HOLD ‘EM UP:
Ways to Increase Student Participation During Whole Group Calendar Math Instruction

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Radio Park Elementary Intern
2010-2011 School Year
3rd Grade
Context:

I have chosen to complete my inquiry research in one of my two intermediate level classrooms, a traditional third grade classroom at Radio Park Elementary. This class is comprised of twenty-two third grade students of diverse cultural and academic backgrounds. For daily mathematics instruction, however, this class gains several students from a neighboring third grade classroom. With that being said, the group I am collecting my data on is made up of twenty-four third grade students. There are two ESL (English as a Second Language) learners and four students receiving Title I math services in this group of math students. Of the twenty-four students, there are fourteen male students and ten female students. Two students in this math class receive third grade math enrichment services on a weekly basis.

When the students from the neighboring classroom first come over for math class, my mentor or I teach from the Every Day Counts Calendar Math curriculum. All of the students meet on the back carpet in front of the white board during this time. Calendar Math usually begins with the students looking at the monthly calendar, finding the day’s date on the calendar, and determining which day pattern piece comes next, based upon the pattern that preceded that day’s date. Next, the students determine what numeric day of school it is for the year and find the factors of that number, raising their hands and presenting the factors to me as they find them. The students then add their daily deposit (an amount of money equivalent to the numeric day of the school year) to the bank, and raise their hands to share the total with the rest of the class. Finally, the students may solve some other time, measurement, probability, or money problem that I present to them. It is after
Calendar Math that students are given an explanation of what they will be doing, and what is expected of them, for the remainder of the math session.

Rationale:

I have chosen to focus my inquiry on student participation in mathematics instruction for several reasons. First, I want to use student participation as yet another way to assess students’ understanding of a variety of mathematical concepts. I do not think it is always accurate to group a student by ability solely upon their pre-assessment scores, because there are many students who are excellent mathematical thinkers, but have difficulty writing out their ideas and strategies on paper. By encouraging students to share their mathematical thinking and strategy development through active participation, my mentor and I may be able to make more accurate grouping placements for small group instruction.

The next reason why I chose to make my inquiry focus on increasing student participation is because I want to close the gap in the amount of participation between the students in my math class. There are several students whose hands seem to be consistently raised because they are constantly engaged and participating in large group instruction, and on the other hand, there are many students who rarely contribute their ideas during mathematics instruction. I am hoping that through this process, I will be able to increase the amount of participation from those students who rarely participate, while maintaining the high levels of participation and engagement some students exhibit on a daily basis.
Main Wondering:

- Which strategies increase student participation during whole group Calendar Math instruction?

Sub-questions:

Because I am looking to increase the amount of student participation during whole group mathematics instruction, I have several small wonderings about other factors that may influence the amount of participation that occurs in my class. Some of my sub-questions include:

- How does assigned seating on the whole group carpet affect student participation during whole group mathematics instruction?
- How does student choice of partner in think-pair-share influence the amount of participation during whole group mathematics instruction?
- How does the amount of wait time affect the number of students who participate in Every Pupil Response signaling questions (such as “thumbs-up”, holding up the correct answer on your fingers, invisibly “drawing” the answer in the air, etc.) during whole group mathematics instruction?
- How does the use of response cards, such as math journals and white boards, influence the amount of student participation during whole group mathematics instruction?

Data Collection and Analysis Process:

Student Participation Data Sheet:
I used several data collection tools to measure the rate of student participation during Calendar Math. I began by using a tally chart (see appendix A) to measure the number of times students were called on, had their hands raised to add to the conversation, were called on without their hand being raised, shouted out an answer, participated in an every student response question, and had their hands raised without being called on. For every instance of one of the previous behaviors, a tally was placed in the appropriate column for that student. Students who did not participate in an every pupil response question received a “0” in that column, which represented a -1 rate of participation. At the end of each day’s Calendar Math session, I found the total rate of each student’s participation across all categories. I continued this daily process for two weeks in order to determine and identify student participation patterns. Finally, I combined each student’s daily participation rate and divided it by the eight sessions I collected participation data during Calendar Math in order to determine each student’s average daily rate of participation. This average daily rate of participation was the basis upon which I determined whether or not each of the interventions I implemented increased or decreased each student’s level of participation on a given day.

Student Surveys:

In order to determine student preference in seating, the sharing of their ideas and participation, I gave students two math participation surveys that helped guide the interventions I implemented during Calendar Math (See appendix B). The first survey was given to the students before I began implementing any interventions,
but after I collected baseline data, and served as a means for me to determine the students’ attitudes about math and which classroom environmental factors deterred their ability to participate actively during Calendar Math. In this survey, I also provided a space in which students could share which strategies they believed would help them participate more frequently during Calendar math.

The second math participation survey I created was given to students after I had implemented three weeks of interventions (see appendix C). In this survey, students were able to share how effective each of my interventions had been for them in increasing their daily participation during Calendar Math. The students were also able to share with me, once again, which things still deterred them from participating during Calendar Math and which strategies I could continue to use to help them participate more during Calendar Math. The results of this survey helped me determine which strategies I would continue to implement during the “After Intervention” portion of my data collection.

Math Journal Checklists:

Because one of my interventions was allowing students to use math journals during Calendar Math, I wanted to be able to assess the students’ rate of participation by examining the amount of problems and mathematical work shown in their journals for those days. In order to do this, I created a simple checklist to determine whether or not the students showed evidence of work and solutions for each Calendar Math question I asked them to solve (See appendix D). By examining each intervention entry in their math journals, I was able to determine whether or
not the students were truly following along and participating. When using the checklist, I would circle “Yes” for any evidence of related content for each question asked during a Calendar Math session. If the student’s journal lacked evidence for any question on the checklist, I would circle “No” for that category. Because there are five questions on the checklist, I used a scale of 0-5 determine the rate of participation for that student. For example, if a student received 4-5 “Yes” on the checklist, they were considered to be participating at a high rate, and students receiving 0-1 “Yes” would be considered as demonstrating little to no participation on that day. I totaled the amount of students in each category to determine whether or not the use of math journals was successful in increasing student participation during each intervention.

**Explanation of Findings:**

**Claim #1:** Allowing students to choose their partner during “Think-Pair-Share” increased the rate of student participation across a significant majority of the class.

I used “think-pair-share” as the sole intervention for four days throughout the course of my “During Intervention” data collection. According to Tyminski, Richardson, and Winarski (2010), think-pair-share is, “… the development of a community of mathematicians who share their thinking, listen to one another, and carefully consider the math presented” (p. 451). An example of a think-pair-share question I would pose to students would be, “Please think of a prediction of today’s calendar piece, share your prediction with your partner, and then raise your hand if
you would like to share with the rest of the class”. Dixon, Egendoerfer, and Clements (2009) also advocate sharing ideas during mathematics instruction and state, “Research indicates that learning opportunities arise as students participate in whole-class social interactions. These interactions provide opportunities for students to reflect on their methods, justify solutions, and share their information with others” (p. 1068).

For two out of the four days I implemented think-pair-share as the sole intervention for Calendar Math, I selected the person in which the students would be sharing their ideas with before they shared with the rest of the class. I used similarity in mathematics ability as well as significant difference in mathematics ability as the two criterions in which I paired students on those days. The other two times I implemented think-pair-share as the primary intervention in the “During Intervention” state, however, I gave students the opportunity to chose their partner.

While student participation did not decrease for a majority of students as a result of teacher-assigned think-pair-share partners, it did not increase student participation nearly as much as giving students a choice in their partner did. For example, on the day I paired students by different mathematics abilities, twelve out of twenty-two students showed an increase in overall daily participation. This differed greatly from when I gave students a choice of their partner, which demonstrated an increase of student participation in twenty-three out of twenty-four students. The second time I gave students a choice in their think-pair-share partner, I saw an increase in student participation in twenty out of twenty-three students. This showed me that the great level of overall student participation that
occurred the first time I gave a students a choice in their partner was not just a one-time occurrence.

While the increase in student participation from student choice in think-pair-share partners increased student participation greatly, many students did not believe that the use of think-pair-share was an effective way to increase their daily rate of participation. For example, in the post-intervention survey I gave the students, only ten out of twenty-one students agreed that the use of think-pair-share helped them participate more during Calendar Math. This discrepancy between student perception and actual participation data surprised me.

Claim #2: The use of assigned seats on the carpet increased student participation in Calendar Math, regardless of which criterion was used to seat the students.

I used assigned seats on the carpet as my first intervention strategy to increase student participation during Calendar Math. I used numbered “X’s” on the carpet, made out of masking tape, to easily place students in designated spaces for each intervention day. I assigned students’ seats on the carpet based upon their rate of participation collected in the baseline data. Once I collected baseline participation data on each student, I ranked students from least amount of participation to greatest amount of participation and used those student participation rankings to help me easily place students depending on the criteria I was using to seat students each day.

The first day I assigned students a seat on the carpet, I had the students with the least amount of participation, based upon the baseline data, sit in the first rows
and the students with the greatest amount of participation sitting in the rows farthest from the whiteboard (see appendix E). After collecting data using the participation tally sheet for this first seating arrangement, I saw an increase in student participation in nineteen out of twenty-four students present. When I reversed the arrangement of the students on the second day, (students with the greatest amount of participation closest to the whiteboard and students with the least amount of participation farthest from the whiteboard) I once again saw an increase in participation for a majority of students with thirteen out of twenty-four students participating at a greater rate than the did while baseline data was recorded. While this was not as great of an increase in participation, it still showed me that student placement has a positive impact in participation in a majority of students.

I assigned students to seats on the carpet for two more days and continued to see increases in participation for a majority of students, regardless of how I seated them. For example, on the third day of this intervention, I seated the students with the least amount of participation in the middle of the carpet and had students with average and high levels of participation surrounding those students. This seating arrangement led to an increase of participation in fifteen out of twenty-three students. On the fourth day of this intervention, I alternated students with low rates of participation with students demonstrating high rates of participation. This seating arrangement showed an increase of participation in fourteen out of twenty-three students.
Claim #3: The use of wait time increased the rate of student participation for a majority of students; with greater rates of student participation seen as wait time was increased.

Because I know that not every student can solve a math problem as quickly as the top mathematical thinker in the group, I believe that providing extra time in which students can solve for problems may increase the number of students who are willing to share their answers and strategies. I first implemented the use of wait time during Calendar Math by providing students with fifteen seconds of time in which to answer each question I posed to them. Fifteen seconds of time was slightly more time than I would normally give students to answer the routine Calendar Math questions. By giving the students a few extra seconds of thinking time, I saw an increase in student participation in thirteen out of nineteen students present that day (68%).

After seeing an increase in student participation with the use of fifteen seconds of wait time, I provided students with thirty seconds of wait time the next day I implemented wait time as an intervention. After providing students with thirty seconds of wait time after each Calendar Math question was presented, I saw an increase in participation in seventeen out of twenty-two students (77%).

Of the seventeen students who had increased rates of participation with the use of thirty seconds of wait time, eleven were students who have demonstrated basic to average mathematical ability. The increase in participation in this demographic of mathematic ability made me realize that many students may be capable of solving these problems and sharing their successes if they are given ample time to do so. I was pleased with having an increase in participation in 68% of
students with the use of fifteen seconds of wait time and was even more impressed to see an increase in participation in 77% of the class with the use of thirty seconds of wait time, making me believe that as wait time increases, so does the rate in which students participate.

**Claim #4: The use of hand and arm signaling, as a form of Every Pupil Response, decreased the rate of participation for a majority of learners.**

For this intervention strategy, I provided the entire class with hand or arm actions to demonstrate together after I posed each question. For example, I may ask students to put two hands on their head if they believe that day’s calendar piece would be a green square. Another example of signaling would be asking students to show on their fingers how many factors of the daily number they were able to find. I would also allow students to silently “flash” the four-digit daily depositor total of the day on their fingers to me after they calculated the total.

On each given day of this intervention, I would use a variety of hand and arm signaling gestures as I felt they were manageable for each question. The first day I implemented signaling, I saw a decrease in participation in thirteen out of twenty-two students. Wanting to test this intervention once again, I implemented signaling along with the use of math journals and still saw a decrease in participation in thirteen out of twenty-three students. I implemented this strategy one more time, this time coupling it with the use of student white boards, and while I did not see that a majority of students decreased their daily rate of participation, only ten out of twenty-two students had an increase in participation and four students had a participation rate that stayed the same.
I do not know for sure why this intervention did not increase participation like the other inventions I implemented did, but I believe there are several factors that could account for this trend. First, this signaling intervention occurred on days in which some students had just spent the morning completing PSSA make-up tests. Perhaps these students felt too tired or drained to quickly solve for Calendar Math problems and actively show their answers using a variety of physical movements. Next, this class may be comprised of more visual or auditory learners as opposed to kinesthetic learners. For example, there were increases in student participation when students were given the opportunity to create a visual representation of their thinking in their math journals and whiteboards and when they were able to share their answers during think-pair-share, an auditory activity. According to “Learning styles” (2006) visual learners, “Remember things they read and write” and auditory learners, “Enjoy classroom and small-group instruction.” If there truly are more visual and auditory students in this class, many students may not prefer to use body movements to share their ideas, which is something many kinesthetic learners prefer. “Learning styles” (2006) states, kinesthetic learners “Remember best through getting physically involved in whatever is being learnt”.

**Reflections and Future Practice:**

Throughout the course of this experience, I have learned many valuable lessons and tools that I will continue to implement the rest of this school year as well as in my future classroom. The first thing I learned is that the use of student input greatly impacts student performance as well as teacher instructional practices. By allowing the students to share which interventions they believed
helped them participate the most actively, I was able to implement these interventions more frequently, even after I finished collecting data. Also, the use of student choice in think-pair-share partners increased rates of participation greater than assignments made by the teacher did.

Next, I learned that intervention strategies should be combined together in order to attempt to meet the needs of as many learners as possible. Not every learner is the same and therefore, not any one particular intervention strategy should be used by itself. In the “After” portion of my inquiry process, I combined two intervention strategies at a time in order to meet several different student learning styles on any given day. The combination of interventions produced promising results, with a majority of students demonstrating an increase in daily participation in four out of six days of multiple intervention strategies being implemented.

Finally, I learned that multiple data collection tools should be used when collecting data in order to provide for the most accurate measure of student performance. When I used two different data collection tools, the tally sheet and the math journal checklist, to measure the effectiveness of using math journals during Calendar Math, the two tools showed me two very different results. Looking at the data from the tally sheet it would appear that only eight out of twenty-three students present (35%) had an increase in participation while using their math journals during Calendar Math. When I used the math journal checklist, however, I noticed that sixteen out of twenty-two students who submitted their math journals (73%) considered to be participating at a high rate (receiving four to five “Yes” on
the checklist), based upon the amount of work shown in their math journals. This occurrence made me realize that I cannot make instructional decisions based solely upon one method of data collection. After I used both tools, I realized that the use of math journals was actually more effective in increasing student participation than I had originally thought.

As a result of this process, I realized that the outcome of my original wondering led me to another future wondering. For instance, when I went back and looked at the results of the post-intervention survey, I noticed that eighteen out of twenty-one students expressed that the persons around whom they sit on the carpet during Calendar Math still continued to distract them, even after the use of interventions. This made me wonder if assigning certain students to sit beside one another for think-pair-share increased the levels of student participation, but also created more distractions at the same time. A future inquiry could be to determine whether or not an increase in student participation during think-pair-share could concurrently lead to an increase in off-task student behavior.
APPENDIX
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Appendix A

Baseline Data Tally Sheet

Date: 2/15/11  
Group size: Small  
Setting: Back carpet  
Lesson: Calendar mat

KEY: 1 = one occurrence of participation  
0 = no occurrence of participation in EPR

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Appendix B
Pre-Intervention Student Survey

MATH SURVEY

**Please circle the choice that best matches how you feel for each question***

1. I enjoy math class
   
   YES  NO  SOMETIMES

2. I like to share my ideas during math
   
   YES  NO  SOMETIMES

3. It makes me nervous to share my answers in front of the whole class
   
   YES  NO  SOMETIMES

4. I like to answer math questions when my friends are sitting near me
   
   YES  NO  SOMETIMES

5. I feel comfortable sharing my ideas or answers with a partner
   
   YES  NO  SOMETIMES

**Please write down a few words for each question**

6. What things distract you during Calendar Math?

7. What would make you participate more during math?
Appendix C
Post-Intervention Student Survey

MATH SURVEY #2

**Please circle the choice that best matches how you feel for each question***

1. Having an assigned seat helped me participate more often during Calendar Math
   
   YES    NO    SOMETIMES

2. Giving the teacher a signal to answer a question helped me participate more often in Calendar Math
   
   YES    NO    SOMETIMES

3. Writing my answers on a white board helped me participate more often in Calendar Math
   
   YES    NO    SOMETIMES

4. Writing my answers in my math journal helped me participate more often in Calendar Math
   
   YES    NO    SOMETIMES

5. Having extra time to answer questions helped me participate more often during Calendar Math
   
   YES    NO    SOMETIMES

6. Sharing my answers with a friend before raising my hand helped me participate more often
   
   YES    NO    SOMETIMES

**Please write down a few words for each question**

6. What things could Miss Geiger and Mrs. Zupon do to help you participate more often during Calendar Math?

7. What things still distract you during Calendar Math?
Appendix D
Math Journal Checklist

Student’s Initials: ______________ Date of Entry: ______________

1. Has the student written the day of the school year on the top of the entry? YES NO
2. Has the student written/drawn a prediction of the day’s calendar piece? YES NO
3. Has the student written factors for the daily number? YES NO
4. Has the student written the day’s daily depositor equation/total? YES NO
5. Has the student shown work/answers for subsequent questions? YES NO

Scale:

5-4 Yes= High rate of participation
3-2 Yes= Average rate of participation
1-0 Yes= Low rate of participation
Appendix E

Sample Seating Arrangement

White board (Front)

Least

1 2 3 4 5

7 8 9 10

11 12 13 14 15

16 17 18 19 20

21 22 23 24 25

Greatest

Back of carpet
Context:

I have chosen to complete my inquiry research in my partner classroom, a traditional third grade classroom at Radio Park Elementary. This class is comprised of twenty-two third grade students of diverse cultural and academic backgrounds. For daily mathematics instruction, however, this class gains several students from a neighboring third grade classroom. I have chosen to focus my inquiry question on the group of students that gather for daily mathematics instruction once several students from room three join this class. With that being said, the group I am collecting my data on is made up of twenty-four third grade students. There are two ESL (English as a Second Language) learners and four students receiving Title I math services in this group of math students. Of the twenty-four students, there are fourteen male students and ten female students. Two students in this math class receive third grade math enrichment services on a weekly basis.

When the students from the neighboring classroom first come over for math class, my mentor and I teach Calendar Math. All of the students meet on the back carpet in front of the white board during this time. Calendar Math usually begins with the students looking at the monthly calendar, finding the day’s date on the calendar, and determining which day pattern piece comes next, based upon the pattern that preceded that day’s date. Next, the students determine what numeric day of school it is for the year and find the factors of that number, raising their hands and presenting the factors to my mentor and I as they find them. The students then add their daily deposit (an amount of money equivalent to the numeric day of
the school year) to the bank, and raise their hands to share the total with the rest of
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participation is because I want to close the gap in the amount of participation
between the students in my math class. There are several students whose hands
seem to be constantly raised because they are constantly engaged and participating
in large group instruction, and on the other hand, there are many students who
rarely contribute any ideas during mathematics instruction. I am hoping that
through this process, I will be able to increase the amount of participation from
those students who rarely participate, while maintaining the high levels of participation some students exhibit on a daily basis.

**Main Wondering:**

- How can I increase student participation during whole group Calendar Math instruction?

**Sub-questions:**

Because I am looking to increase the amount of student participation during whole group mathematics instruction, I have several small wonderings about other factors that may influence the amount of participation that occurs in my class. Some of my sub-questions include:

- How does homogeneous/heterogeneous student participation seating arrangement affect student participation during whole group mathematics instruction?

- How does the location in which the student is seated on the carpet (front, back, middle) impact his or her level of participation during whole group mathematics instruction?

- How does the use of heterogeneous mathematics ability pairing during think-pair-share, by participation level of the student, influence student participation during whole group mathematics instruction?

- How does the use of homogeneous mathematics ability pairing during think-pair-share, by participation level of the student, influence student participation during whole group mathematics instruction?
• How does student choice of partner in think-pair-share influence the amount of participation during whole group mathematics instruction?

• How does the amount of wait time affect the number of students who participate in Every Pupil Response questions (such as “thumbs-up”, holding up the correct answer on your fingers, invisibly “drawing” the answer in the air, etc.) during whole group mathematics instruction?

• How does the use of response cards, such as math journals and white boards, influence the amount of student participation during whole group mathematics instruction?

• Which Every Pupil Response (EPR) question elicits the greatest amount of student participation (Using journals, white boards, or hand gestures) during whole group mathematics instruction?

Timeline:

**Week 1- February 14th-18th, 2011: (BEFORE)**

- Collect baseline participation data during large group Calendar math instruction using tally sheet
- Provide math participation survey to math students
- Gather resources for annotated bibliography
- **Inquiry brief draft due 2/18**

**Week 2- February 21st-25th, 2011: (BEFORE)**

- Collect baseline participation data during large group Calendar math instruction using tally sheet
- Continue to gather resources for annotated bibliography
- Revise inquiry brief draft
- Analyze baseline data of whole group math instruction and rank students from least amount of total participation during “before” period to greatest amount of total participation during “before” period

**Week 3- February 28th- March 4th, 2011: (DURING)**
INTERVENTION STRATEGY: Changing seating arrangement

• **Monday**: seat students on carpet with students ranked with least amount of participation on the front of the carpet and greatest amount of participation on the back of the carpet
• **Tuesday**: seat students on carpet with students ranked with greatest amount of participation on the front of the carpet and least amount of participation on the back of the carpet
• **Wednesday**: seat students with the least amount of participation in the middle of the carpet and with students with mid-greatest level of participation surrounding the other students
• **Thursday**: seat students on carpet by alternating students with high levels of participation with students with low levels of participation
• **Friday**: allow students to chose a “x” (spot on carpet created by my mentor and I) on the carpet in which they feel they will focus the most during whole group mathematics instruction
• Collect participation data during large group Calendar Math instruction using participation tally sheet
• Collect anecdotal notes on student participation during whole group math instruction
• Continue to gather sources for final annotated bibliography

**Week 4**: March 7th-11th, 2011:

• **SPRING BREAK**

**Week 5**: March 14th-18th, 2011: (DURING)

INTERVENTION STRATEGIES: Think-Pair-Share, Response Cards (a type of Every Pupil Response)

• **Monday**: Students chose who they would like to engage in think-pair-share with.
• **Tuesday**: Seat students beside someone with similar mathematics ability on carpet and have the students participate in think-pair-share questions with that person
• **Wednesday**: Seat students beside someone with similar mathematics ability on carpet and have the students participate in think-pair-share questions with that person
• **Thursday**: Students use math journals to record answers during calendar math
• **Friday**: Students solve equations and hold up answers on white boards during Calendar math
• Collect participation data during Calendar Math using tally sheet
Participation during think-pair-share also measured with anecdotal notes
Data collection on participation in math journals will be measured using a teacher checklist

**Week 6- March 21st-25th, 2011: (DURING)**

INTERVENTION STRATEGIES: Wait Time, Every Pupil Response/Response Cards

- **Monday:** Teacher uses wait time (15 seconds) for every question asked during Calendar Math
- **Tuesday:** Teacher uses wait time (30 seconds) for every question asked during Calendar Math
- **Wednesday:** Students use a variety of hand gestures (Every Pupil Responses) to represent answer to teacher question during whole group mathematics instruction
- **Thursday:** Students use math journals and hand gestures during instruction (both are examples of EPR’s)
- **Friday:** No data collected, guest teacher
- Collect participation data during Calendar Math using tally sheet
- Anecdotal notes used to measure student participation
- Analyze data from interventions, re-rank students based upon total participation during intervention weeks

**Week 7- March 28th-April 1st, 2011: (DURING & AFTER)**

- **Monday:** Students use white boards and hand gestures during instruction (both are examples of EPR’s)
- **Tuesday:** Think-pair-share and wait time (15 seconds)
- Give another math participation survey (Tuesday)
- Students return to choosing their own seats during whole group mathematics instruction
- Collect participation data during Calendar Math using tally sheet
- Interview students about their thoughts and experiences throughout the course of the participation interventions

**Week 8- April 4th-8th, 2011: (AFTER)**

- Students return to choosing their own seats during whole group mathematics instruction
- Collect participation data during Calendar Math using tally sheet
- Analyze data from “After Interventions”

**Week 9- April 11th-15th, 2011**
Data Collection Ideas:

I plan on using several different means to collect data during whole group math instruction. First, I plan on using a class list tally chart, which is a way to collect six different categories of participation. This type of data collection will be used during the “Before”, “During” and “After” periods. This tally chart will serve as an efficient method in which to collect baseline data on the entire class in a variety of settings and math lessons, as well as collect data regularly and efficiently throughout the entire process. I also plan on giving the students a math survey that focuses on their level of participation in large group settings. I will give the students this survey during the “Before” period and will provide a subsequent survey during both the “During” and “After” periods of inquiry.

Next, I plan taking regular anecdotal notes during activities that may not permit themselves to using tallies. The use of anecdotal notes will help me record interactions between students and/or teachers that may play a role in the amount of student participation during math instruction, as well as unusual behaviors that
occur that may not seem as significant if just recorded as tally marks. I will also
develop a checklist that will assess the amount of participation and writing in
student math journals on days students are permitted to use their math journals
during Calendar Math. Finally, I plan interviewing students as a means to help me
determine the effectiveness of each of my interventions in increasing student
participation.
Annotated Bibliography


Clarke’s book begins by explaining the origins of mathematics and how mathematics has been reformed in the United States since 1950. After explaining mathematics education in other parts of the world, and comparing it to the ways in which we teach mathematics in the United States, Clarke shares several approaches to teaching mathematics in modern day America. I plan on using Clarke’s suggestion of using kinesthetic teaching-learning activities as part of the foundation of my use of signaling as a form of every pupil response questions given during Calendar Math. I hope the use of this movement strategy will help students with a kinesthetic learning style benefit from this intervention because many of my other interventions are strategies that may help auditory or visual learners.


Dixon, Egendoerfer, and Clements’ article describes the effects of using student-centered mathematics discussions in a second grade classroom, as opposed to teacher-centered dialogue. Through the use of student-centered mathematics discussions, the students were able to explain their reasonings, as well as challenge the ideas of other students in a respectful manner, without being manipulated with teacher control. The students were also able to correct themselves once they heard their ideas aloud and were able to teach other students who may be struggling with a concept. I plan on using this article as the basis of a possible intervention strategy to use while in the “during” portion of the inquiry process. After giving the students a math attitude/participation survey, I noticed that several students wrote that sharing their ideas with their friends would be a way to increase their level of participation. The use of student-centered mathematics discussions may be a way to increase overall student participation during whole group mathematics instruction, as well as make students feel more confident in their thinking and mathematics reasoning.

Koshy’s instructional book provides many helpful strategies for teachers to use in their mathematics classroom. She focuses on how to create a nurturing and enriching classroom environment for students who are strong mathematics students. She describes how teachers can identify mathematically promising pupils, assess student work, differentiate instruction effectively, group students by ability, and structure each mathematics lesson. While many of her strategies focus on creating a rich and stimulating experience for stronger math students, I believe that many of her recommendations can be used as interventions to increase mathematics participation for a majority of my math students. I plan on using her recommendation of starting each lesson with a “Mental and Oral Starter” during some of my Calendar Math lessons. She believes that students should be given the opportunity to share their ideas during these first five to ten minutes of math instruction and also believes that students should use response cards/whiteboards to hold up and share their answers during this math introduction time. This directly connects to my think-pair-share and every pupil response interventions during Calendar Math.


http://www.pesdirect.com/learning-styles.html

This website provides information on each of the three common learning styles seen in many classrooms including: auditory, visual, and kinesthetic. This website gives an explanation of each learning style, provides strengths and traits of each learner, lists learning and teaching strategies for each learner, and provides possible activities to use with these learners. I plan on using this website to help me select and explain my choice of interventions to use with the students. By having a list of strengths and activities for each learning style, I will be able to plan activities and inventions that will fit the needs of most of my learners throughout the course of my intervention process.


Leinwand provides teachers with several strategies they can use in their mathematics classroom to increase student success. Some tips he provides teachers include: using questioning such as “Why? How do you know? Can you explain?” frequently, reviewing math concepts frequently with students,
incorporating reading instruction techniques into math lessons, using pictorial representations, and having clear teacher and student roles during math instruction. I plan on using Leinwand’s recommendations for using pictorial representations and social interaction between students to help support and drive the use of my response card and think-pair-share interventions.


Posamentier, Hartman, and Kaiser offer many great strategies to use in a variety of mathematics related situations. In each section, they state the tip or strategy, provide research that has been conducted on that tip, provide ways you could apply the tip in your classroom, and offer some precautions that teachers should keep in mind before implementing each strategy. I plan on using their tips on wait time, varying the types of questions you ask students, and cooperative learning to help me select appropriate strategies and questions to ask during daily Calendar Math.


This article by Narayan, Heward, Gardner, Courson, and Omness first describes the traditional method of teacher-led whole-class instruction, which is characterized by a teacher calling on one student at a time after presenting a question. They believe, however, that this type of traditional teaching is not the most effective way of actively engaging all students during whole group instruction. Instead, they recommend that teachers use response cards to increase student participation as opposed to solely using hand-raising. I plan on using this source as a model for my intervention plan because it summarizes and incorporates several of my sub-questions and intervention ideas. For example, this article used wait time as a variable in the study, which is something I plan on implementing. This study also successfully demonstrated the effectiveness of using response cards in student participation, compared to hand raising, which supports my idea that interventions such as writing in Math Journals or using white boards need to be implemented during whole group math instruction in order to increase
student participation.


This book, written by Reed and Bergemann, contains hundreds of sample forms used in collecting observations and other important data on both students and teachers. This guide also provides examples and directions on how to accurately complete each type of observation form. I plan on using several of these sample forms to help me construct my own data collection tools to accurately collect data on various types of student participation data, as well as help me confirm that I am collecting my data in a non-biased or skewed manner.


This article describes typical behavior patterns that occur when studying student participation. It also describes certain factors that may negatively impact student participation. Finally, this article shares several methods teachers can use to increase student participation in elementary classrooms. I plan on using this article to help me come up with new, fair, and fun ways to increase student participation. For example, this article describes using both wait time and written responses (two of my possible interventions) as a means of increasing student participation. This article also suggests using a pattern in which to call on students in and using name sticks to arbitrarily call on students with in order to create a fair platform in which students participate. I really liked the idea of telling the students the carpet pattern in which I was going to call on students (for example, forming a letter “G” in my mind for Miss Geiger and calling on students in order of the shape of the letter G on the carpet) because I think this is a fair and fun way of getting the students actively involved. Also, it gives students a “heads up” for being called on and keeps the students interested to see what the pattern might be the next day.

10. Tyminski, A. M., Richardson, S. E., Winarski, E (2010, April). Enhancing think-
Tyminski, Richardson, and Winarski’s article in *Teaching Children Mathematics* describes a revised version of the traditional think-pair-share model. This revised version includes five phases such as: orientation, play-investigate, share-reorient, pair play-pair listening, whole-group share. The article then summarizes a scenario in which students were instructed to go to a group table and play a math game, come back to the carpet to share their ideas on the game, return to the table and play the game again with a partner, and finally share their pair’s ideas/experiences with the whole-group. I believe that this version of think-pair-share would work well when attempting to increase student mathematics participation during small group stations. This strategy will be particularly helpful, and easy to implement, as I am leading my math activity station on Wednesdays and Thursdays. I can present the game to the students, have them play it individually for five minutes, share ideas as a group, have the students play the game again with a partner, and finally share each pair’s ideas with the rest of the group. This strategy will be a great way for me to collect data on the amount of student participation exhibited during both small group instruction *and* through the use of think-pair-share.