my case, I did have instruments in place to help track and verify this improvement.

On the first day of my project, before I had started the presentations, I gave my students two pre-experiment surveys. (Appendix C &D) These surveys asked questions ranging from the level of student enjoyment received from math to their perspective on the benefits of teacher lecture. As I handed them out, I was uncertain as to how my students would answer some of these questions. As I collected the post-surveys, I was even more confused how I would score them and make this data usable. There were 29 students in my class with 23 of them being able to turn in both pre- and post-project surveys. I compiled data by giving each rating they answered a corresponding value. Both surveys had five choices from which they could answer each question, Strongly Disagree, Disagree, Undecided, Agree, and Strongly Agree. I chose to give a number value of 1-5, 1=Strongly Disagree and a 5 rating if they Strongly Agreed. The table below shows how I scored these surveys.

Student Response	**Corresponding Value Given**
Strongly Disagree	1
Disagree	2
Undecided	3
Agree	4
Strongly Agree	5

Because both surveys probed the students for a positive response, the higher the score, I viewed that as having a more positive view of mathematics. As I compiled the data only 5/23 students had higher values on both surveys from pre- to post-project which I interpreted as their views of mathematics had improved. Slightly more students, 7/23, had a lower score on both the surveys, and I took this to mean their views had diminished toward math. The majority, 11/23, had no change from pre-project survey to post-project survey. Figure 2 below shows the percentages in a graphic.

Figure 2: Summary of Survey Data



Looking at this data was slightly discouraging because the majority of my students showed a decrease or no change in a positive outlook toward math, but I had evidence, including test grades, Stars test results and student journals that confirmed that improvement was made. Possibly by the time my students filled out the post-surveys they were burned out with the various project-related requests I had made. Some students filled out the final survey answering every question with Strongly Disagree. These were some of the students showing great improvement. Tyler, for example, was a student who made very steady gains throughout the project. However, when the time came to fill out the final survey, he filled it out in a minute or less and all questions were answered as Strongly Disagree. Tyler had become discouraged with the project and the journaling, interviewing and challenging problems of the day. Negative comments and unenthusiastic gestures about math became expected from him. Therefore, I considered the surveys and the results to be slightly skewed.

Reviewing data collected from the project showed an upward trend in both daily graded work and test scores throughout the project. Although this is a positive outcome, I gave very little weight into these numbers. Students with daily grades in the 90s, while seemingly good, often times reflected mom and dad's ability to catch mistakes before assignments were handed in. This excessive help usually resulted in good daily grades and poor test grades, since students had not done or understood their own work. Test grades for students had an increase on average of nearly 5.5% points. This provided evidence that understanding and retention was increasing throughout the study. Homework grades for students rose on average 3.75%. The increase in overall average was due to the fact that I had better homework completion rates from a number of students and thus they received significantly higher grades. Figure 3 and 4 are summarizations of daily homework grades and test grades respectively.

Figure 3: Summary of daily homework grades

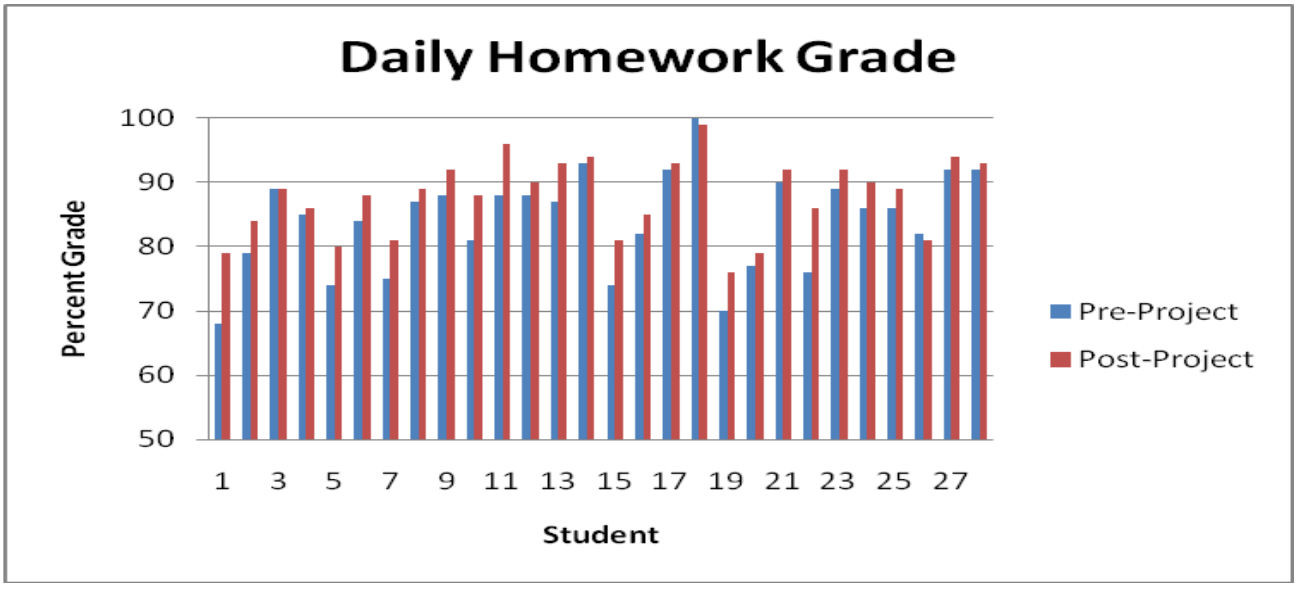
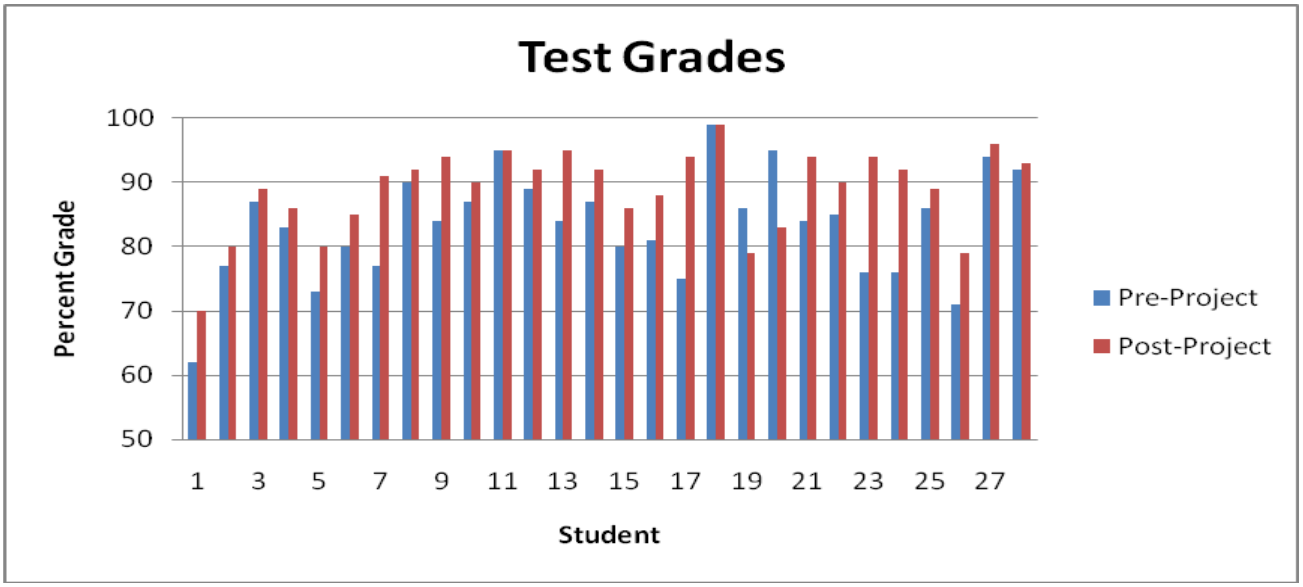


Figure 4: Summary of test scores



One last test that I relied on that gave me a glance at the level of understanding was a computer generated test that our school used as a tool to track students' abilities throughout the elementary grades called the STAR Math test. I had my students perform this test in September as a baseline mark, again in February for a pre-test, and one last time in late April to serve as a post-test. This was one of my best tools to gauge if my students were getting more skilled in mathematics. As I mentioned earlier too many times grades were a reflection of a student's ability to find and get help. This test was performed 100% on students' own, without teacher assistance. When I tested students in September, I had 18.2% of my class in the 75th percentile or better. In January, 31% were in the 75th percentile, and in late April 55.2% of my class were in the 75th percentile or better. Figure 5 depicts the results of the STARS Math Assessment.

Figure 5: STARS Math Assessment Pre-Project Summary

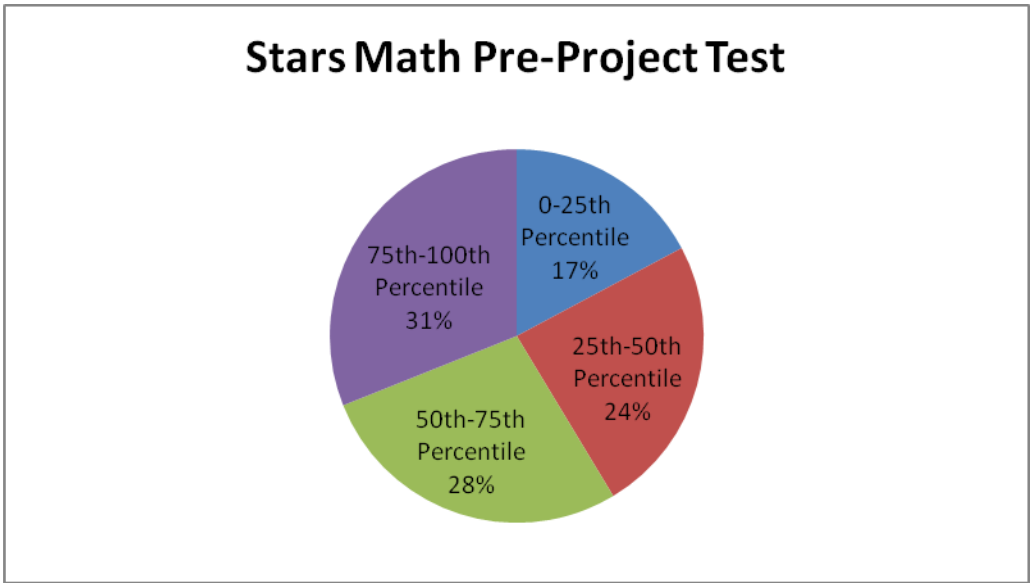
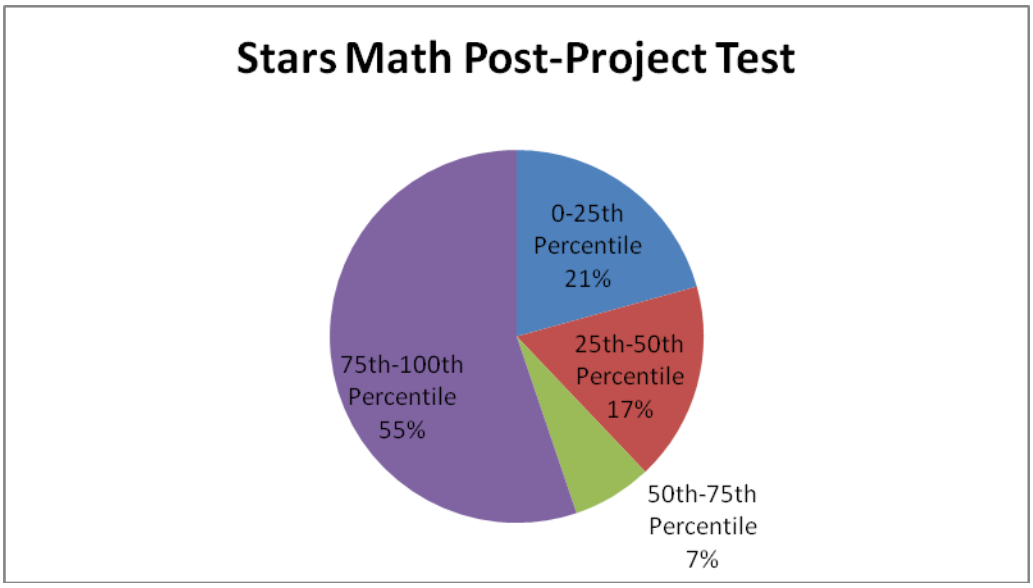


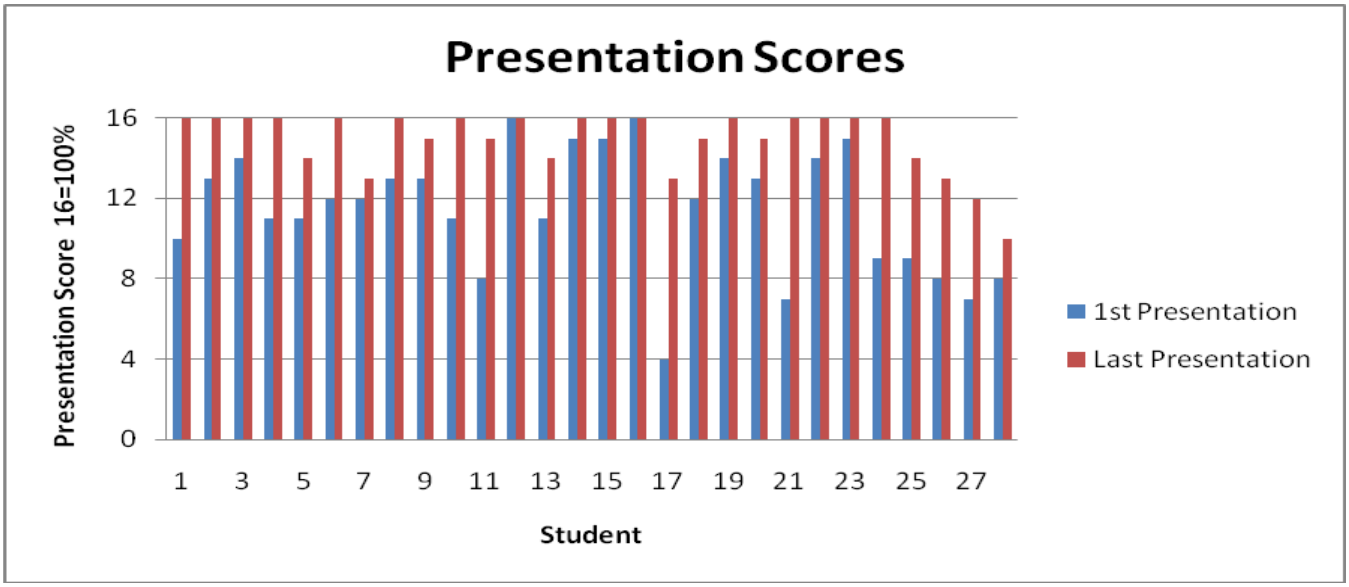
Figure 6: STARS Math Assessment Post-Project Summary



Homework presentations helped me gain insight into my research questions. Scoring of homework presentations was done through the use of a rubric (Appendix E). I used this rubric to score each student in four different areas of the presentation of his or her work, including

explanation, readiness, proper use of mathematical language, and overall effort. Students could score as high as a 4 or as low as a 1, with a perfect total score being a 16 as the total across all four areas. The goal of the project was to get every student in the class to present at least two different times during the project. Of my 29 students, I did have 24 who presented at least twice and many of them as many as six times. Reviewing the scored rubrics I observed the tendency of scores to rise as the project continued. Overall, 89 presentations were given and scored. Below was a graph that showed the vast improvement each student made. In the bar graph, the blue bars represented the students' first attempt, which happened to be their lowest score, followed by the maroon bars which represented each student's highest presentation score. Although understanding had been increasing over the duration of the project because we were covering more content, my students' self-confidence of being in front of the class helped these scores to gradually raise throughout the project. With communication and the correct use of mathematical terminology accounting for 50% of each student's grade on the scoring rubric, students' ability to communicate via accurate vocabulary was pivotal in the raised scores. See presentation scores are summarized in Figure 7.

Figure 7: Summary of first and last scored presentations for each student



Throughout the project, my classroom was decorated with math posters. These posters ranged from basic mathematical terminology accompanied with the exact definition, to concepts, for example area, defined with a picture. These posters were displayed in an effort to raise the level of mathematical understanding and increase the level at which my students communicated with me and with one another. I believed the combination of enhancing the environment with instructional posters and encouraging presentations that included correct terminology helped to overall significantly increase my students' level of understanding. In my personal journal I wrote about the importance of making the environment inviting and nurturing to support mathematical exploration and how this could help all of the students, from struggling individuals to the overachievers as well.

> Presentations are getting better all the time; I think that it is because the problems are continually getting harder. The harder the problems the more in-depth the students engage, the more organization it takes, better visuals support their understanding and presentations also. The four steps that have been taught have not only helped with their understanding of the problem, but helps in grading their presentations. With the students having more tools to use during presentations the

> better I can gauge if they utilized the tools given or if they have fallen short. More than ever before, I am noticing that there are many different reasons why students succeed or fail. With an added focus on communicating, (verbal, written and visual), enhancing the environment with student made posters and obvious changes with the project I have seen students both flourish and struggle, but all are improving. After trying to enhance the room in any way I can, I still have students who divorce themselves from lectures and are still underachieving. (Personal Journal, March 20, 2009)

In all my efforts to improve the environment and instill a "habits of mind" thought process, I was still seeing some students not engaged like I thought they could. The class as a whole was improving, and I needed to keep in mind the students that were benefiting from the environment changes. I knew that I needed to try additional methods to help the distracted students connect to what I was doing, but I also needed to make sure that the students that were engaging better than they had been were getting praised for that as well. The student journal entry, written by an apathetic student who struggled prior to the study, shed light on my teaching changes that helped this student to become a better problem solver during the project.

> Homework presentations raised my level of mathematical knowledge and reasoning ability by teaching me what I did wrong and how to fix it. My ability to communicate has changed since the beginning of the project by knowing how to write things out, draw a diagram and to explain things." (David S. Student Journal April 15, 2009)

In a group interview, at the conclusion of the project, I probed students about their ability to complete Problems of the Day (PODs) and asked them to comment on how their level of understanding had changed since the beginning of the project. As I stated before, some students seemed to reflect poorly on the project in the post-project survey, but many had statements that confirmed my prior assertion that both understanding and

confidence were gained throughout the project. These statements were made by students in an April 28 group interview.

> Howie: "At the beginning of the year it was kind of hard, because you didn't know what to do; now it is really easy to do it."
>
> Brandon: "My understanding has increased; the PODs are easier and more fun."
>
> Peter: "I liked the project because it taught me more, it made me understand math better and it was fun, but we had to PODs, so it was kind of hard to."
>
> Andy: "Solving the PODs from the beginning of the year to now has gotten easier."
>
> Evan: "I like the project because of the PODs, they're kind of interesting and fun, but I didn't like the presentations because I didn't want to get in front of the class and present. I think that I have gotten better at solving them because we know to write down what we know when starting the problem and work it out."
>
> Patty: "I liked the PODs and I liked doing presentations because it helped me understand the problem if I got it wrong."
>
> Laura: "I liked the project because the PODs were interesting and fun to figure out and if I figured them out by myself I felt glad."
>
> Walter: "I liked the PODs in the morning. I kind of liked presenting, but kind of not because when I get in front of the class I get nervous. The nervousness went away because I was used to doing them, my level of understanding made a difference in how nervous I was. If I didn't understand I was really nervous."

Within these quotes I saw a confidence in my students that was not present prior to the start of the project. These quotes showed that understanding and retention of material had effects on the students that changed their attitudes toward the subject of math. As I thought about student attitudes prior to the study I saw a direct relationship between student apathy and a lack of understanding; this was something that was often misperceived.

Confidence was an aspect of learning that many of my students lacked in mathematics. However, it started to appear in many of my students as the project progressed. Prior to the

project, many did not have the confidence to complete the assigned problems without help from a friend or me. Reassurance was needed with many tasks. Students' confidence that they could solve problems independently was not evident. Observations taken and noted through journaling and informal assessments of students during work time made it possible to see that confidence grew in every student. This journal entry was written on March 24, 2009. These were my reflections about a student who needed to be reassured in every step of the problems. It clearly showed that she had developed self-confidence in her problem solving abilities as well as in her ability to arrive at an answer and her willingness to present it to the class.

> Paige C. presented a problem today. She was asked to show how she could use the digits 0 and 1, add them together and arrive at an end sum of 24.013. She worked flawlessly on this problem, but could not explain how she had come up with her answer that she did. I really didn't know how to help her explain herself either. I have talked about Paige before; she is very average, but very hard working. This problem came very naturally to her. She got up presented and was very confident, something that was lacking in her mathematical skills prior to the study. When Paige was working on this assignment yesterday, March 23, she was helping one of her friends Anna. Anna is about average, but was asking Paige how to solve a perimeter problem. Paige helped Anna on the rough spots of the problem, but didn't give her the answer. I commented earlier on Paige's confidence; she now has become so comfortable in her abilities that she helps others. Anna and Paige are friends. Usually it is Anna helping Paige, but this goes to show that Paige likes math more and has more self-confidence in her skills. (Personal Journal, March 24, 2009)

Multiple tools for data collection used in recording the projects' activities had similar results. Knowledge, understanding and confidence were all gained throughout the experiment. Presentations proved to be an ideal instrument to bring great change in my classroom and an outstanding means of assessing my students' understanding; this was a change that would stay as a part of my teaching practices.

Homework

Students' view of homework was a question I was interested in addressing for multiple reasons. Completion rates of daily work were at an all-time low with the first semester coming to a close in December. The low-completion rates did not improve as students arrived back from holiday break. I initially wanted to pursue an investigation peering into student apathy, but after reconsideration of the difficulty of measuring this, I chose to examine homework and its role in increasing student understanding. Reasoning for choosing homework was that I saw a direct relationship between apathetic students who chose not to complete their daily assignments and low achievement. These apathetic students usually were the students that struggled in math and had a lack of understanding.

The teacher's and students' journals as well as student interviews addressed this research question. Although students longed for the day of no assigned problems, they did realize that homework was a tool used to master a desired concept in any discipline. March 3, 2009, journal entries gave me an opportunity to read students' views of homework. Reading these gave me insight into the students themselves and the relationship between the completion of homework and a better understanding of mathematics. Throughout the project, I had been seeing improvement in areas such as understanding and communication. I could not help but come to the conclusion that because these students knew how to perform the problems they were asked to do for homework, that enjoyment had been increased as a result of the presentations as well. Through these journal entries on April 4, 2009, I also saw the relationship between my students having a deeper understanding and how it changed their views of homework resulting in them enjoying math more.

> Evan: "My views about math homework have changed because I am starting to like math a lot more than I used to."
>
> Alli: "My opinion about homework has changed for me because it helped me to complete my assignments and understand better."
>
> Sally: "My views and opinion about homework has changed big time since the beginning of the project. I like it."
>
> Nikki: "I still don't like homework, but I know that it will help me in the long run."

Although not all of my students had changed their views about homework to liking it, like the students above, I thought that all of my students did know homework's purpose and why teachers give homework.

From the beginning of the project to the end, I saw a difference in the way that students approached their homework assignments and the PODs as well. Prior to the project, in a classroom discussion about homework, several students made comments about homework and how it was just the way teachers came up with grades. At the time, I was slightly irritated that my fifth grade students would have the courage to say something so directly. But in hindsight, I did want to encourage safe and open communication; telling it like students' saw it reflected this increased comfort with taking risks that I wanted to create. The students were right. Teachers need proof that kids have mastered the material and what better way of getting it than by giving and grading homework. One major reason my students' views about homework changed was that my teaching practices had changed. The pressure to be correct sometimes gave students anxiety that limited their true ability to think critically. Throughout the study students made me aware that a "process vs. product" mentality was less stressful and a more inviting environment within which to work. In addressing my last research question,

which involved changes that took place in my teaching practices, I had collected journal entries and student interviews that verified the changes in my teaching focus from product to process oriented instruction. In this group interview on April 24, 2009, I asked the students, "How has my teaching changed throughout the project? How has my teaching approach of process versus product affected your learning?" The comments below were from three students that represented a low, average, and a high achieving range. Here were comments from student interviews that provided evidence that relieving the pressure for students to be correct enhanced their ability to solve problems and, in turn, helped them to become better mathematics students.

> Walter: "Your teaching has changed because you don't care if we have the right answer or not, it is just how much effort we put into it. I think that it has been a good change, because I used to only focus on the right answer all the time. With this change I am not as nervous to get in front of the class."
>
> Doug: "You've changed in what you want from us when we answer our assignment problems; you've wanted us to be more organized with our assignments. Your changes have lowered the level of pressure because I know what I am doing and I realize that I actually don't have to have the right answer."
>
> Andy: "You've changed in that you are not so worried about the answer and more worried about the thought process. The level of pressure is lower now that you have changed."

It was interesting to read and reflect on how my teaching changes were perceived differently by different students. These students mentioned the relief of pressure to be correct was helpful in improving as a math student. After getting in front of the class multiple times for math presentations, Walter's fear seemed to subside; one aspect of him being in front of the class after the project compared to before was the eye contact he had with his classmates while he was presenting.

This change in my teaching was not just felt by the students when approaching the PODs, but was reflected in their efforts to complete their daily math assignments as well. Although creating an inviting and comfortable learning environment had been a goal of mine each year, as an inexperienced teacher I relied too heavily on outdated assessments and materials used by the previous teacher. These product-oriented assessment techniques led me to believe that the answer was all that mattered. Now I realized the process, whether arriving at a correct or incorrect solution, was the vital part of learning. This project produced this change in the focal point of my teaching and will affect my educational approach forever.

Teaching Changes

Implementation of homework problems has changed the way I view my own teaching practices and the way I view student work. Before this project, my teaching practices had involved accepting the correct answer and rejecting the incorrect solution. This project changed the way I viewed daily work and gave me insight into the many levels of correctness at which students arrived while solving problems. Based on students' attitude improvement, an overall increase in students' scores in every formal testing category (STARs, criterion referenced and daily work), and better communication skills on the part of students, I realized that the development and promotion of the process students utilize was more vital than the end solution. This change in my teaching became known to my class as process vs. product. Journal entries and group interviews touched on this change later in this summative work. Presentations gave me great insight into the thinking process that took place with more in-depth math problems. This eye-opening study helped me become aware of the damage old and close-minded assessment practices could cause. Prior to the study, assessing students on correct or incorrect answers helped me arrive at a grade that represented a semester's worth of work. Looking back

now, I realized how destructive it could be to neglect to assess the process and only validate the students' attainment of the end result of a solution. Students thrived on teacher feedback. Teachers could create a fear of failure or bolster self-confidence; these variances in feedback contribute to students' success or failure. Creating the environment and a change in teaching focus helped me better serve my students. It was also proof that students started to take pride in work, offer more input in class, and take more chances when fear of failure was a nonissue within the classroom. Reviewing the personal journal I kept throughout the project, I saw change in my students. This entry showed Patty, an average to below average student, find self-confidence to problem solve on her own. She was very apprehensive and unsure of herself prior to the project starting and as the project progressed she changed the way she approached problems. She had a sense of fearlessness. This project brought out the best in her.

> I think that it has been a nice change, my kids are starting to open up just a bit in the way that at the beginning of the project they were stressed out about the PODs because they thought that they were going to be a grade and the level of difficulty of the PODs was going to be a detriment to their grades, but now that I have been stressing this for the last 7 or 8 weeks, I think that they have really started to attack these problems without the fear of failure. I had Patty come up today and ask if she was correct. She had solved a problem that I had helped them out slightly on the board and she had come up with the incorrect answer, she asked if she could hand it in and I said, yes. She stopped at the homework drawer and said, "Mr. Ford that isn't what you got on board." I then had her explain her answer to me how she had solved and she did so beautifully, she understood the thought process that she used to solve. Although she was incorrect, I showed Patty her error, she messed up slightly at the beginning of the problem, she went back to her desk and solved correctly and she was just beaming with pride. It just goes to show that the kids are starting to really take pride in their work, and I don't think I would have seen this change in my kids by just giving the normal 15 problems. (Personal Journal, March 25, 2009)

A change in my teaching methods from modeling "the" correct way of solving a problem to modeling "a" correct way of solving a problem opened the doors for students to trust their instincts and go out on a limb to solve problems differently than I had shown on the board. In

many instances, my students solved problems differently than I had shown on the board and this led to more confidence in problem solving for students in future problems. This was also true when students were asked to present solutions in front of the class on the board. The entry from my personal journal below showed that the student I wrote about had made enormous gains in his ability to solve problems on his own. He solved a problem with his own method and had not asked me to look over; this was a kind of independence I had never seen from him in the past.

> Tom, an average student, has shown much improvement in his problems solving skills. He presented a problem that showed evidence that multi-step problems have become easier. His presentation was very fluid; he could have done better with a visual that would have shown the students who may have solved it differently from him. What impressed me the most was that this was a type of problem that I had modeled, on the board, no more than two weeks ago. Whether he forgot the way that I solved it or found his own way to solve shows me that he is gaining in his skills to perform these harder level problems. His math computation was solid; the only thing I would have wanted him to show was the fact that the concept being used was an "average" problem. His confidence has gone through the roof from one of his beginning presentations, but with the organization of information, it helps students like Tom sort out the good info from the bad. After the presentation, I talked really quick with Tom about his solution and his work and asked what he thought about this problem and how he liked presenting. He said, "I think that I am getting way better at these longer problems." (Personal Journal, March 23, 2009)

This process vs. product change in my teaching had come from being more focused on the students' learning rather than on them performing well on daily work and tests. Although I do want them to score well, this new focus results in them scoring higher, but my students having a deeper understanding of the material would resulted in retention of material as well. I was not sure if this was from my participation in the MIM program or from completing this research project. I thought that the MIM program had encouraged this way of thinking into my brain. Throughout the duration of the MIM program, we have had multiple assignments and problems;

within the program we have called them Habits of Mind (HOM) problems. These were without a doubt the most difficult mathematical problems I had ever encountered. Our directions for completion of the HOMs were simple, work extremely hard to complete them. If you cannot solve them, have questions ready when you come to class. This had been the philosophy that I took from the program. So, I adopted this within my own classroom. I told my students to give an outstanding effort, and after that I would assist them in any way I could. This emphasis on process used to solve problems made it acceptable that a student gets a lower grade than desirable on an assignment and understands, rather than cheating and receiving 100% and not understanding the "how and why" of the solution. I gave kids praise for attempting problems and not having the correct solution more than I praised the kids that had the correct answer, but had no logical explanation as to how they arrived at their answer. These interview responses and journal entries showed that the level of pressure to perform and "find" the correct answer could over-shadow the process. The following responses came from my last group interviews conducted on the last day of the project, April 24, 2009. I wanted to know if any teaching changes I had made through the duration of the project affected anxiety, if they had any, to present the math problems to the class.

> Peter: "Your teaching change (process vs. product) has been a good thing, because then when I am working on it and I'm kind of worried about if it is right because I don't want to get it wrong, because I have worked so hard on it."
>
> Tom: "Your teaching has changed by how you want us to show more work instead of having the right answer, so we can understand the problems better."
>
> Emily: **"**Your teaching has changed; you focus on work instead of the answer. If we show our work, we know if we got it wrong and where we went wrong and can go back and fix it."
>
> Brooke: "It is easier for me to just show my work instead of worrying about the right answer because then I just freak out and not want to hand it in. It has been a good change, because not worrying about the right answer has been nice."

Student anxiety toward math was evident in these quotes. Students diligently working on difficult problems should not be hindered by the fear of solving incorrectly. When I alleviated this fear, apprehension subsided.

Again, the process vs. product change in my teaching was monumental. It was what made this project a complete success. This transformation indirectly addressed many other issues that I would have liked to address within my study. An area I had great interest in was student characteristics of apathy, attitude and effort within a curricular area. They were all addressed under this theme. By the creation of a low-stress environment, effort was increased and attitudes were improved. I credit these changes to the students' more complete understanding of mathematics. Students liked doing something they were good at. Not having the pressure of being wrong helped students work diligently on problems until they were right. This confidence started with losing the fear of failing.

CONCLUSIONS

Through my research, my findings supported many previously stated notions by numerous respected authors. Communication was a theme examined in my study, and it appeared to be a missing link in my own assessment methods. Butler and Stevens (1997) made mention in the article they wrote that communication was a vital part of the assessment process. They added, "Knowledge students acquire in all subjects is most valuable when they can communicate that knowledge to others in effective ways" (p. 218). A proverb mentioned in Berry and Houston (1995) is "The one who teaches learns twice" (p.23). I see the truth in this statement. Prior to my project, communication had one meaning for my students: talking. Although talking was one form of communication used many times in daily lectures and

presentations, I focused on two other forms of communication during my study. Written and visual communication became an important part of my classroom this spring. These forms of communication had an impact on my teaching as well as the manner through which my students learned. Written explanations helped students organize their thoughts, but it was the visuals that helped students retain material and concepts. These visual aids made presentations and math a little more interesting. Berry and Houston had similar results when poster sessions replaced semester culminating seminars, "Preparing posters is a different and novel task for mathematics students and thus provides a variation in activity which adds interest to their learning" (p. 23). Making the students present solutions all three ways, verbally, visually and through written communication helped to fortify the process they used to solve and made it more likely that they would remember how to solve in the future.

Morgan and Watson (2002) focused on the many ways teachers could evaluate student understanding. Cut-and-dried testing procedures were not the most effective manner to measure student progress and achievement. My research and data showed that an increase in student understanding had a direct relationship with the alternative assessment procedure I was using. Presentations, although intimidating at first, proved to bolster student confidence and understanding. Results showed a connection between a student's ability to communicate mathematical ideas in front of the class via presentations with an understanding of the concept assessed. Izard and Haines (1994) shared in this belief, "The use of projects and investigations, as assessment tasks, has the potential to mirror the desired skills, with the aims and objectives of the activity, hence contributing to valid assessment" (p. 374). Although I obtained results showing an increase in overall class averages in daily work and in test scores, paper and pencil daily work and tests still did not provide me with a reassuring feeling that understanding and

retention are increased. Izard and Haines (1994) also commented on the delicacy of assessment in their article regarding the development of better assessment practices. They pointed out that assessments could be the building blocks or the wrecking ball of a student's confidence in mathematics. Izard and Haines (1994) mentioned how teaching style and teaching focus could affect student performance. This was something I found in my study as well. Izard and Haines (1994) stated, "This intensive coaching to learn certain concepts destroy the relation between the direct and indirect criteria and the indirect measure does not measure the true objectives" (p. 374). Current issues in assessment claimed that too many teachers were teaching "for assessments" and not teaching "for learning"; we had to remember our end goal was to have our students retain what was taught. This project would have a lasting change in classroom setting, teaching focus and overall learning environment. Students learned mathematics better and more rapidly when they were immersed in a mathematical environment that was non-threatening and focused on process of understanding rather than producing the correct solution.

Cooper, Robinson and Patall (2006) went on to add that a happy medium needed to be found, but said that age made a difference in the level of positive outcomes that could result from homework and how teachers could maximize those benefits. Nine of the studies reviewed showed that homework given to elementary students showed little to no academic gains from extra work done out of the classroom. My findings confirmed statements made by Cooper, Robinson and Patall that a happy medium in regards to homework needed to be found. Within my own project I found that my students did benefit from work that was done outside the classroom, but shortened daily assignment length allowed many of my students to complete the daily work within the school day.

Prior to the study, completion of homework was becoming a more significant concern in my classroom every day. A combination of the lack of student internal drive and parental supervision made the idea of learning mathematics anywhere but in my classroom nearly impossible. If students did not receive help during school hours, the work likely would be turned in late, or not at all. Homework was my last theme studied in my project. As Cooper, Robinson and Patall (2006) wrote in their article about homework, it could improve or worsen student attitudes, which directly tied to academic achievement. A happy medium in homework workload was found within my study, and attitudes were changed in favor of math as my study progressed. As Cooper, Robinson and Patall (2006) mentioned in their article, "The long-term academic benefits of homework are not necessarily enhancements to achievement in particular, but rather the establishment of general practices that facilitate learning, it is expected to encourage students to learn during their leisure time, improve their attitudes toward school and improve study habits" (p. 6). My project supported what these researchers found. Although my students might not have done mathematics in leisure time, study habits, as well as, attitudes toward math made a complete turnaround. With the workload lessened and students' attitudes improving, math was much more enjoyable and in turn I covered more mathematics material.

IMPLICATIONS

I now believed that it was worth every teacher's efforts to try to improve the learning environment in their classrooms via presentations. Presentations were a less formal approach to assessments. This alternative method lessened the fear of failure and led to more confidence in my students in my classroom. I found a new and innovative way to connect with my students. I was able to assess my students' levels of understanding through my students' ability to communicate, whether it was orally, visually, or through written communication. It was

imperative that an active learning environment embraced the various ways that students learned. Mathematics material has not changed in the last couple of decades, but the ways that I understood that students learned had changed. Traditional methods of communication and assessment were not as effective. What had changed about the traditional forms of assessment was people's understanding of the assessments' limitations. These outdated forms of assessment still had a place in today's classrooms. However, these new and innovative informal assessment strategies needed to be added. A mixture of informal assessments within the classroom as well as rubric-style, formal assessments measured the students' thought processes thereby giving the instructor a more complete picture of the students' mathematical understanding.

Throughout the project other themes emerged that piqued my interest. Cooperative learning, the daily schedule, and a curriculum change from what my students had been used to for four years from a chapter-style book to a spiral curriculum appeared to have significant effects on student performance. Findings within my study, though not directly addressed, verified that many other factors could and would affect student performance. Throughout this project, I had witnessed growth in learning that took place because of my change to more process-oriented, contemporary style of assessments. The results of my study and the feedback I received from my students supported the notion that it was worth the effort to incorporate presentations at some level in the classroom.

These presentations may be as simple as student-to-student presentations when explaining answers from daily work or as complex as presentations of PODs complete with written explanations, oral communications (using proper terminology), and supported with visual aids presented to the entire class. Through the homework presentations conducted by my students, light was shed upon my students' weaknesses. Rubrics made for my action research

project could be used in the future to help assess students' progress. The positive results received from my students encouraged me to continue with the implementation of homework presentations next year. Most importantly homework presentations have had an impact on my students. By increasing their understanding of the mathematics being taught and enhancing their enjoyment of the process through which problems were solved, I had better served my students.

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Appendix A

Student Survey #1

	SD	**D**	**U**	**A**	**SA**
I am good at completing my math assignments.	SD	D	U	A	SA
I feel the need for math homework.	SD	D	U	A	SA
I believe math homework is helpful.	SD	D	U	A	SA
Math homework presentations will/ has help(ed) me learn better.	SD	D	U	A	SA
Math is enjoyable.	SD	D	U	A	SA
I learned math well from teacher lectures.	SD	D	U	A	SA
I learn mathematics from completing math homework.	SD	D	U	A	SA
I am interested in furthering my math understanding.	SD	D	U	A	SA
I believe that teachers assign homework to helps us learn better.	SD	D	U	A	SA
I hope that presentations will be a part of my next math classes.	SD	D	U	A	SA
I think I learn math content better when I am asked to perform a presentations about that concept.	SD	D	U	A	SA

Appendix B

Student Survey #2

	SD	**D**	**U**	**A**	**SA**
Math is very enjoyable for me.	SD	D	U	A	SA
I want to improve my mathematical skills.	SD	D	U	A	SA
I learn math best from the teacher talking.	SD	D	U	A	SA
I learn math best from practicing on the white board.	SD	D	U	A	SA
I learn best from doing homework and other practice techniques.	SD	D	U	A	SA
I believe math homework is helpful.	SD	D	U	A	SA
I believe teachers give math homework to help me learn.	SD	D	U	A	SA
I complete my homework every day.	SD	D	U	A	SA
I see the need for learning math in my every day world.	SD	D	U	A	SA

Appendix C

Homework Presentation Rubric

	1	2	3	4
Explanation	**Concept explanation is not complete; question is incomplete.**	**Concept is explained with a few errors; question is answered**	**Concepts is explained so that process is clear; question is answered**	**Concept is explained so that the process is clear and question is answered thoroughly**
Preparation/ Readiness	**Student is not ready to present**	**Student is not entirely ready to present**	**Student is ready to present**	**Student is ready to present**
Mathematics/ Language Usage	**No use of mathematical language and or mathematical symbols**	**Students attempts, but does not used mathematical language and symbols correctly**	**Student used correct mathematical language and symbols with minor errors**	**Student used correct mathematical language and symbols**
Effort	**Student did not seem to attempt the problem outside of class**	**Student made little effort to complete the problem correctly**	**Student made an attempt to answer the problem, but gave up quickly**	**Student made an excellent attempt to answer the problems and showed excellent logic although answer may have been incorrect**
Overall Score	**Beginning**	**Progressing**	**Proficient**	**Advanced**

Appendix D

Personal/ Teacher Journal Prompts:

1. What changes have I noticed about how I perceive homework?
2. Have I noticed through the presentations that students have found more than one way of solving the problem?
3. What changes have I noticed about math discussion?
4. What changes have I seen in my students this week as they present homework problems and their understanding in general?
5. What I my overall feeling on my students mathematical knowledge?
6. What are conflicts that I have encountered with homework presentations?
7. What changes have I noticed about homework completion?
8. What is one question I have after this week' presentations?
9. What changes have I noticed about students' comfort levels in their presentations?
10. What did I learn this week about homework presentations and a means of assessment?
11. What went really well this week, related to my problem of practice?
12. What changes have I noticed about mathematical language and correct usage of it?

Appendix E

Student Interview Questions:

1. Do homework presentations help you, if so how?
2. What is the meaning of homework presentations?
3. What is your definitions of homework
4. What do you like best about math, what do you like least about math?
5. How would you describe yourself as a student in general?
6. What makes math easy or difficult for you?
7. What is the objective of homework?
8. Does homework help you, if so how, if not why?
9. How much time on average do you spend on math homework?
10. Has the change in homework improved your learning?
11. How would you rate your mathematical understanding before/after the implementation of homework presentations?

Appendix F

Student Journal Prompts:

1. Do homework presentations help you, if so how?
2. What is the meaning of homework presentations?
3. What is your definitions of homework
4. What do you like best about math, what do you like least about math?
5. How would you describe yourself as a student in general?
6. What makes math easy or difficult for you?
7. What is the objective of homework?
8. Does homework help you, if so how, if not why?
9. How much time on average do you spend on math homework?
10. Has the change in homework improved your learning?
11. How would you rate your mathematical understanding before/after the implementation of homework presentations?