

7-2009

Oral Communication and Presentations in Mathematics

Brian Johnson
Nebraska City, NE

Follow this and additional works at: <http://digitalcommons.unl.edu/mathmidactionresearch>

 Part of the [Science and Mathematics Education Commons](#)

Johnson, Brian, "Oral Communication and Presentations in Mathematics" (2009). *Action Research Projects*. 63.
<http://digitalcommons.unl.edu/mathmidactionresearch/63>

This Article is brought to you for free and open access by the Math in the Middle Institute Partnership at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Action Research Projects by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Oral Communication and Presentations in Mathematics

Brian Johnson
Nebraska City, NE

Math in the Middle Institute Partnership
Action Research Project Report

in partial fulfillment of the MAT Degree
Department of Mathematics
University of Nebraska-Lincoln
July 2009

Oral Communication and Presentations in Mathematics

ABSTRACT

In this action research study of my classroom of eighth grade mathematics, I investigated the attitudes of students toward mathematics along with their achievement levels with the use of oral presentations in my Algebra class. During the second semester the class was divided into groups of two for each presentation, changing partners each time. Every other week each group was given a math problem that required more work than a normal homework type problem. On the last day of that week the students gave a short presentation on their problem. I discovered that while there was no significant evidence that student achievement increased, the students did enjoy the different aspect of presentations in a math class. I plan to implement presentations in my classroom more often with the intent to increase student enjoyment.

INTRODUCTION

Communication is one of the main keys for learning in a classroom. This is a two-way street for learners and teachers. If I, as a teacher, am unable to communicate properly with a student then he or she may not understand the concepts. If the students are unable to communicate with me, I may not be able to help them with their issues. This is a problem with all curricula and all grade levels. Students seem to be only graded on oral communication in their English classes. I have seen some presentations in social studies but not many in middle-level mathematics.

I previously have had students show me their concluded answers on the front marker board with little success. The students lacked confidence in speaking in front of their peers. This tells me they do not have the understanding of the material that I am looking for. By communicating their process of thinking to me through one-on-one contact or in front of the class I believe the students will gain a deeper understanding in the concepts I am teaching.

I have noticed in the Math in the Middle program that one of our group members will say “I will present this problem because I actually understand it.” This is what I want my students to achieve. I am looking for that phrase to come from my students because they understand the material so well. When I teach a section to my students, I am able to communicate to them different methods in which to solve each problem. I can do this with a presentation because I have deep understanding of the concept.

Most mathematics teachers give many tests throughout a student’s life with numbers and multiple choice type answers. I forget that oral communication is much more important to a student’s future than choosing the correct letter. Communication cannot just be taught in the English classroom. There are different types of ways I have to communicate in a math class than

a science or social studies class. It is important to teach our students various skills to prepare them for their future.

PROBLEM STATEMENT

I, along with many teachers, have gotten in a rut of accepting the answer as good enough to continue with the next chapter or concept. I should be more careful of falling into that teaching style. It is much more meaningful if a learner can clearly explain and communicate what they have just completed. The NCTM (National Council of Teachers of Mathematics) clearly states Communication as a standard for students. Students will “communicate their mathematical thinking coherently and clearly to peers, teachers and others” (NCTM, 2000, p. 268). The NCTM also suggests that this is a challenging standard with the type of students I use in my research. Middle-level students are often reluctant to do anything that causes them to stand out in a crowd, such as giving a presentation to their peers. The standards of Reasoning and Communication seem to be an afterthought in the mathematical teaching world compared to some of the more typical standards like measurement or geometry.

There have been many times where I have had a conversation about the hiring of an education position. The applicants’ schooling usually comes up and how much experience they have. The other factor that always comes into conversation is their presentation and communication skills. If a person cannot communicate with the audience, he or she most likely will not be successful in his or her career of choice. I am happy that I am able to teach students interesting mathematical concepts. I think it would be more beneficial for their futures if I include something like communication skills in my math class.

LITERATURE REVIEW

Communication is a key element in any situation that someone will come across in his or her life. I believe that all teachers, coaches and sponsors should demonstrate good communication skills to the students. Math teachers need to implement teaching oral and written communication into the mathematics curriculum. When students can explain to me and their peers what they have solved, only then can I see what their thought process is and if they understand the steps they have taken to get there.

I have reviewed literature on oral presentations in the classroom. Writing is another form of communication, but I wanted to bring something into my classroom that I have not done before. Through my research I found there is a lot more into speaking than standing in front of the room and giving the audience an answer. I have found five themes that go into presentations in the classroom. First and foremost is the presentation itself. There needs to be a set way in which students' will be giving the presentations. Small group work was a very common theme in presentations. It seemed that most of the studies had students working together on their presentations rather than alone. Evaluation of the students is very important. I cannot change part of my teaching style and not have some evaluation of how the student is completing the presentations. Student and Teacher attitude of the new form of learning plays a major role in how successful this will become. Finally one common theme I found was student discussion. This is different from the small group work. Some of the research talked about whole classroom discussion after the presentations.

I picked presentations solely for the purpose to get students involved and engaged in their own learning. There were too many times where I stood in front of the class like a robot giving students steps to complete for the day. The students completed the steps, handed in their

homework and received a new set of steps. I think the lack of completing homework is partly due to the fact that the students do not have enough ownership in the work. In one research paper, Eisen (1998) said, “Students work hard because they do not want to look unprepared in front of their peers” (Eisen, 1998, p. 54). Peer acceptance is a big deal to young teenagers. Most of them do not want to feel uncomfortable in front of the class. The best way to not feel that is by being prepared and understanding the material.

That brings me to one of the biggest points in to why I have decided on this topic, and that is knowledge and understanding of the concepts. I think all teachers have the students that do well but are not following or understanding all of the information they want them to learn. There are students who have a very difficult time expressing what they do or do not understand in the lessons. By completing communication research Adler (1999) was able to quote an educator that sums up best why I have chosen this topic. “Hearing what it is pupils think and articulate can help you [the teacher] see what they understand” (Adler, 1999, p. 55).

Eisen (1998) developed a semester-long class based on presentations alone. This biology instructor broke up the students into small groups and gave each group research articles to present to the class. The class was structured so at the beginning of each class time together, Eisen presented the basic background information on the topic from the text. The second half was a presentation by a particular group related to this information. Since half of the semester was given to these group presentations, they were limited to how many topics they could discuss. Eisen states, “I believe that it is more valuable to cover a few topics well than to merely touch on many” (Eisen, 1998, p. 57). This type of thinking is what I would like to accomplish during my research. There are so many standards that an eighth grade math teacher must go through that it is difficult not to speed through some concepts.

I decided to use small group work in my research project because there is so much positive research that has already been done with cooperative learning. This was a very common theme when looking into literature. Dundes (2001) mentions the challenge of practicing public speaking in a curriculum while including all students. “The small group debate design described here offers all students a chance to discuss social issue and learn in an enjoyable format” (Dundes, 2001, p. 242). One major part of having all students participate is making sure I have a plan for how groups work together. Blumenfeld (1996) gives four topics that research has shown promote successful groups. The first is group norms, “effective group work requires students to share ideas, take risks, disagree with and listen to others, and generate and reconcile points of view” (Blumenfeld, 1996, p. 38). Secondly groups must stay on task. Too often in small groups people tend to discuss something other than what they are working on. Third is giving and seeking help and last is accountability. “Groups can be assessed on a single product with all students earning the same grade” (Blumenfeld, 1996, p. 38). Everyone in a group must do their part. If the group does not work as a team or one person does not complete their task everyone’s grade could be affected on their presentation. I have chosen to work in groups for my oral presentation research project. Using group work should influence each student to take ownership of his or her learning and the learning of his or her peer.

I was searching for a rubric in the literature because I wanted ideas on how evaluation should work in my research project. One such piece of research was strictly done on a form called COPS. “The COPS form (for Content, Organization, Planning, and Style), which allows faculty members and students to analyze oral presentations critically” (Kain, 1992, p. 302). I wanted to have a plan for grading my students. I have taken a big chunk of class time during the semester to do this research. Previously the students were graded almost every day on daily

work and quizzes. There were some days that were designed for them to just work on their presentations. The COPS form that I found covered more area that I needed so this was a good start for my rubric. Another research article by Dundes (2001) had a much simpler rubric for presentations. Dundes' form had three main points: organization, persuasiveness and preparedness. All three of these points can be found somewhere in the extensive COPS form. I wanted my students to know how I was going to grade their presentations and make it simple for them to complete each task.

I was happy to find portions of the research articles that discussed the attitude of students and teachers. I researched how the student's attitude changed from one semester of typical teaching style to another semester of student presentations. I also wanted to research how my attitude changed during this project. "The direct link between self-concept and achievement may be tenuous but the evidence that teacher attitude affects student performance is stronger" (Relich, 1998, p. 180). Relich says exactly what I wanted to take a look at in my project: if my attitude changes, can I see the results in the students. During this research I wanted my attitude to show a noticeable difference and in turn affect student performance for the better. I was happy to find in Eisen's (1998) research that he found "over three semesters, more than 90% had strong praise for the opportunity from both the academic and social perspectives to work intensively in a small peer group" (Eisen, 1998, p. 57). Most of these students also rated the presentation approach highly. These are the types of conclusions I am looking for in my research.

I was not sure if discussions and small group learning would be the same theme but after researching a bit more these are slightly different. There was research where two or three individuals would give presentations and that was the end of it. There was also research where there would be presentations and then class discussion after or during a presentation. For the

most part any student-to-student interaction seemed to be a positive in their research. Adler (1999) says, "Discussion of a task should enable the mathematical learning" (Adler, 1999, p. 50). The research also pointed out that discussion in the math classroom can help or harm the learning of students. "It is possible, however, that in the mathematics class the discussion itself becomes the focus and object of attention instead of a means to the mathematics" (Adler, 1999, p. 50). This is something that I needed to be careful of to ensure I did not have just talking and instead the students were discussing and learning. I have found there are certain ways to ask questions and promote discussion for the better of the topic. Student discussion can be helpful for the listener and the speaker. The speaker is in deep thought about the topic and wants to express what he or she is thinking. The listener may find some helpful advice to better his or her own understanding. I am glad the research pointed me to this theme besides the small group type of learning. I was able to observe everyone during this time unlike the small group days where I had to spend only a few minutes at each group.

I am focusing on oral presentations and how that can change the dynamics of the classroom and the attitudes of student and teacher. The literature that I have found helped me come up with quite a few of the tools and questions that I went into this project with. There were some other topics that I had thought of that the research articles gave valid backing. I had hoped through this research project that my style will change for the better and I learn something about my previous teaching style.

PROBLEM STATEMENT

The purpose of my research is to improve student involvement in learning mathematics using partner involvement with oral presentations. I want the student to gain enjoyment and understanding of mathematics through the communication with their peers. I want to understand

this learning style that I have previously ignored until this research project. I will be focused on researching these questions:

- What happens to my mathematical teaching when I let students explore their own learning instead of constant guidance from me?
- What happens to the attitudes of students toward mathematics when they are allowed to work together on oral presentations?
- What happens to the level of student achievement when they work with partners on oral presentations?

With these three focus questions I have a better understanding on how students can use their communication skills to gain knowledge in a math classroom. I also found out how I can change as a teacher to improve my knowledge base of different communication learning styles.

METHOD

The first day of research began on February 19, 2009, with the students receiving the consent forms. I was disappointed to find out that only 5 students out of 21 actually decided to be involved in this research process. The adult that helped with the collection of the forms did continue to ask the students if they had their form of if they were going to be involved in the research. After the students were given their consent forms they completed the pre/post survey (Appendix A).

Monday, February 22, was the first time I matched the class into partners. My first method of partner grouping was decided by alphabetical order. I gave each group the exact same question to answer and present to the class at the end of the week. The class was instructed that they were allowed to work on their presentation near the end of each class throughout the week. Students were given the opportunity to work together during study hall with the permission of their study hall teacher.

Over the next few presentations, I changed the way the partners were grouped together. I allowed the students to pick their own partners. I also picked partners based on their seating arrangements. I always tried to make sure no two students were together more than twice during the research. This was to ensure random groups. This was one aspect that was difficult to do. I wanted to make sure high level learners were grouped with low level learners, and I also wanted the same level of learner grouped together.

Presentations were graded based on a rubric that I created (Appendix B). I used the expertise of the English department to help me find the best categories to judge the students' presentations. With the ranking of each numbered 1 through 4 with 4 being the highest grade, each presentation had a maximum score of 24 points. While the presentations were going on I circled their point value and wrote simple notes to myself to help with the rubric. I also sat in the back of the room during the presentations so the students would be focused on their peers. One of the rubric items was voice. Sitting in the back of the room helped me score this part of the rubric accurately.

Over the course of the research I was able to interview four students about their presentations. The students were asked a series of previously created questions to prompt their discussion on how well they did their presentations and how well they understood the concepts they presented (Appendix C). The interviews were done during a small portion of their lunch about two hours after their presentations. I believe this gave them time to think about how they did and what they could have done better for next time. The students did not mind that I wanted to ask them some questions about their presentations; they were all aware this did not affect their presentation score.

Throughout the semester the students were able to complete four presentations. With shortened weeks during the spring and various activities, I decided that every other week for presentations would be beneficial. Each topic was related to the concepts the students were learning in class. This made it easier for students to discuss with one another instead of asking me for help with the math problem. At the end of the research the students were asked to complete the survey one more time to gauge if they thought differently about their math class since the beginning of the research.

I created small journal entries at the end of each week when there were presentations. I kept my entries short and to the point so I didn't over analyze what I was feeling. I wish I wrote more about my teaching style in my journal entries. I also kept small short excerpts from my interviews in my journal. Before each journal entry I asked myself, "How did the presentations go?" This simple question got my mind thinking in general instead of about individual presentations.

FINDINGS

The average week of my research started by announcing the groups for the week and giving the students their math question to present. I found out through my research that the 10 or so minutes at the end of each class period seemed to be enough time to get things accomplished. There were no comments from the students or my colleagues that the students used time outside of my class to discuss or complete their presentations.

A typical day in class started out with checking the previous day's homework. The students were then given notes on the new section or a review worksheet. By the time the lecture was completed each day, the students had 15-20 minutes of work time in class. This is where I

gave the rule that all students needed to work on homework first and then the presentation question. The rule worked nicely as all students were able to have the presentation ready by the end of the week.

Part of my research dealt with finding out how my teaching changed throughout the semester. I did not have any trouble with the students working on their presentations during class time. All of the students followed the direction that the homework for the day needed to be worked on first before the students could talk about the presentations. I seemed to become more lenient about student interaction even during their regular work time. There were times through the semester where I would stop myself from asking the students to quiet down. I would first observe them to see if they were discussing math or something other than math class.

The first partner presentation day was February 27. The students seemed excited to give their first presentation. I am not sure if that was due to the fact that they knew there was no homework to be had over the weekend or if they were happy to complete some other task during class time. In my teacher journal I wrote, “Kids got bored since I gave out the same question” (Feb. 27, 2009). I had a feeling this might happen. The students had to sit through 10 presentations about the same question and same answers. This was definitely my first learning experience with oral presentations in the classroom. Along with the comment about the bored students I also wrote, “Give tips for next time”. There were some bad presentations. The days before our second presentation I would point out some things that were being discussed in class and tell the students how this was a good way to present information. Even the simple aspect of using the marker board space wisely was an issue in the beginning. Groups would start showing their answers in the middle of the marker board and then run out of room and would have to erase some information that should have stayed up there or write the next step to the left.

The average score on the rubric for presentation number one was 14.7. I only scored one group with a 20+ grade out of 24. This group received a full credit (4) for their voice. The speakers projected their voices and were able to be heard in the back row. The lowest score for the first presentation day was 10 out of 24. This came from two very hard working individuals with A's in math. They did not project their voices and got the lowest score possible on demonstration. There were no steps shown so it was not easily understandable. Even though the students were given a copy of the rubric at the beginning of the week, some of them did not follow all of the categories to the best of their ability.

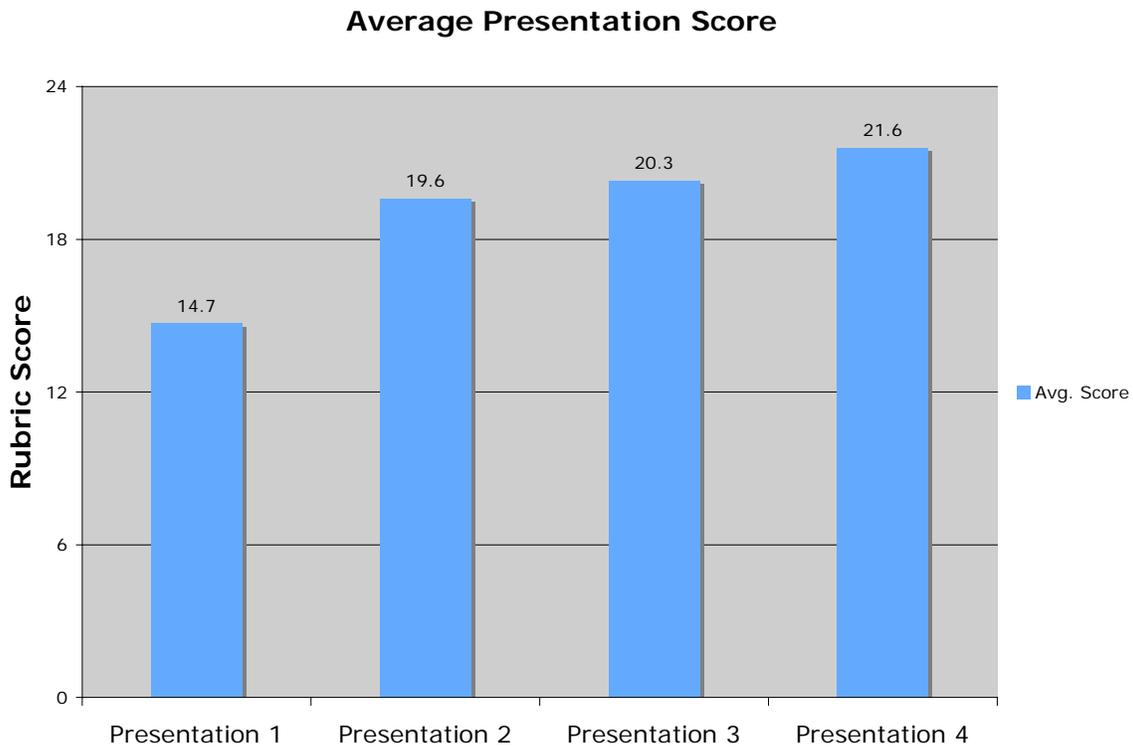
I wanted to see if student attitude and involvement increased with the partner presentations. This is a difficult topic to assess unless there is student feedback during the research or at the end in my survey. Throughout the research I noticed more teamwork involvement during the presentations. I noted this on various rubrics that I completed. I found 50% of the students increased their comfort level answer in the pre/post survey question, "I like to explain my solutions to the class." There was also a student who asked if there was going to be a presentation during one of the shorter weeks. I responded that they were not going to because I wanted to allow the students a full week to prepare for their presentations. The student responded that he "enjoyed them," meaning the presentations. This solidified my assumption that students were getting more involved in math class when they were allowed to work together on presentations.

On the post-survey I had three open-ended questions where the students were encouraged to write how they felt instead of answering with a typical ranking method. This is where I was going to find out if my assumptions were correct. There were three students who put almost the identical answer when asked, "What would help you learn math better?". These students

responded with, “working in groups.” Another student responded she would like someone to break it down for her. I took away from that comment that they were not talking about me the teacher but one of their peers. When asked the question, “I understand math concepts better when working with a partner,” there was only one person who circled, “never.” There was also the same outcome when asked, “I would rather ask another student for help instead of the teacher.”

I was pleasantly surprised that the students felt confident enough in their peers to help them learn the concepts so they could master them. This was a big change from what I previously thought. Students did not want to talk to their peers just to help them, they felt more comfortable and confident that they could get similar help from a fellow student instead of the teacher.

What effect on achievement levels does working with partners on oral presentations have? While I was not able to find any significant evidence on achievement levels I did find amazing results with their oral presentations and how in-depth the students were going throughout the semester. I talked about the first presentation and how the students did not follow the rubric that I gave them. Over the next few presentations with some coaching through the week there were some significant improvement in presentation achievement. Below is a graph of the average score for each presentation. There is a big jump from the first presentation to the second. This is when I talked to the students about following the rubric they were given the next time they plan their presentation.



The third and fourth presentation averages did increase slightly but with a maximum score of 24 the increase would be expected to level off after so many practices. It also should be noted that in almost 35 to 40 presentations throughout the semester, only one group was given a full credit 24 points.

After each presentation session there was an interview process with a random group. Interview question number three asked the student if they could, would they add anything to their presentation the second time around. All four interviews gave the similar answer of yes. One student said, "I would find different ways to explain because people understand things in different ways." The other common answers were with question number five about planning and presenting for their next presentation. This question was to prompt the student to think about next time and how they could do better. Every student interviewed answered that he or she would do a better job in planning his or her talk or steps to write on the marker board.

Were the students learning the concepts at a deeper understanding than without presentations? The data related to this question was inconclusive. There was a mix of answers when I asked students if they could take the concept they learned and teach it to the next class. Half of the students reverted back to their comfort level of standing in front of a group of peers while a few said they would need to get a better plan together than the one they used for our presentations. This was also evident when asked in the post-survey, "I feel comfortable speaking in front of my peers in class." In the pre-survey the average comfort level students gave was a two-and-a-half out of four. This was the same average score the students gave in the post-survey. I am concluding that four presentations in one semester were not sufficient enough to make the gains I was looking for.

CONCLUSION

In my findings I was able to show that students increased their planning and preparation toward the next presentation. This is similar to what Eisen (1998) found when he said "Students work hard because they do not want to look unprepared in front of their peers" (Eisen, 1998, p. 54). The best way to not feel uncomfortable is to be prepared for the presentation. Students took this to heart and began to realize that if they have a good plan the presentation will go smooth and they will have the confidence to speak in front of the room.

Eisen (1998) also noted that more than 90% of students during his research had strong praise for the opportunity from both the academic and social perspectives to work intensively in a small peer group. This was a common theme in my classroom as well. Students enjoy working with their peers, not just so they can talk but also with the comfort level that someone they already trust is helping them along the way.

The research by Dundes (2001) strengthens my conclusion that group work is an enjoyable format. His research said, “The small group debate design described here offers all students a chance to discuss social issue and learn in an enjoyable format” (Dundes, 2001, p. 242). I was able to add a new part to my teaching style that did not interrupt what we, as a class, were doing the previous semester. With one addition to the classroom my students’ attitudes became more positive over one semester.

IMPLICATIONS

As a result of my study it is now obvious to me that I need to implement some form of partner or group work in my classroom. I do need to include oral presentations in mathematics to help some students with their comfort levels. Next school year I will write in my curriculum plans the use of a group project with a presentation for each quarter. After one semester of research I do not have enough practice to implement this learning style every one or two weeks just yet. I found out that with a new teaching style there are going to be some bumps in the road that need to be ironed out before I take away more time from what has seemed to be successful before this research project.

During the semester of my research I was part of a faculty study group that focused on different forms communication in the classroom. The findings of this research were shared with the individuals of my group. My group gave an overall summary of the findings to the whole faculty in an end-of-the-year meeting. There was an agreement with my fellow group members that time was a factor in expecting major results.

References

- Adler, J. (1999). The dilemma of transparency: Seeing and seeing through talk in the mathematics classroom. *Journal for Research in Mathematics Education*, 30, 47-64.
- Blumenfeld, P., Marx, R., Soloway, E., & Krajcik, J. (1996). Learning with peers: From small group cooperation to collaborative communities. *Educational Researcher*, 25, 37-40.
- Dundes, L. (2001). Small group debates: Fostering critical thinking in oral presentations with maximal class involvement. *Teaching Sociology*, 29, 237-242.
- Eisen, A. (1998). Small-group presentations teaching “science thinking” and context in a large biology class. *BioScience*, 48, 53-57.
- Forman, E., & Ansell, E. (2001). The multiple voices of a mathematics classroom community. *Educational Studies in Mathematics*, 46, 115-142.
- Kain, E. (1992). Evaluating students’ presentations with the COPS form. *Teaching Sociology*, 20, 302-308.
- Relich, J. (1996). Gender, self-concept and teachers of mathematics: Effects on attitudes to teaching and learning. *Educational Studies in Mathematics*, 30, 179-195

APPENDIX A**Pre and Post Survey**

	Always	Usually	Sometimes	Never
1. I like to explain my solutions to the class.	4	3	2	1
2. I like when the teacher calls on me for answers.	4	3	2	1
3. I like when another student explains the math concepts to me.	4	3	2	1
4. I like to help my fellow peers when they are struggling.	4	3	2	1
5. I feel comfortable speaking in front of my peers in class.	4	3	2	1
6. I would rather ask another student for help instead of the teacher.	4	3	2	1
7. I understand math concepts better when working with a partner.	4	3	2	1
8. I enjoy coming to math class every day.	4	3	2	1
9. I am being challenged in math class every day.	4	3	2	1

Please write as much as you want based on these prompts. (use the back if need)

-Do you like math?

-Has this year changed your opinion about math?

-What would help you learn math better?

APPENDIX B**Presentation Rubric****Visuals**

Using the marker board or other tools in the presentation. How clear and organized were the visuals?

4 3 2 1

Voice

Did the speaker project their voice and speak clearly?

4 3 2 1

Demonstration

Shows the audience the steps with clarity and detail? Completes all mathematical problems.

4 3 2 1

Diction

Precise, easily understandable, articulate

4 3 2 1

Mathematical Fluency

Showed understanding of the topic being discussed, answered questions thoroughly from the audience.

4 3 2 1

Overall Impression

4 3 2 1

APPENDIX C

Partner Interviews

1. Tell me how you feel the presentation went today.
2. Did you get a sense from the audience that they understood and followed along with your concept?
3. If I asked you to present this again, is there anything you could have added into your presentation?
4. If I asked you to present this again, is there anything you feel like you could leave out for next time?
5. Is there anything you will do differently in planning or presenting your next presentation?
6. Do you feel you could teach the next class this concept? They have never seen this before.