“Can You Repeat That?”
How Math Talk Impacts Student Learning

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and
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2010-2011
Panorama Village Elementary School
Third Grade
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Teaching Context

For the 2010-2011 school year, I am working as a Professional Development Intern in a third grade classroom at Panorama Village Elementary School. I represent The Pennsylvania State University as one of sixty students interning for an entire year in the State College Area School District. I will be completing my inquiry project in collaboration with my mentor, Linda Margusity. Linda has been a faculty member of Panorama Village for the last twenty-one years. In those twenty-one years, she spent eighteen of those years teaching second grade and is currently in her third year of teaching third grade.

Our class is comprised of twenty students, seven boys and thirteen girls. There is also a second grade boy that joins our class for math. Of the twenty-one students, two students are from Russia and take part in the ESL program. At the beginning of the year, four students qualified for Title One math. Three of these students have exited the program but still require additional teacher support in the classroom. There are seven students who receive extension problems throughout the units and weekly homework. Two of these students also participate in an enrichment program one day a week.

Our class uses Investigations in Number, Data and Space to teach mathematics. The Investigations Math Program utilizes a combination of teacher-led discussion, independent practice, and small group work as key features in math instruction. So far this year, we have covered addition, subtraction, multiplication, division, area, perimeter, measurement, triangles, quadrilaterals, and angles. Our next investigation will introduce the concept of fractions and decimals. These units will be used to implement our inquiry project.

Each of our students is an individual learner, and each has his/her own strengths and weaknesses according to each content area. Overall, we have five students that consistently perform on the advanced level on all assessments and assignments. One of these students also receives math enrichment once a week. There are four students that fluctuate between proficient and advanced. There are four students that are consistently proficient, and seven students that are
basic. Finally, there is one student who is below basic and needs significant support from a teacher or paraprofessional. This information was obtained through assessment of student work, student participation, end of unit assessments, and district assessments to date.

**Rationale**

Last semester, through my MATH ED 420 class, one assignment was to observe my mentor instruct a math lesson and look specifically for their use of the Math Talk Moves which include: Revoicing, Repeating, Reasoning, Adding-on, and Wait time. The data showed that my mentor did use revoicing and wait time, but the other three talk moves were not used at all. These results were not surprising, because we stress revoicing and wait time the most during instruction. When a student states an answer, both of us will restate the answer in order to help other students understand the meaning. We also are conscious of giving students time to think before asking for an answer. What differentiates revoicing and wait time from the other three moves are a requirement for student to listen and a need for student to interact with one another.

After my paper was turned in, the assignment stayed in the back of my mind. As the year continued, Linda and I were constantly thinking about ways to encourage students to listen more closely to one another, and work with each other to create a deeper and more thorough understanding. We often asked students to turn and talk with a partner for a given problem. This permitted the students to work together and use their combined knowledge to solve the problem. However this was used on a very limited basis.

The more we analyzed our current math talk, we realized the teacher was doing the majority of the talking while occasionally asking students questions. These questions allow one student to answer at time. As a result, some students have stopped participating, because they know another student will answer the question. After brainstorming ways to increase class participation, we returned to the assignment I had in my MATH ED 420 class. This prompted the decision to implement this strategy into our math class, and use the inquiry project as a means to determine the effectiveness on student learning and understanding.
Main Wondering

What effect does incorporating Math Talk and class discussion have on student learning and understanding in math?

Sub Questions

- What impact will this have on how students listen to one another?
- Which Math Talk moves encourage students the most student participation?
- How does using math talk moves help students to make clearer contributions or allow others to ask clarifying questions?
- What impact will incorporating the talk moves have on class participation?

Data Collection

After reading the book Classroom Discussions: Using Math Talk to help students learn by Suzanne Chapin, Catherine O’Connor and Nancy Anderson in the fall MathEd 420 class offered through the PDS, we wondered how incorporating math talk into our own classroom would affect student learning. The book focuses on five different talk moves, which include:

1. **Revoicing**—“The teacher essentially tries to repeat some or all of what the student has said, and then asks the student to respond and verify whether or not the teacher revoicing was correct.”
2. **Repeating**—“Asking a student to repeat or rephrase what another student has said, and then immediately following up with the first student.”
3. **Reasoning**—“After a student makes a claim, the teacher elicits reasoning from other students about the claim.”
4. **Adding-on**—“After an initial response is given, other students are asked to contribute by stating an agreement, disagreement, or adding other comments.”
5. **Waiting**—“Waiting at least five seconds for students to think after asking a question before calling on someone for an answer.” (See Appendix B)

We collected several different types of data throughout the inquiry. To start, we gathered baseline data by giving a pre-test to students to uncover their starting knowledge of fractions. (See Appendix C) The pre-test was in a similar format to the district assessment students completed at the end of the unit, but was half the length. We also videotaped two math lessons,
one with each of us as the lead teacher, prior to implementing math talk moves. This allowed us to see our baseline teaching before implementing anything new.

Next, we focused on implementing the talk moves in our math discussions. In preparation, we would go through each math lesson and identify areas in the lesson where we could focus on math talk moves. On a chart we kept track of the five math talk moves (revoicing, repeating, adding-on, reasoning, and wait time) as well as partner talk and when students asked questions of others. Partner talk was a suggestion of the book *Math Discussions*. This time allows students to talk with one another and organize their thoughts with their partner prior to sharing it with the large group.

Each time a math talk move was observed, we made a tally mark on the chart. (See Appendix E) In addition to the chart, we used a video camera to record one or two lessons a week. These videos were later analyzed for the same categories that we recorded on the chart. To help us gain a deeper understanding of math talk moves and their appropriate uses, we interviewed Andrea McCloskey, who is a faculty member of Penn State and instructs the Math Ed course for the PDS program. Andrea’s main suggestion was to start slow until the moves are a part of our teaching style.

In order to gain a student perspective into our inquiry, we asked our class to complete a survey about their feelings of math in general and their opinion of the math talk moves we implemented, which were mainly repeating and wait time. Questions on the survey included:

- What do students need to do to be successful in math class?
- What do teachers need to do to help students be successful in math?
- What activities do you enjoy in math?
- What activities do you find hard in math?
- Recently your teachers started asking kids to repeat what someone else has said. How has this helped you or your classmates? (See Appendix F)
The results of the survey were compiled and from the responses, we chose students to interview at the end of the data collection period. These students were asked to explain their feelings of the repeating strategy. These interviews were recorded using a video camera for further analysis. The students that were interviewed were asked to respond to the following four questions:

- How has repeating helped you in math?
- Have you noticed a difference in our class since we started to incorporate repeating?
- If it were up to you, would you continue to use the repeating in our math discussion?
- Do you think this would work in any other subject besides math?

Our final source of data was through student assessment. Students were given a post-test, which mimicked the questions of the pre-test students had completed at the beginning of the fraction unit. (See Appendix D) Student scores were recorded in Excel in order to compare the results to the pre-test. Students also completed a district assessment written for the end of our unit. All of these items were used to evaluate the effectiveness of math talk moves on student learning.

**Data Analysis**

By the end of our inquiry period, one student moved before he could complete all of the assessments and one student began the evaluation process to see if he has a learning disability. Their data was incomplete and therefore was not included in the analysis. The following data is based on 19 students.

We started our data analysis by first looking at the preliminary data. We scored the pre-tests and put the information into an Excel spreadsheet. We organized the spreadsheet to show each student’s score for each question. From this information, we found that most students scored between two and four points out of a possible 10 points. There were 3 students who scored 7 points or higher. This showed us that in general, students had some prior knowledge of fractions,
but the majority of students had a limited to basic understanding. We compared this data to the post-test students took at the end of the fraction unit. The average of scores went from a 3.74 out of 10 to a 6.16 out of 10. (See Appendix G)

At the end of the unit, the students took the district assessment. Of the nineteen students who took the assessment, two scored advanced, six scored proficient, two scored basic, and nine scored below basic. After correcting the papers, we noticed that students made many more mistakes than we expected. We looked at each student’s assessment to see what type of error was made. As a class, we found that almost every student made at least one error that was not content based. These errors included: answering the wrong question, using an incorrect number in the problem, and forgetting labels. Normally, we go over the assessments with students and have them make corrections in pen, using it as an opportunity to re-teach content. In order to see if these errors were careless mistakes or content misconceptions, we asked students to fix any mistakes in pen without any assistance. After students were finished, we re-scored the assessments. With the revised scores, seven scored advanced, four scored proficient, four scored basic, and four scored below basic. (See Appendix H)

When comparing pre-test scores to district assessment scores, we noticed a trend. Of the nine students who scored three or lower on the pre-test, six of them received a basic or below basic score on the district assessment. Three of these nine students scored at the advanced level. Of the ten remaining students, their pre-test scores ranged from four to ten points. On the district assessment, eight students received proficient or advanced scores. One student was basic and one student was below basic. From this information, we concluded that in general, the students who scored lowest on the pre-test also scored lower on the district assessment and the students who scored highest on the pre-test, scored higher on the district assessment. (See appendix I)
In order to analyze the videos, we used the Studiocode program. Studiocode is a computer program that allows for the identification of categories the user determines. Once videos are put in the Studiocode program, they can be analyzed by clicking whenever a category is observed. The observations can then be combined into a single video showing all the categories identified. Through the use of Studiocode, we analyzed our videos and coded for the five talk moves, partner talk, and students asking questions of others. As we watched the baseline videos, it was clear that we used these strategies infrequently. We were surprised by the fact that the wait time we thought we were using was not long enough to be considered wait time. We found a few instances of revoicing and occasional partner talk, but the other talk moves were non-existent.

We did find that it was difficult to concentrate on all five talk moves at once. Taking advice from our interview with Andrea McCloskey and the book *Classroom Discussions: Using Math Talk to Help Students Learn*, we decided to start with the talk moves “repeating” and “wait time”. We felt that wait time was something that we were trying to use already and repeating would help students listen to one another as they begin to have discussion.

While using Studiocode to analyze the videos, we found that when we increased the amount of wait time, more students raised their hands to participate. Allowing more time for students to process the questions enabled more students to feel willing to participate. We also increased the amount of wait time we used after we called upon a student. This gave the student time to figure out what he/she wanted to say. Kenneth Tobin, a researcher in Australia, studied the effect of wait time on mathematics and literature in elementary classes. At the conclusion of his study, he stated, “If an average teacher wait time of 3 to 5 seconds can be maintained, the quality of teacher and student discourse can be improved and student achievement can be enhanced.”
The second talk move we focused on, repeating, also had an impact on student participation. This was evident in the videos as well as the student surveys and interviews. The students focused more on what their classmates said, which meant they were better able to pay attention. They quickly realized if they couldn’t hear the person who had answered, it was their responsibility to ask for it to be said again. Hearing one student’s thoughts multiple times also helped many of the students to process the information. One question on the survey asked, “Recently your teachers started asking kids to repeat what someone else has said. How has this helped you or your classmates?” Some of the responses affirmed our belief that using the repeating talk move was helpful.

“Yes. I think it has (helped) because when you say it, it helps you understand better and other people can hear it said to them again.”

“I think repeating helps kids because it can help them pay attention and make the question more understandable!”

“I think it has helped me and my classmates understand each others’ thinking.”

“It helps with listening because you have to repeat what the person said.”

“It helped me by making me focus because I have to listen because I might get mixed up if I don’t listen.”

When students were interviewed, many also talked about the usefulness of the repeating talk move. Below are some student responses from the interview.

Have you noticed a difference in our class since we started to incorporate repeating?

- “I think people, including me, pay attention when you’re asked to repeat because then you get more focused in it and can here the stuff more than once.” J.M.
- “Yea, it makes it better because you understand more of what other people are saying and not just the teacher. And you get to know it because you can ask other people questions” L.G.
- “I noticed that more people have been paying attention in case they get called on to repeat, they know what to say.” M.C.

If it were up to you, would you continue to use the repeating in our math discussion?

- “Yes I would because it helps me pay attention more and focused on the discussion” J.M.
- “I would because it helps you because you pay attention more because you don’t know if someone is going to call you or ask you to repeat. It helps you get more into it” C.N.
“Yes because it can help you much more. If you say it, it may help, but hearing again helps even more” P.S.

“Yes! Yes I would because it really helps me in math and I noticed that some of my classmates did not pay attention before we started the repeating, but now they pay a lot me attention. It is helping them pay attention in case they get called to repeat. I really really like doing it!” M.C.

One of the suggested formats for using math talk is partner talk. Math Discussion: Using math talk to help students learn states, “It allows students to practice their ideas-to put them into words-before they face the entire class.” We opted to assign partners for a week. When we interviewed one group, they all stated that it was nice working with the same person for a week because they learned how they (sic) did math. They also thought it was good to get to work with other people when we changed partners.

Since we coded for partner talk in Studiocode, we were able to see the amount of partner talk we used increase. This allowed students to have time to process their thinking with a partner before having to share it with the class. This also increased the amount of time students spent on task because we were giving them time to discuss math ideas, rather than just listen to those ideas. Overall, the partners worked fairly well together and we were able to target the pairs that were having difficulties.

The ground rules for student talk in the book Classroom Discussions: Using math talk to help students learn reinforces the ground rules we set in our classroom:

1. That every student is listening to what others say
2. That every student can hear what others say
3. That every student may participate by speaking out at some point

Overall, this increased the amount of cooperation and respect we saw when partners were working together. We saw them voluntarily help their partner answer a question. For example, the person who was called upon “got stuck” and turned to the partner for help. Each time the partner willingly helped out.
Towards the end of the data collection period, we noticed the talk moves were starting to filter into more than just “our” math discussions and seemed to be having a positive effect on cooperation. For example, one student said, “You didn’t get all of it, let me repeat it for you.” This student understands the math talk procedure and offered to repeat his statement without prompting from the teacher. Another example occurred during literature time. A group of students were reading the book *Dear Mr. Henshaw* by Beverly Cleary and became enthralled in the book. On their own, the students got their small group together and had a discussion about each day’s reading prior to meeting with an adult.

**Explanation of Findings**

**Claim #1: The Talk Move “Repeating” raises expectations for participation and may enable students to remember the content better.**

**Evidence:** After collecting and reviewing our data, we found that using the repeating move had a positive effect in our classroom. The most telling evidence came directly from our students. In the student surveys, six of the nineteen students mentioned that repeating helped them to stay focused in math discussions. Eleven students said repeating helped them to better understand the topic because they hear the information multiple times. From the student interviews, all eight students mentioned that the repeating helped them and their classmates to focus because they may have to repeat what another student has said. Students also felt the expectation to participate and pay attention increased because the entire class was working together instead of just the teachers talking and the students listening.

The book *Classroom Discussions: Using math talk to help students lean*, states, “Repeating gives the class another rendition of a student’s contribution. It gives them more time to process a statement, and it adds to the likelihood that that students will follow the conversation and understand the point.” Each time the repeating move is used; students hear a statement at least twice; once when the answer is given and again when a student repeats. Many times, in order for
the student repeating to say the answer correctly, they would need to ask the first person to repeat the answer again. Although it took additional time, students still heard the information again.

Claim #2: With an increase in “Wait-time,” more students are willing to participate.

Evidence: We found that each time the teacher asks a question of the whole class, a few students would raise their hand immediately with a response, but the majority of students did not. If at least five seconds of wait time is given, the number of hands in the air usually doubled or tripled. From analyzing the videos, we were able to count the number of hands that were up immediately and the number of hands in the air after the wait time was given. The average number of hands in the air immediately after asking a question was about 4 hands, but the average number of hands after wait time went up to about eleven.

Andrea McCloskey made an excellent point when we asked her to explain the benefits she sees in using math talk. “In my opinion, some benefits are that students are more likely to stay engaged, feel the need to participate, and feel like math class depends on them being engaged, and the talking is not left up to the teacher.” Using the math talk moves has allowed our students to take a more active role in the classroom instead of simply listening. Looking at the videos, four to eight students answered questions in our baseline lessons before incorporating the math talk moves. After incorporating the math talk moves, the number of students participating went up to an average of eight to fifteen who answered questions. The videos that had the most students willing to participate were the ones where wait time was being used. This shows that participation increases the most when the wait time is used.

Claim #3: Since implementing Talk Moves, student cooperation has increased.

Evidence: During our interview, Andrea McCloskey said, “Just as in a math department, math is often done in groups, which means being persuasive to convince others. Math is much more exciting and motivating when you talk to others.” This is the atmosphere we are creating in our class. Students respond to one another, listen to one another, and persuade one another in math
discussion. One of the most exciting parts of our inquiry was when a group of three students were explaining their answer to a question. One student did not agree with the other two and had to explain her point of view three or four times. She slowly began to persuade her group members, and the rest of the class, helping them to see how her idea was correct. The first student disagreed politely, explained her reasoning, and then answered questions of other students in order to convince them that she was correct. This all occurred while we were facilitating the discussion.

Throughout the inquiry, students were assigned a weekly math partner to do class work with and to talk when partner talk time was given. We utilized partner talk throughout the inquiry to give students the opportunity to get their ideas together with their partner. After students had a chance to talk with their partner, we would ask someone to respond to the question. We noticed that when a student had difficulty answering the question, the student would ask his or her partner for help. The students would talk quickly and get their answer organized, and then the original student would be able to give the answer.

**Reflection and Future Practice**

Looking back on the inquiry as a whole, we were very happy with the results we have seen in our classroom. Students are working together, listening to one another, and participating more. The increased class discussion is very valuable for our students and helps them build a better understanding of the concept at hand, regardless of the subject area. Students have become more willing and more confident in their classroom participation and students seem to enjoy math more. When we asked our students if they would like to continue using the repeating strategy, every student that was interviewed responded with a yes. We also agreed with our students and we will both continue to incorporate the math talk moves as we go our separate ways at the end of the school year.

In order to make the inquiry more manageable and successful, we choose to start by focusing on repeating and wait time. At the end of our data collection period, we were beginning
to incorporate some of the other talk moves, but not consistently. In the last part of the year, we will continue to focus on repeating and wait time, but also focus on adding the other talk moves of revoicing, adding on, and reasoning. We also want to watch for overuse of the moves. We want to make sure we are using the talk moves as effectively as possible, realizing when to use the moves and when to avoid them.

The more time that passed, the more comfortable we became with the talk moves in our math class, and the more often we found the moves creeping into other subject areas. Science seemed to be the first subject that incorporated the talk moves during class discussions about experiments that were done in class. This was the most natural because the discussions in science are very similar to our discussions in math. Through the use of inquiry, students use evidence to support their claims in a large group discussion, working together to create a better understanding of the topic. We also think that the talk moves could be incorporated into other subjects such as literature and social studies. The more experience we have using the talk moves, the more comfortable we will be adding the talk moves to these other subjects.

One question we are continuing to think about is what math talk will look like in our classes next year. Our inquiry started in the middle of the year and at that point, we knew the students in our class and the classroom dynamics. Next year, the class dynamics and the students will be different. Incorporating the talk moves from the beginning of the year will play a role in developing classroom community and effective student communication. Over the summer, both of us will spend time planning how we will introduce and incorporate the talk moves from the beginning of the year.

With the two of us doing the inquiry project together, there was always another person watching and keeping track of the talk moves that were used during a lesson. Next year, we will not be together, but we still want to be able to keep track of the progress we are making using the math talk moves. In order to do this, we plan on either using a recording sheet that we would mark ourselves or set up a camera that could be viewed later. In order for us to continue making
progress, we both need to continue to reflect on our teaching in order to assess our growth or see areas that need more development.

We both are looking forward to the upcoming years as we continue to grow in our use of the math talk moves. This inquiry project was just the beginning for us, and we will continue to use and improve our class discussions with the talk moves.
Resources


Appendix A

Mary-Lynn Robosky
February 18,
Inquiry Brief Draft

Context

For the 2010-2011 school year, I am working as a Professional Development Intern in a third grade classroom at Panorama Village Elementary School. I represent The Pennsylvania State University as one of sixty students interning for an entire year through the State College Area School District. I will be completing my inquiry project in collaboration with my mentor, Linda Margusity. Linda has been faculty member of Panorama Village for the last twenty-one years. In those twenty-one years, she spent eighteen of those years teaching second grade, and is currently in her third year of teaching third grade.

Our class is comprised of twenty students, seven boys and thirteen girls. There is also a second grade boy that joins our class for math. Of the twenty-one students, two students are from Russia and take part in the ESL program. At the beginning of the year, four students qualified for Title 1 math. Three of these students have exited the program but still require additional teacher support in the classroom. There are seven students who receive extension problems throughout the units and weekly homework. Two of these students also participate in an enrichment program one day a week.

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Each of our students is an individual learner, and each has his/her own strengths and weaknesses according to each content area. Overall, we have five students that consistently perform on the advanced level on all assessments and assignments. There are four students that fluctuate between proficient and advanced. There are four students that are consistently proficient, and seven students that are basic. Finally, there is one student who is below basic, and needs significant support from a teacher or paraprofessional. This information was obtained through assessment of student work, student participation, end of unit assessment, and district assessments to date.

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After my paper was turned in, the assignment stayed in the back of my mind. As the year continued, Linda and I were constantly thinking about ways to encourage students to listen more closely to one another, and work with each other to create a deeper and more thorough
understanding. We often asked students to turn and talk with a partner for a given problem. This permitted the students to work together and use their combined knowledge to solve the problem. However this was used on a very limited basis.

The more we analyzed our current math talk, we realized the teacher was doing the majority of the talking while occasionally asking students questions. These questions allow one student to answer at time. As a result, some students have stopped participating, because they know another student will answer the question. After brainstorming ways to increase class participation, we returned to the assignment I had in my MATH ED 420 class. This prompted the decision to implement this strategy into our math class, and use the inquiry project as a means to determine the effectiveness on student learning and understanding.

**Main Wondering**

What effect does incorporating Math Talk and class discussion have on student learning and understanding in math?

**Sub Questions**

- What impact will this have on how students listen to one another?
- Which Math Talk moves encourage students to participate in class discussions more fully?
- How does using math talk moves help students to make clearer contributions or allow others to ask clarifying questions?
- What impact will incorporating the talk moves have on class participation?

**Time Line**

**February 14th-20th**
- Videotape small group lessons
- Create survey for students
- Give pre-assessment on 2/18

**February 21st-27th**
- Give student survey
- Interview students
- Incorporate talk move #2
- Video tape Linda and Mary-Lynn-studiocode for talk moves/student participation
- Analyze data

**February 28th-24th**
- Interview students
- Incorporate talk move #2 #3 and #4
- Video tape Linda and Mary-Lynn-studiocode for talk moves/student participation
- Analyze data

**March 7th-March 13th**
- Spring Break
- Linda will continue implementing talk moves

**March 14th-March 20th**
- (PSSA week) # of math classes will be limited
- Studio code
- Analyze data

March 21st-March 27th
-Finish implementation and look at data
-Incorporate talk moves #2 #3 and #4
-Fraction post-test
-Analyze data

March 28th-April
-Analyze data
-Write paper
-Revise paper

April 4th-April 10th
-Inquiry paper draft due to Doris 4/8
-Revise paper

April 11th-April 17th
-Peer editing inquiry at seminar
-Revise paper
-Work on presentation

April 18th-April 24th
-Inquiry practice at seminar
-Work on presentation

April 25th-May 13th
-Inquiry Conference 4/30
-Final paper due to Doris 5/1
-Revise final paper (if necessary)
-Final paper due to Bern 5/13

Data Collection Ideas

1. Pre-assessment- In order to determine students’ current knowledge, we will be giving students an assessment prior to teaching any information on fractions. The questions on the assessment cover the topics we will be teaching throughout the fraction unit. This will give us an idea of what students’ prior knowledge is and on what level instruction can begin.

2. Post-assessment- In order to assess the effectiveness of the lesson, we will give students an assessment following the fraction unit. This will be in the same format as the pre-assessment, but the questions will be different.

3. Survey-We will survey our entire class, using a survey we created. This survey will be asking students what they need to do to be successful, what teachers need to be successful, what activities they enjoy, and what activities they find hard. We will use the responses to select students to interview about math.

4. Interviews-From student survey responses, we will select some students and ask them to respond in more depth to questions about math. This will give us a better understanding of their responses. In addition, we will be interviewing some professionals including Andrea McCloskey to gain additional insight into our topic.
5. **Video Evidence** - We will be recording a few math lessons each week, and use studio code to examine our teaching. We will be coding for the 5 different talk moves, and student participation. This will allow us to reflect and analyze our implementation of the talk moves.

6. **Recorded Data** - Linda and I will be using a checklist to supplement the studio code of every lesson. This will allow us to determine how many times we use the talk moves over the course of a lesson, without having to go back and review every single lesson and code.

**Annotated Bibliography**


Linda used this resource as a textbook for an online class she recently participated in. The text shows how teachers can teach math in a way that students can understand. Among many topics, the book talks about effective classroom approaches that teachers can implement to increase student understanding. One of these approaches is incorporating class discussion. The text points out that this technique not only allows students to help one another to understand mathematical concepts, but also allows them to enjoy math. Another topic covered is how teacher questioning can impact student learning. In order for students to have a discussion in math class, the teacher must first be able to ask questions that will encourage discussion. We will be using the book as a reference as we begin to implement class discussion.


Another goal we have is to encourage students to listen to one another and to be able to respond to one another. The resource promotes the idea that math is a form of communication and it exists to express ideas within and between members of society. In order for people to have a conversation, they need to be listening to the other person so they can respond accordingly. Talk move #2 is restating and asking a student in the class to repeat or restate what another student said. By incorporating this move, students are encouraged to listen. We will use this resource as a reference to gain ideas about how to incorporate discussion and encourage students to listen to one another to make the discussion successful.


This is the resource that prompted our entire inquiry. This will be the key resource we use as we implement the five talk moves stated in the book: revoicing, repeating, reasoning, adding-on, and wait time. This book goes step by step and explains each of the talk moves in depth and how to incorporate them into a class. It also offers ideas and troubleshooting to help make it as successful as possible. This will be a key resource as we begin to implement these talk moves into our own classroom.

This resource contained information about using cooperative group work as a means to increase student’s ability to express their reasoning, problem solving, and explanation. This is a strategy that the book *Classroom Discussion: Using math talk to help students learn* suggests using partner talk to increase students discussion. We will use this information to gather other additional strategies that utilize cooperative work.


This article contains information about Math Talk moves and how to incorporate it into an elementary classroom. This will be used to supplement the information from our main resource *Classroom Discussions: Using math talk moves to help students learn*. This resource includes information about starting a math-talk learning community from the beginning of school which is something that we are both interested in setting up for the upcoming years.


This resource stressed the importance of actually talking about mathematics and creating a discussion in the classroom. This book stressed the importance of using this discussion as a way of building understanding. Although this resource does not list specific moves to use to facilitate discussion, it does emphasize the role of the teacher and the student in the discussion and how to use this in both small and large group settings.


Andrea was the mathed instructor for the fall of 2010. She utilized the book *Classroom Discussions: Using math talk to help students learn* as a one of the textbooks for the class. In addition to assigning readings from the book, she also create a project for all students to observe and use the math-talk moves in our own class. This assignment is what sparked our inquiry. By interviewing Andrea, we were able to ask her questions more specific to our inquiry and gain a better understanding of the benefits of math talk moves. She was also able to share her personal experiences of her use of the math talk moves.

This is our math investigations textbook. We felt it was important to include this on our bibliography, because this is the information we will use to create questions that facilitate discussion. We feel it is important to prepare questions for each lesson ahead of time, so we can plan what we want to get out of the discussion. We will be teaching Unit 7: Finding Fair Shares, which takes gives students a closer look at fractions.


One of the talk moves we used in our classroom was wait time. Once we started to incorporate this into our teaching, we found that using the wait time did not come as easy as we expected. This resource gave us a deeper insight into use and benefits of using math talk in our math class as well as in subjects of the language arts. This journal focused on the impact of wait time during communication.


Van de Walle believes that when students have different answers, the entire class should be involved in a discussion and students should have the opportunity to defend their answer. Once they defend their answers, the rest of the class should have an open discussion facilitated by the instructor. This allows student to gain insight and be an active participant in their education. We will use this resource as a reference to what happens when students disagree on an answer as well as incorporating student questioning into the discussion. It will not only be our questions that facilitate the discussion, but also questions that students ask of us as well as to fellow classmates.
<table>
<thead>
<tr>
<th>Move 1: Revoicing. (&quot;So you’re saying that it’s an odd number?&quot;)</th>
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<tbody>
<tr>
<td>Move 2: Repeating: Asking Students to Restate Someone Else’s Reasoning. (&quot;Can you repeat what he just said in your own words?&quot;)</td>
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<td>Move 3: Reasoning: Asking Students to Apply Their Own Reasoning to Someone Else’s Reasoning. (&quot;Do you agree or disagree and why?&quot;)</td>
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<td>Move 4: Adding on: Prompting Students for Further Participation. (&quot;Would someone like to add something more to this?&quot;)</td>
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<tr>
<td>Move 5: Waiting: Using Wait Time. (&quot;Take your time . . . we’ll wait . . .&quot;)</td>
</tr>
</tbody>
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Appendix C

1. Which combination of fractions equals 1?
   A. \( \frac{1}{2} + \frac{1}{4} \)
   B. \( \frac{3}{4} + \frac{3}{4} \)
   C. \( \frac{3}{8} + \frac{6}{8} \)
   D. \( \frac{1}{4} + \frac{1}{4} \)

2. Which fraction represents the part of the whole that is shaded?
   
   A. \( \frac{4}{7} \)  B. \( \frac{7}{7} \)  C. \( \frac{6}{7} \)  D. \( \frac{5}{7} \)

3. Which fraction of the circles is shaded?
   
   A. \( \frac{1}{10} \)  B. \( \frac{6}{10} \)  C. \( \frac{7}{10} \)  D. \( \frac{10}{10} \)

Short Answer: Write the correct answer on the line provided.

4. Write a fraction equal to \( \frac{1}{2} \).

5. How much money is the same as \( \frac{3}{4} \) of a dollar?
6. If 8 people share 4 brownies equally, how much will each person get?

7. You know that 1 week = 7 days. What fraction of the week could you use to describe the days in a weekend?

8. Write a fraction to represent the part that is shaded.

Open-Ended Question

9-10. Use the circle graph to answer the questions.

Keeley has 36 marbles.

How many orange marbles does Keeley have?

How do you know?
Appendix D

Multiple Choice: Circle the correct answer.

1. Which combination of fractions equals 1?
   A. ½ + ¼  
   B. 5/8 + 5/8  
   C. ¼ + ¼  
   D. 2/8 + 6/8

2. Which fraction represents the part of the whole that is shaded?
   
   [Diagram of a whole divided into 9 equal parts, 5 parts shaded]

   A. 4/9  
   B. 7/9  
   C. 6/9  
   D. 5/9

3. Which fraction of the circles is shaded?
   
   [Four circles, three of them shaded]

   A. 3/5  
   B. 6/5  
   C. 1/5  
   D. 5/3

Short Answer: Write the correct answer on the line provided.

4. Write a fraction equal to ½.

   

5. How much money is the same as 1/4 of a dollar?

   

6. If 8 people share 2 brownies equally, how much will each person get?

7. You know that 12 months = 1 year. If June, July, and August are the summer months, what fraction of the year is summer?

8. Write a fraction to represent the part that is shaded.

Open-Ended Question

9-10. Use the circle graph to answer the questions.

Keeley has 42 marbles.

How many orange marbles does Keeley have?

How do you know?
Appendix E

Robosky, Margusity Inquiry Data

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Appendix F

Name: ___________________________ Date:____________________

Please answer these questions to help us learn about what you think about math class. Thanks! 😊

1. What do students need to do to be successful in math class?

________________________________________________________________________

2. What do teachers need to do to help students be successful in math?

________________________________________________________________________

3. What activities do you enjoy in math?

________________________________________________________________________

4. What activities do you find hard in math?

________________________________________________________________________

5. Recently your teachers started asking kids to repeat what someone else had said. How has this helped you or your classmates?

________________________________________________________________________
Appendix G

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Appendix H

Original End of Unit District test information

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