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# Can homework become more meaningful with the inclusion of oral presentations?

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**Can homework become more meaningful with the inclusion of oral presentations?**

## Abstract

In this action research study of my 7th grade math class, I investigated the inclusion of homework presentations to see if they would improve students' attitude toward mathematics, participation, and understanding. I discovered that although the implementations of presentations into our homework routine did not drastically influence grades, or even improve attitudes (according to test grades and student surveys), a multitude of other changes surfaced. These changes consisted of an increase in discussion, a team effort among students in my class, and an overall "learning community" effect. I plan to continue to pursue presentations as a major part of my homework routine, and also incorporate presentations into review sessions.

## Introduction

I researched homework methods and the effect that homework has on student learning. Some issues that concern me are equity within the realm of homework, whether homework can become meaningful and engaging, and whether poster presentations would affect student learning and promote mathematical discussion. After changing my ideas from week to week and almost from extreme to extreme, I decided to focus my action research project on homework: specifically, how integrating students' presentations into my daily homework routine would affect student learning and attitudes toward math.

My 7th grade math class, my first class of the day, is comprised of 18 students. I currently assign daily homework, and we correct it the following morning. We exchange papers, and I choose a student to read the answers to us. While that child is reading the answers, I correct his/her paper. After discussing any exercises that may have been problematic, we proceed to the next lesson. The problem is that the same students always ask me to explain a problem or two, while the majority do not even look over the problems that they missed. I believe the homework is a learning tool only for a select few: the students who both care and also are brave enough to ask questions in front of the whole class. I then collect the papers, enter the grades into the grade book some time during the week, and hand the papers back to the children (hopefully) sometime during the week.

Another point of regret for me is when the students receive their papers back after they have been graded. At this time, all papers go directly into recycling. The lack of interest that my students take in their homework is extremely disheartening. Very few students will actually look carefully over their papers for my changes and notes that I may have written by an incorrect problem. Viewing homework that has been checked and commented on should be a learning

experience. This tells me that the learning has stopped when they handed the paper in. I wish that they would question the problems that they worked incorrectly and try to find where they went wrong in their process.

## Problem of Practice

I am probably from the old school somewhat, because I still believe that children need practice to deeply learn certain math skills. However, I believe presentations by students would bring learning to the center of the class, instead of being a remote item in individual students. It would also give me a chance to assess the students' understanding of the concept and vocabulary more deeply. Also, instead of one person doing the majority of asking and telling, with a random system, every student would get an opportunity to present.

So my solution to my proposed problem of practice is that I would like to randomly choose one (or two – to begin with) students to present a rich problem that incorporates the concept that was learned previously. I would like to provide students with large chart paper, plenty of markers, and working space to carefully and very thoroughly present the following day. The students who present would be exempt from homework that day, and of course, the presenters would change daily – giving everyone an equal chance to show and discuss their work. This would solve the problem of the shy students who are pretty much overrun by the bolder ones, and it may also provide an interesting change in our homework routine.

The National Council of Teachers of Mathematics (NCTM) standards related to my project are representation, problem solving, communication, reasoning, and equity. Representation was demonstrated in the presentations when the students are explaining their reasoning to the rest of the class. As they explain their thought processes used, problem solving was involved. There was much whole class discussion (communication) after each presentation

because observing classmates were allowed to question the process and the reasoning used by the presenters. I also see equity as being a positive effect because teachers had an opportunity to see/hear all students' ideas. The expectations were set high for all students because every student was held accountable for explaining his/her thought processes. In addition, working initially in groups was children the support that they may not receive at home while doing their homework. This should also bring every child into the center of the discussion and hopefully fewer children will be allowed to slip through the cracks.

I do not expect a miracle, but I will strive for a realistic compromise between my "dream" classroom and what I can realistically achieve. I realize that there will be challenges and some students who will not respond in the way that I desire. I also realize that three months, which is the length of time of this research, may not be enough time to see the positive effects that I am hoping for. Another gray area may be the presence of lurking variables, because I plan to use other teaching/learning strategies, such as group work. Any success (or failure) cannot completely be linked to the inclusion of presentations in my homework routine.

My research can be used to improve the larger community of educators, instead of just my classroom. I believe that the intellectual warrant for my proposed research is that currently in the average classroom equity is not being achieved, because teaching may too often be presented in a lecture manner, and students' thought processes are not being heard or understood by their teacher. I also believe that--overall--homework is not meaningful to students. My theory is that homework should be used as a learning tool. I do not believe that it is having that effect in my classroom right now. By incorporating presentations into my homework routine, I hoped to not only improve students' understanding, but also to improve their attitudes about mathematics.

## Literature Review

Homework is probably one of the most controversial and dubious of all aspects of teaching. Maybe this is because homework has so little control by the teacher once it leaves the classroom. In 1979, Coulter compiled an overview of research that had been done on homework in the 30-year span previous to 1960. He found that in this period, out of 280 articles published on homework, only 17 were actually experimental research.

Educators' curiosity, however, has led to an increasing number of research articles delving into this aspect of teaching. The meaning of homework and the philosophy behind it can be as varied as the teachers who assign it. The method in which homework is given has taken on different forms, however, depending on the local and national views of education, as well as the research and educational reform movements at the current time. However, the issue of exactly how homework should be handled still seems to be a challenge for teachers everywhere. Educational research on this subject had common themes throughout: equity, engaging and challenging students, and poster presentations.

### *Equity*

While in the classroom, teachers can attempt to create a learning environment that is equitable for all students. However, once children leave the school building, the learning and support systems that the individual students find in their homes can differ greatly. From technology to parental/sibling support, equity of students' home situations cannot be guaranteed. According to Coulter (1979), who researched the relationship between homework and academic achievement, students from lower income homes often do not have the conditions appropriate for homework success, and must compete on unequal terms with their middle class counterparts.

However, accessibility to technology, via public libraries, schools, etc. has narrowed the equity gap that existed in past years. Students can even get help with homework by use of computers.

Hong and Lee (2000) compared preferred homework styles of Chinese students who were characterized by self-perceived homework achievement and attitude, teacher-rated homework completion and quality, and academic achievement in mathematics. This study interested me because the subjects were 329 5$^{th}$ graders and 244 7$^{th}$ graders, which is the same grade level of students in this study. Hong and Lee found that, as expected, the parent role had a strong correlation with student homework achievement and attitude. This becomes another concern tied to equity – not all children have the same type of support in their home environments to be equally successful with their homework, which in turn affects their mathematical achievement.

Many teachers rely heavily on homework for reinforcement of previously taught concepts, and then find it difficult to monitor whether students are getting the support needed to achieve these learning practices. Corno (2000) summarized both theories of homework and different homework research projects. Corno's theory is that homework should not just be practice of learned concepts, but an extension that engages family at home, and serves as a building block for future learning strategies. Besides being a practice tool, it can also serve as a learning and exploratory device, enabling students to develop the skills of reasoning and self-learning.

As stated by Corno (2000), who studied the changing meaning of homework, homework is not just an academic task any more; because of the changing times and the busy families, it has become a nightly commitment that has infiltrated families' lives and become "one more commitment" that needs to be tended to. Students have less and less time to devote to homework, because of the increasing number of after-school activities. These activities may not always be

their own. Their evening hours are often occupied by sibling's activities or even parents' social obligations. The choices made by parents for their children can determine whether all children have an equal chance to be successful with homework.

***Engaging and Challenging Students***

In order to reduce both student and parent frustration at home, homework has usually been given as a form of practice of skills taught in class. Much drill was a popular method, especially in math class. This was ironic, because the student had to have a grasp of the algorithm before leaving the class, or he/she would not be able to complete any of the problems. If the method was not understood before leaving the classroom, chances are that the problems would all be done incorrectly, if at all.

Another concern of teachers is that an overload of the same type of problem can lead to boredom, especially if the student has a firm grasp of the concept – this term has been labeled "drill and kill." According to Wills (1962), who experimented with programmed vs. creative teaching strategies, students need variety, rather than one single mode of presentation that the teacher may consider the most effective. The purpose of his study was to study experimental textbooks written by University of Illinois Committee on School Mathematics (UICSM). He involved 200 college students in either programming or creative teaching classrooms. He found that students need variety, time to practice, and also time to discover.

Wills' (1962) study supports my idea that maybe the "look" of homework should be varied. I would like to allow my students to have that time to practice concepts that they have learned, yet have the opportunity to present and talk about their ideas to the class. Although this study worked with college-level students, my 7$^{th}$ graders can also benefit from a variety of instructional methods.

Gill and Schlossman (2003) used surveys to compile research on the time spent on homework. Their surveys spanned 50 years, and focused mainly on students ages 9, 13, and 17. Gill and Schlossman found that the amount of time spent on homework changed very little over the decades, but did increase slightly in the early 1980's, when there was a strong public push to excel. The concern that I found in their study was that as the students matured, they would actually spend less time on homework, because they would tend to ignore homework. Could this be because they felt that it was irrelevant, or even too overwhelming? Would it be more beneficial to students to concentrate more on ideas and processes rather than "correct" answers? If students were held accountable for their thought processes and being able to communicate them to the group, maybe they would be more apt to strive for understanding, rather than getting the "correct answer."

Children learn in different ways, so in order to reach all students, different presentation methods should be implemented. This theory could also be true when homework is considered. Gill and Schlossman (2003) found that the questions of "What?" and How?" are being considered just as much as "How much?" According to their research, teachers are becoming more aware of the fact that homework needs to become more stimulating and challenging in order to keep students engaged.

Another concern that has been associated with homework, particularly since the reform movement, is that the communication does not exist in a portion of homes. Communication has been found to be an important part of learning and is also one of the NCTM standards. According to Dolezal, Welsh, Pressley, and Vincent (2003), who investigated different motivational techniques used by teachers, engaging children in their work allows for more positive and motivated students, and also higher achievement. They investigated nine third-grade

teachers and documented detailed observations of these teachers and the effect that their individual teaching strategies and individual classroom management skills had on their students' achievement and interaction. Although my research deals with junior high students, the correlation between motivation and engagement is apparent. So there is a need to tie this in with homework, also, and make it more engaging for students rather than allowing homework to be remote and isolated, rather than engaging and motivational. As stated by Hong and Lee (2000), the more motivational the teacher, the higher the student homework achievement and attitude were.

***Poster Presentation***

There has been an abundance of research on maximizing the learning potential within the classroom, but the question of how to bring as much meaning as possible to the time that children spend on homework, and also to transform homework into a learning tool, and not just a means of assessment or practice, is still unknown. My research project strives to find a way to bring communication, presentation, and meaning into the center of a homework routine. Page (1962) studied the effects of posters and projects on mathematical interest and learning at the Annual Mathematics Fair at the University of Maine. Sixty-four high school students competed with two different types of projects: visual displays or exhibits. Page found that visual aids stimulated mathematical achievement and exploration among students both participating and observing the presentations. If educators made "rich" homework problems visually accessible to the class, and allow for discussion and exploration, students would be more apt to engage themselves in the learning and would more fully understand the concept.

A two-year study by Berry and Houston (1991) involved examining the use of posters in math classes. The main goal was to study the effects of using posters in comparison to writing a

paper. This is the type of presentation that I implemented with my project. If students can transfer their thoughts onto a format that they can use to explain their thoughts and at the same time stimulate discussion from the class, they will more fully understand their concept. Berry and Houston (1995) state that "When you teach, you learn twice" (p. 23). Students who are allowed to explain a concept through the use of posters could not only learn the concept , but through communicating their understanding to others, could gain a deeper understanding themselves.

My research studied the incorporation of poster presentations into my homework routine. Each day that homework is assigned, each of two of the "rich" problems were assigned to a randomly selected pair of students. These students thoroughly presented their problem to the class on large chart paper, instead of doing the regular assignment. After presenting their problem, the class may ask them questions to clarify their thought processes. They were evaluated with a rubric by both teacher and peers.

## Purpose Statement

The major purpose of my research study is to find some way to make homework meaningful to students. For this particular study, I chose one specific method to research: homework presentations. I collected data to investigate the following research questions:

- What will happen to students' confidence and attitude toward math after initiating presentations?
- How will presentations influence the amount of participation of individual students?
- What will happen to students' understanding of concepts/processes after initiating presentations?
- What happens to my teaching when I institute homework presentations?

## Methods

I set out to find data that could help me to make assertions concerning my research questions and then to support them, or prove them false. My teacher journal gave me a continuous story of my research. I used this as a base to include all of the other data collection methods, along with my thoughts and insights that may have occurred on any given day. I attempted to write in my journal each week, using post-it notes that I used throughout the week to document any highlights that occurred. Things that I specifically searched for were changes in the quality of individual questions, moments where unique mathematical connections were made, and instances where I noticed changes in the learning environment in out classroom.

Student surveys (see Appendix A) were given both at the beginning (February 8, 2008) and again at the completion of our research period (April 15, 2008). The surveys took approximately 10 minutes to complete and their purpose was to measure changes in attitude and confidence of students because of our homework presentations.

I documented results of any online assessments that were taken during our research study. These tests were written by math educators in our service unit and the results are reported to the state. During this period my class took four of these tests. Each online test had 15 questions, most of which were represented by presentations during the unit at some point.

On March 12 and March 25, 2008 I interviewed individual students during the students' study halls so as to ensure privacy. In these interviews, I was searching for two major insights: students' honest feelings toward our presentations and also their mathematical processes, which were gained by watching them work through problems similar to the ones that were presented.

Presentations were graded by the use of rubrics. I also let peers evaluate each other and let each group read comments made by both myself and other students. I also took photographs

of the presentation posters that students created during our research period. I wanted to see if there was any improvement in the problem-solving methods as we went along, or rather, if they were using multiple methods more frequently.

Small group interviews given on March 21, 2008 and March 28, 2008 (see Appendix B) consisted of two or three students at a time, in which students were asked to discuss their feelings relating to presentations and the changes in our classroom. They were also asked to give me advice as to how I should incorporate presentations in the future.

Student participation tallies were kept weekly between January 30, 2008 and April 10, 2008. These were sheets consisting of all of the students' names, and were kept by randomly selcted students to show the frequency of each student's questions during presentations.

Retention quizzes were given two different times during the research period. These were given two to three weeks after a concept was taught. Sometimes it was a concept that had been covered by a presentation; at other times it had only been taught by me, without the use of presentations. This allowed me to see two things: if the concepts covered by presentations were understood better by the students, and also if the concepts were understood for a longer period of time.

While students presented, I also asked the students to jot down any question that they asked the presenters. They did not always remember to do this, or maybe they chose not to, but this helped me to see if the quality of questions improved with the use of presentations.

## Findings

A typical day during the period of my action research started with "our homework routine." Here we listened to those who volunteered to give presentations on certain homework problems that were more challenging, or contained multiple steps and/or concepts. These usually

initiated conversations that sometimes led to concepts that we had not yet covered, and sometimes set the basis for the concepts that were taught that day. After beginning presentations, even though I had completed lesson plans for each week, my teaching was guided more often by the discussion than by my lesson plans. I learned to be more flexible, because if our discussions went off on a tangent, the students were more easily motivated and had better comprehension by these leads, rather than if our lessons were rigid and completely teacher-centered.

Most of our learning came about by discussion followed by group work, followed by more discussion. The emphasis on a correct final answer slowly gave way to the challenge of finding multiple solutions to solve a problem. Students were more comfortable taking risks, and were offering help or hints to each other. I found that as time went along, students were asking each other for help just as often (or more) than they would ask me.

Our assigned homework had a different look than before. Often it consisted only of presentations. Other times the majority of class time is spent solely on discussion. In these cases, homework may consist of only one or two challenging problems.

One of the biggest challenges relating to my research is the timeliness of the presentations. Producing a quality presentation may take more time than the usual assigned homework. Late papers get points deducted, but I did not want to discourage quality of work as a tradeoff for work that was turned in on time. So I no longer took points off for late presentations. However, by the time that some presentations were given, we were already moving away from those concepts. On February 21, I journaled that I was continuing to give extensions on presentations whenever requested. This was a tension between the teacher and the researcher in me: should I let the teacher in me give the late grade when a presentation in incomplete, or should I let the researcher in me take over and selfishly give extensions when needed

(supposedly), knowing that more time may give a better product and higher student understanding, therefore, making my research look like it is working.

Another area of concern for me was the fact that only two pairs of students present per lesson – and at the same time, are exempt from homework for the day. However, when the rest of the class is correcting our homework, those students often seem bored, so I would let them polish up their presentations. Unfortunately, this sometimes was distracting to the rest of the class.

After conducting my research, my data at times supported my assertions and at other times left me with more questions. My findings for each of my research questions are as follows:

Research Question 1: What will happen to students' confidence and attitude toward math after initiating presentations? My assertion is that students feel more comfortable asking questions since we have began using presentations as part of our homework routine. To investigate this question, I gathered the following forms of data:

Individual student surveys – I gave my class a survey asking them to reflect on their feelings and experiences relating to math (see Appendix A). This was given both at the beginning and end of my research study. In general, this survey did not show me that there was a positive correlation between my research and the students' attitudes/confidence toward math.

Here is a chart comparing some of the responses before and after the research:

| Statement | Before Research | After Research |
|---|---|---|
| 1. I like math. | 9 Agree | 9 Agree |
| 2. I am good at math. | 12 Agree | 10 Agree |
| 3. When I do not understand a problem, I am brave enough to ask questions. | 11 Agree | 9 Agree |
| 4. I like to answer questions asked in math class. | 8 Agree | 8 Agree |

The results from this survey were slightly disheartening, because observation and classroom discussion led me to believe that presentations were enhancing both comprehension and confidence. The only way that I could rationalize this is the fact that the post survey was given at the time of a difficult unit with which several students struggled with understanding.

The data from the small group interviews almost seemed to contradict the individual surveys. These were given in groups of two or three students. The feedback from students led me to believe that presentations were a very worthwhile form of homework and that it led to deeper understanding for both presenter and listener. This is shown by the following student comments:

Question: Who do you think learns more from the presentations, the presenter or the listener? Why?

"Both, but mainly the presenters, because they have to learn all about the problem to be able to teach it"

"The listener, because they're learning from other students – students learn better from other students"

Question: Has your attitude about presenting changed over the last three months?

"Yes, I used to not like to present, but now it's kind of fun."

"I was nervous at first, but not now."

These quotations showed that the participation has improved. These quotes were meaningful to my research question because these students were not students who normally participated in class discussions previously.

I included students' participatory behavior in class in my teachers' journal and documented the types of discussion activity that I noticed in my class since beginning presentations in class. Some excerpts are as follows:

> Bright note – Lani[1], who never ever talks, was the only one who gave us a hint on how to find volume of a cone. She wasn't correct, but didn't seem really upset, which shocked me. I was pretty excited. (Personal Journal, February 7, 2008)
>
> Participation-wise, I noticed that one of my struggling students – Kenny – seems to ask a lot of questions during presentations. I get the feeling that he is comfortable asking the presenters questions, because we had previously discussed the fact that asking them questions gave them a chance to prove how well they understood the concept. I believe that Kenny doesn't usually ask me questions because he doesn't want to look bad in front of the whole class, or appear to "not get it". However, by asking others questions, he could just be "testing" the presenters, and not look like he doesn't understand. (Personal Journal, February 21, 2008)

Both students in these journal entries were not active participants previously, so it is such a huge step for Kenny to ask questions so easily. Lani, who never seemed "safe" enough to make a comment, is now taking big steps by making suggestions during discussions.

Even though the surveys did not show positive growth concerning participation because of presentations, the other data collections said otherwise. Students' responses in their interviews (both individual and group), along with observations that are noted in my teacher journal, supported the fact that students feel much more comfortable asking questions than before.

Research Question 2: How will presentations influence the amount of participation of individual students? I assert that the amount and quality of participation from individual students increases with the use of presentations. I found strong evidence to support this assertion as shown by the following three forms of data.

[1] All names are pseudonyms.

On days when we had presentations, students took turns documenting students' participatory behavior with a tally chart. We made tally marks once a week to show how many students would participate, either in the form of comments or discussion. The data did not show a huge increase in any certain individual; however, there was a steady increase in the number of students who participated in a lesson. Below is a graph showing the number of students participating in class discussion during presentations (See Figure 1).

Class Participation

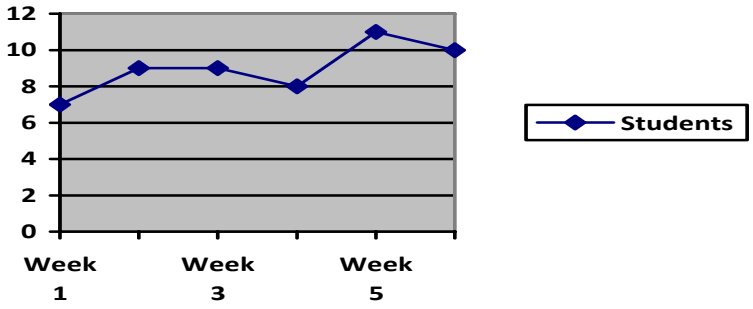


**Figure 1: Student Participation**

I kept a weekly teacher journal to document the quality of questions asked by the students during presentations.

In today's presentations (similar triangles where one is part of a larger one), the types of questions were different than those on the peer grading rubrics. These types of problems were challenging to the class as a whole because you had to visualize the triangles separately. Examples:

"How do you do that again?

"Can you also determine similarity by using angle measure somehow?"

> "What do those letters in the fraction mean?" (The presenter was showing ratios with corresponding sides and was using the sides instead of the measurement of those sides.) (Personal Journal, February 25, 2008)

> When discussing similar figures and proportional sides, I noticed that very few students asked me questions about the work, but seemed to discuss more when a student got up to show a method that they used. Are they more intimidated by a teacher than a student? (Personal Journal, February 19, 2008)

These journal articles are relaying the effect that presentations had had in my class. The students' questions are evidence that the questions have become more about the process than the end result. Also, my last journal article shows that more students are participating when a student is in front of the room rather than the teacher. One possible explanation of this may be that students are less threatening, thus providing an open, safe learning environment.

The students wrote down examples of the questions that they asked presenters in their student journals. Some examples of questions asked were:

- (on a lesson involving surface area of solids) – "What makes a prism? Does it matter in what order you multiply length and width?"
- ( on a lesson involving volume of cones and pyramids) – "Why does the formula have us divide by 3?"
- (on a lesson involving area of a triangle) – "Where is the base on a right triangle?"
- (on a lesson involving area of a trapezoid) – "Why does the formula make us add the bases and then divide by 2?"

I included these quotations because the types of questions are rapidly becoming "Why" and "How" instead of "What is the answer?" I was excited to see that students that used to be concerned only about correct answers were now more focused on the process.

Evidence from my personal teaching journal, student journals, and the participation tally graph all show an increase in the amount of questions asked, quality of questions asked, or both.

Research Question 3: What will happen to students' understanding of concepts/processes after initiating presentations? I assert that students' understanding and retention increases after implementing presentations in the homework routine. I noticed that there was a positive relationship: however, some of my data supported that theory more strongly than others, as shown in the following forms of data collection.

Online test scores were given after each major unit was taught. As a teacher, I thought that student understanding was increasing overall since beginning presentations, and the test scores showed an increase on the last test given. I included the most recent test that was given before beginning the research to use as a baseline. There were 18 students taking these tests and these are scores out of 100 points. I calculated the mean and standard deviation of all of the test scores that were given after beginning my research project, as shown below:

| Date of Test | Preresearch Test (baseline) 1/10/08 | 2/14/08 | 3/6/08 | 3/19/08 | 4/14/08 |
|---|---|---|---|---|---|
| Mean | 74 | 75.6 | 70.7 | 72.6 | 83 |
| Standard Deviation | 18 | 19 | 20.7 | 20.4 | 13.1 |
| Minimum | 33 | 20 | 27 | 27 | 47 |
| Maximum | 100 | 100 | 93 | 100 | 100 |

The data does show an increase in overall scores. One positive result is that the minimum score is increasing, but with so few tests, we cannot be sure. More tests would make this assertion stronger.

Student interviews allowed me to study the students' thought processes while working problems and also to find out if students thought that presentations were worthwhile. In the following interview with Kenny, I got insight into the areas that he was struggling with. He was one of my low-performing students, and I realized that he was confusing the concept of surface area with volume.

EJ: How much paper is needed to make a box that is 1 foot long, 2 feet wide, and 3 feet high? You may work the problem any way that you want. You may start by drawing a picture, if that helps.

Kenny draws a plane figure.

EJ: Think of a 3-D box. (I repeat the dimensions.)

KE: 2 times 3 = 6

EJ: Which face was that?

KE: The top – this would be the side, so the top and the side would be 6, and the bottom - times by 1

EJ: Times by 1?

KE: That would be 6.

EJ: And it is in feet, right?

KE: 6 feet squared – or 6 square feet

EJ: And why did you say "square"?

KE: Because it's a box.

EJ: And you're finding?

KE: Area .

EJ: So you're finding area of each….. (I get him a 3-D rectangular prism to use) So you've got the area of each ….

KE: Face - It would be 6 square feet.

Even though Kenny struggled with math, and did not know how to find the surface area, this interview showed me that he had retained some of the concepts that were covered in previous presentations. He was at least showing effort, which is more than he did in the past. This was good for me to see, because now I am aware that we need to cover the concept of surface area. In other interviews, students expressed their thoughts as to whether or not presentations helped in their understanding of concepts.

EJ: Why do you think I have started having students do homework presentations?

Dan: To help us learn and to find out how we learn

Xavier: So we could learn more.

Frannie: You thought it would be a new way to learn, and it wouldn't be as monotonous

EJ: Do you feel that you ask more or less questions now than before we started presentations?

Dan: More.

Frannie: During presentations – more, but after – less, because we understand.

These thoughts were very representative of other students. Every student interviewed felt that presentations did increase their understanding, and they all voiced the fact that presentations were worthwhile.

Retention Quizzes were given approximately one month after each concept was taught, to check students understanding on a longer-term basis. Students were given one problem to solve. They were told to show all thought processes along the way. Retention quizzes did not show as

great a degree of student retention as I had helped; however, they were a great teaching tool and provided a wonderful review of a concept already learned. This "second time around" I noticed that several others seemed to catch a stronger grasp of the concept.

Results of Retention Quizzes

| | Correct Answer And Explanation | Correct Method But Incorrect Answer | Did not Understand Concept |
|---|---|---|---|
| Surface Area Of Rectangular Solids | 7 students | 5 students | 6 students |
| Volume of a Triangular Prism | 4 students | 3 students | 11 students |

I was very pleased with the quiz on the surface area of a rectangular solid. Students as a whole could explain what area was. Some arrived at the correct answer, but could not explain their thought processes. The quiz on the volume of a triangular prism proved to be much more difficult. Looking back, I wish that I would have used a rectangular solid for that, too. The most common student error was when finding the area of the triangle on the base of the prism. Many students forgot to take one-half multiplied by the base. Also, many process mistakes were due to the fact that students were trying to find surface area. The online test scores and interviews strongly supported the assertion that presentations increase understanding and retention. The retention quizzes showed no improvement, but they did reinforce the previously taught skills and the discussions of those problems were a great review tool for the students.

Research Question 4: What happens to my teaching when I institute homework presentations? My assertion is that the use of presentations has promoted discussion in my classroom, and I find my students doing just as much teaching and leading discussions as I do. My evidence comes from excerpts of my teaching journal.

The biggest turning point this semester for my students and the effect of the presentations was probably the lesson on transformations – specifically rotations. It was probably one of the most obvious times that I felt that my research had – in a roundabout way – influenced our classroom as a community of learners, rather than an isolated teacher and a group of students. Usually this lesson is my most dreaded, because it is so difficult for students to see the meaning in the change of coordinates, and then linking it to the actual visual image of the object rotating about the origin. I have become so much more aware of my method of teaching ever since we began presentations, so every time I present a lesson, I feel like I am giving them a model for their own teaching during presentations. I find myself seeking out questions that may lead to further discussion, even if it is beyond the concept being taught. I am also finding multiple ways to teach concepts, even if it may "slow down" our pace, but at the same time stimulate good discussion. I am also stressing the "method", rather than the exact answer. This lesson was particularly exciting, because my students were coming up with ways to help explain the concept of rotation to the others, such as having a group stand in front of the class and turning 90, 180, 270, and 360 degrees. Along with this, they demonstrated how 90 degrees clockwise would be the same as 270 degrees counterclockwise. We then showed rotation about an origin by attaching a paper triangle on the end of a stick and moving it about the origin on a coordinate grid, to see the changes in the physical orientation of the figure. After this, we then discovered the relationships between the coordinates and came up with rules, such as changing the y-value and switching for 90 degrees counterclockwise. I was so excited about this lesson, because I realized that my students had taken upon themselves the responsibility for teaching others. I even felt like I learned from this, and because of

> my students, I feel more comfortable with this concept. (Personal Journal, February 28, 2008)

In one of my journal entries I wrote that:

> It hit me for the first time this week that maybe the research in itself is contributing to the discussion in my room, because the students feel "safe" when I ask them a question. I think they're more apt to talk and take risks, such as ask questions, because they realize that questions now are not all about the asker, but they help learning occur for the presenters, as well as the whole group. They also know that now when I ask them a question, it may be because I'm gathering ideas for my research, and not because I'm "testing" them or making judgments on their knowledge. (Personal Journal, March 14, 2008)

A third journal entry revealed the following: "When discussing similar figures and proportional sides, I noticed that very few students asked me questions about the work, but seemed to discuss more when a student got up to show a method that they used" (Personal Journal, February 19, 2008).

My journal articles support the assertion that presentations increase the amount of mathematical discussion among students. I have noticed the increased interaction between students instead of between teacher and students. My journal articles are also evidence of students taking over the "teaching" of concepts to other students. The first journal entry celebrates the fact that our classroom has evolved from a community of individual, isolated learners to a unit of communicating learners. The second entry reflected the fact that my classroom may not be so competitive anymore. Students are feeling safer and taking more risks. My third entry suggests an open classroom where the students are at the center of the teaching

and learning. Students are going to each other to get ideas and support. My role is no longer the sole teacher, but now I am part of a learning community.

## Conclusions

Although my specific method of study did not bring about dramatic positive changes, it triggered changes in my teaching that in turn caused changes in the ways students are learning and reacting to homework in my classroom. Homework should be stimulating and challenging, according to Gill and Schossman (2003). Educators need to be aware of students' attitudes toward homework, and adjust not only the amount of homework, but also how meaningful it is to students. Since I began using presentations in our homework routine, I did see improvements in several areas that lead to a better learning atmosphere as a whole. Students who usually do not participate are now feeling safe enough to ask questions and give comments. Students are explaining concepts to other students and trying to find multiple methods to find solutions. My students are asking questions, not always because they want to know something, but because they know that it gives the presenter a chance to prove their understanding of that particular lesson, and that sometimes takes us off on a tangent to discover a whole new concept. As stated by Berry and Houston (1995) in their study of teaching with posters, when a student teaches a comment, it is twice learned. They also found that students question each other to give the presenters a chance to prove that they know and understand the concept that they are teaching. I am no longer the only "teacher" in my room, but rather a part of a learning community.

## Implications

Because of my study, there have been changes (both planned and unplanned) that I will continue to encourage in my classroom. I will continue to have students present as part of our homework routine, but I also will incorporate these presentations as a review before each test.

This was not a planned part of my research, but rather one of the afterthoughts once I started this action research project. Reviewing with presentations was extremely beneficial to the whole class and provided a wonderful review before our exam. Each group would present one particular concept that would be covered on our test, and then make up a quiz question. The questions would be compiled into a common review packet for the whole class to take home the night before the test. We would go over these before the test the next day. Because of this change, I probably cannot assume that my daily presentations were the only factor in any noticeable changes in my class, but I do believe that they were influential in any results that I found.

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## Appendix A

Student Surveys:

Please give your honest response to each statement. For each statement, circle the choice that best represents your feelings about that statement.
SD – Strongly Disagree
D – Disagree
N – Neither agree nor disagree
A – Agree
SA – Strongly agree

- I like Math.

  SD D N A SA

- I am good at Math.

  SD D N A SA

- When I don't understand a problem, I am brave enough to ask questions.

  SD D N A SA

- I am good at explaining math problems to others.

  SD D N A SA

- I like to work in groups.

  SD D N A SA

- I like to answer questions in Math class.

  SD D N A SA

- I need to understand Math to be successful in life.

  SD D N A SA

- One thing that I like about Math class is _____

  _____.

- One thing that I don't like about Math class is _____

  _____.

## Appendix B

Student Interview Questions: (for Small Group Interviews):

- Who do you think learns more from the presentations, the presenter or the listener? Why?
- Has your attitude about presenting changed over the last three months?
- Why do you think I have started having students do homework presentations?
- How easy or difficult is it to understand other students' explanations during homework presentations?
- How do you see homework presentations compared to what we used to do with checking homework in class?
- As I consider if I will use homework presentations in my math class next year, what advice would you give me? What do you see as the pros and cons?
- As I consider how to grade homework next year, what advice would you give me? What do you see as the pros and cons of how I am now grading homework?
- Is there anything you would like to ask me about homework presentations?