Domain: SP 2, 3, 4 **Standard Code:** 2, 3, 4 **Teacher Name:** Babcock, Freeman, Congram

Adapted from: Smith, Margaret Schwan, Victoria Bill, and Elizabeth K. Hughes. "Thinking Through a Lesson Protocol: Successfully Implementing High-Level Tasks." *Mathematics Teaching in the Middle School 14* (October 2008): 132-138.

PART 1: SELECTING AND SETTING UP A MATHEMATICAL TASK	
What are your mathematical goals for the lesson? (i.e., what do you want students to know and understand about mathematics as a result of this lesson?)	**Goals for lesson:** 1. Identify and understand the mean, median, mode, and range in a set of data. 2. Visually interpret and represent the set of data. 3. Recognize & communicate the meaning of the data. I can find the center of a set of data. I can describe a set of data by its spread and overall shape. I can know that median is a single number that is a measure of center and it summarizes all values in a set of data. I can display numerical data on a dot plot.
• What are your expectations for students as they work on and complete this task? • What resources or tools will students have to use in their work that will give them entry into, and help them reason through, the task? • How will the students work—independently, in small groups, or in pairs—to explore this task? • How will students record and report their work?	**Materials:** Survey Form Math Journal Chart Paper Small Group/pairs Survey form can be used as well as math journal. End group information would be recorded on a chart or poster.
How will you introduce students to the activity so as to provide access to *all* students while maintaining the cognitive demands of the task?	**Launch:** The PTA or principal is trying to organize the monthly birthdays for the year. We have been asked to study the school and find the months that have the most students born. We should start with our class, then move to other 6^{th} grade classes and finally the school.

<table>
<tr><th colspan="2">PART 2: SUPPORTING STUDENTS' EXPLORATION OF THE TASK</th></tr>
<tr><td>As students work independently or in small groups, what questions will you ask to—
help a group get started or make progress on the task?
focus students' thinking on the key mathematical ideas in the task?
assess students' understanding of key mathematical ideas, problem-solving strategies, or the representations?
advance students' understanding of the mathematical ideas?</td><td>Task 1- Classroom birthdays.
Organize data into visual representation. Ex: Line up students in birthday months, use post-it notes to create a line plot, or simply, give student the birthday information in no order.

Questions and Strategies:
What do you know about Mode?
What do you know about Median?
What do you know about the math vocabulary used in this task?
Looking at the data, what can you tell me about the data?
Can you look for a pattern?
What other methods might work?
How can you visually show the data?
What types of graphs do you know how to draw and label?
Assessment will happen as you listen and direct the questioning.

**This task would be used as the introduction to this area of study. Direct instruction fill follow tasks to scaffold different ways to organize and present data.</td></tr>
<tr><td>How will you ensure that students remain engaged in the task?
What assistance will you give or what questions will you ask a student (or group) who becomes quickly frustrated and requests more direction and guidance is solving the task?
What will you do if a student (or group) finishes the task almost immediately? How will you extend the task so as to provide additional challenge?</td><td>How to know students are engaged in task:
The students are asking questions and math talking with partners.
Students are writing and recording in their math journals.
Intervene with questions from Questions and Strategies. (See Above)
Early Finishers:
Represent the data in another visual.(Draw it in another way)
Write in words how you would explain this information to your parents.
Within group students could repeat the task using family data.</td></tr>
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PART 3: SHARING AND DISCUSSING THE TASK	
How will you orchestrate the class discussion so that you accomplish your mathematical goals? • Which solution paths do you want to have shared during the class discussion? In what order will the solutions be presented? Why? • What specific questions will you ask so that students will— 1. make sense of the mathematical ideas that you want them to learn? 2. expand on, debate, and question the solutions being shared? 3. make connections among the different strategies that are presented? 4. look for patterns? 5. begin to form generalizations? What will you see or hear that lets you know that *all* students in the class understand the mathematical ideas that you intended for them to learn?	**Task 1- Classroom birthdays cont.** **Sharing and class discussion to accomplish math goals:** Students will show their math journals (doc camera) and explain how they found the data set values and how they chose to display their data. • Emphasize vocabulary and labeling. • Use of different types of graphic representations. • Have a student explain what another student has shared in his or her presentation. • Can you explain this strategy in your own words? • Solve it in a different way? • Which way is more efficient? **Leading Questions:** • Can we use this information to get more specific? • Can we find where the middle is? • Can we find where the majority of the class lies? • Could we take this data and organize it in a different way?

PART 2: SUPPORTING STUDENTS' EXPLORATION OF THE TASK	
As students work independently or in small groups, what questions will you ask to— • help a group get started or make progress on the task? • focus students' thinking on the key mathematical ideas in the task? • assess students' understanding of key mathematical ideas, problem-solving strategies, or the representations? • advance students' understanding of the mathematical ideas?	**Task 2- 6th Grade birthdays.** Part 1: Develop a survey form to use in the other classrooms of the school. Please be conscious of your time and the classes' time. Part 2: Using the data gather from other classes, create a Box and Whisker plot. Make sure to list mean, median, mode, minimum, maximum, various quartiles, etc. **Questions and Strategies:** • What informal conclusions can you draw? • How is this data the same/different from our class data? • How does the Box and Whisker plot help you verify these similarities/differences? • What questions can you come up with? Assessment will happen as you listen and direct the questioning. **This task would be used as the guided practice following the lesson.
How will you ensure that students remain engaged in the task? • What assistance will you give or what questions will you ask a student (or group) who becomes quickly frustrated and requests more direction and guidance is solving the task? • What will you do if a student (or group) finishes the task almost immediately? How will you extend the task so as to provide additional challenge?	**How to know students are engaged in task:** • The students are asking questions and math talking with partners. • Students are writing and recording in their math journals. • Intervene with questions from **Questions and Strategies**. (See Above) **Early Finishers:** • Represent the data in another visual.(Draw it in another way) • Write in words how you would explain this information to your parents. • Start generating a computer version of this graph. • Start gathering information from other classes in the school. • Add information to classroom display charts.

PART 3: SHARING AND DISCUSSING THE TASK	
How will you orchestrate the class discussion so that you accomplish your mathematical goals? • Which solution paths do you want to have shared during the class discussion? In what order will the solutions be presented? Why? • What specific questions will you ask so that students will— 1. make sense of the mathematical ideas that you want them to learn? 2. expand on, debate, and question the solutions being shared? 3. make connections among the different strategies that are presented? 4. look for patterns? 5. begin to form generalizations? What will you see or hear that lets you know that *all* students in the class understand the mathematical ideas that you intended for them to learn?	**Task 2- 6th Grade birthdays cont.** **Sharing and class discussion to accomplish math goals:** Students will show their math journals (doc camera) and explain how they found the data set values and how they chose to display their data. • Emphasize vocabulary and labeling. • Use of different types of graphic representations using technology. • Have a student explain what another student has shared in his or her presentation. • Can you explain this strategy in your own words? • How can we make this look professional to present to the PTA or principal? • Have students ask questions about process? • Where is the first 25%? 50%? Etc. • Can we find where the majority of the grade lie?

PART 2: SUPPORTING STUDENTS' EXPLORATION OF THE TASK	
As students work independently or in small groups, what questions will you ask to— • help a group get started or make progress on the task? • focus students' thinking on the key mathematical ideas in the task? • assess students' understanding of key mathematical ideas, problem-solving strategies, or the representations? • advance students' understanding of the mathematical ideas?	**Task 3- School birthdays.** Part 1: Using the survey developed survey the other classrooms of the school. Please be conscious of your time and the classes' time. Part 2: Using the data gather from other classes, create a Box and Whisker plot. Make sure to list mean, median, mode, minimum, maximum, various quartiles, etc. **Questions and Strategies:** • What informal conclusions can you draw? • How is this data the same/different from our class data? • How does the Box and Whisker plot help you verify these similarities/differences? • What questions can you come up with? Assessment will happen as you listen and direct the questioning. **This task would be used as the independent practice following the lesson. Could also be used as assessment. This is an involved task that could take several class sessions.
How will you ensure that students remain engaged in the task? • What assistance will you give or what questions will you ask a student (or group) who becomes quickly frustrated and requests more direction and guidance is solving the task? • What will you do if a student (or group) finishes the task almost immediately? How will you extend the task so as to provide additional challenge?	**How to know students are engaged in task:** • The students are asking questions and math talking with partners. • Students are writing and recording in their math journals. • Intervene with questions from **Questions and Strategies**. (See Above) **Early Finishers:** • Write in words how you would explain this information to your parents. • Start generating a computer version of this graph.

PART 3: SHARING AND DISCUSSING THE TASK	
How will you orchestrate the class discussion so that you accomplish your mathematical goals? • Which solution paths do you want to have shared during the class discussion? In what order will the solutions be presented? Why? • What specific questions will you ask so that students will— 1. make sense of the mathematical ideas that you want them to learn? 2. expand on, debate, and question the solutions being shared? 3. make connections among the different strategies that are presented? 4. look for patterns? 5. begin to form generalizations? What will you see or hear that lets you know that *all* students in the class understand the mathematical ideas that you intended for them to learn?	**Task 3- School birthdays cont.** **Sharing and class discussion to accomplish math goals:** Students will show their math journals (doc camera) and explain how they found the data set values and how they chose to display their data. • Emphasize vocabulary and labeling. • Use of different types of graphic representations using technology. • Have a student explain what another student has shared in his or her presentation. • Can you explain this strategy in your own words? • How can we make this look professional to present to the PTA or principal? • Have students ask questions about process? • Where is the first 25%? 50%? Etc. • Can we find where the majority of the grade lie?

Teacher Outline

1. Launch- 5-10 min.

Introduce birthdays

2. Task 1- 45 min.

Gather class data and organize.
Debrief

3. Direct Lesson- Varies 1-2 class times

Box and Whisker plots, Mean, Median, Mode, etc.

4. Task 2- 60 min.

Gather grade information and organize.
Debrief

5. Task 3- Varies

Gather whole school information and organize.
This can be spread over several days/weeks. It can be used as an extension or continuation after unit is complete.
Debrief once group is ready.