CONSTRUCTING TASK: Oh My Graphing! (OMG)
4 Days to complete

STANDARDS FOR MATHEMATCIAL CONTENT

MCC.3.OA.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

MCC3.3.MD.3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.

STANDARDS FOR MATHEMATCIAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

*****Mathematical Practices 1 and 6 should be evident in EVERY lesson. *****

BACKGROUND KNOWLEDGE

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades 3-5, page 331)

"Bar graphs remain important tools throughout the grades and are frequently seen in newspapers and on the TV news. In grades 3-5, two qualitative differences in their bar graphs can be developed. First, students can easily use centimeter grid paper to construct their own graphs with little guidance. Students can decide on their own scales for their graphs. Labeling of graphs should be less a matter of teacher direction and more a matter of making a graph that communicates and answers the question that is being asked."

"A second element of progression may involve using a single tally or picture element in the graph to represent more than one count. For example, if a graph were being made to show how many seconds different students required to run around the gym floor, using one square of the grid to represent 10 seconds may be useful."

ESSENTIAL QUESTIONS

- How can you display data in a single bar graph?
- How can you display data in a pictograph?
- How does your graph communicate your data?
- What are the steps involved in making and reading graphs?
- How can you use a graph to solve the answer to a question?

MATERIALS

- Our Favorite Sports student record sheet
- Favorite Presents student record sheet
- Favorite Present Family survey sheet
- Skittles student record sheet
- Centimeter grid paper
- 4-5 other teacher's permission to survey their class

GROUPING

Small group, independent

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I: Scaffolding

Today the class will construct single bar graphs using data that is collected and answer questions about the data. They can survey each other to collect data to make a single bar graph representing the class' opinions or the small groups can survey another class. Finally, they will create and answer questions about our class' single bar graph.

Group the students into working groups, no more than four. Introduce the task by asking the students "What do you think are the five most popular sports?" Write student responses on the board or chart paper. Distribute the Our Favorite Sports student record sheet and have the class record what they have determined as the five most popular sports. (At this point you can collect data from your class and use it with an intervention group that needs a more guided lesson. Distribute index cards or post- its and have each student choose their favorite sport from the five determined earlier by the class.) Other small groups can go and survey the pre-arranged classes. Once the working groups have returned, provide materials to each group to begin constructing their single bar graph.

Circulate and check the progress of each group while they are constructing their single bar graph. Each working group does not have to have the same scale as long as the scale works. Prompt groups that choose 1 as their scale to try a different number. After all the steps are completed, let each group share their single bar graph. Let the class ask each group questions. Did every group try a different scale? Which scales worked better?

Finally, ask the groups to look at their single bar graphs. You are going to ask the groups some questions that they can answer with the data from the single bar graphs. If the group knows the answer they must stand up, but they must explain how they got the answer using math language and evidence from the single bar graph.

Questions:

1. Which sport had the most votes?
2. Which sport had the least votes?
3. Which sport had the same amount of votes?
4. How many votes total?
5. How many students voted for _____ and _____?
6. How many students did not vote for _____ and _____?
7. Which sport got half as many votes as _____?
8. Which sport got twice as many votes as _____?

When the working groups have completed their single bar graphs, allow time for each working group to present their single bar graph. When each group has completed their presentation, ask each group to create three questions that could be answered using their single bar graph. Ask each working group to write their questions on a sheet of paper. Next, each working group will ask the class or another working group to answer their questions using the single bar graph. Conclude by sharing some of the questions and how the answers were found. Finally, compare the two sets of data. Which class had more votes for _____ (pick a sport that is on both single bar graphs). How does a single bar graph help you to answer question about a set of data. Display the graphs with questions in the classroom for future reference.

Part II: Constructing

The next two days we are going to continue to construct a single bar graph using data collected from our class as well as construct a picture graph using the same data.

Ask the class to close their eyes and picture a beautifully wrapped present. In their mind they are going to think about what their favorite gift they have received was (or what realistic favorite gift they would like to receive). Distribute index cards or small sticky notes and ask the students to write what favorite gift is in that beautifully wrapped box. Collect the cards/notes. Divide the favorite gifts into categories such as video games, DVD, books, clothes, games, money, technology (iPad, iPod, cell phones) etc. Divide the students into small working groups or partners. Using this data construct a single bar graph. Students may choose to use centimeter grid paper, chart paper or lined paper. Review the steps in constructing a single bar graph from the previous lesson. Circulate and check the progress, asking questions where needed. When the

groups or partners have completed their single bar graph, post the following question for the groups or partners to answer using their single bar graph (or have the question on index cards and give one question to each group, then have the groups explain the question and how they used the single bar graph to find the answer).

1. What is the title?
2. How many different gifts are shown?
3. What is the most popular gift?
4. What is the least popular gift?
5. Do any gifts show a tie?
6. How many people took this survey?
7. List the gifts from most popular to least popular.
8. What other ways could display this data?

A second way to display this data is with a picture graph. Using the data the class has collected about their favorite presents, model the procedure to create a picture graph. You may do this on the board, chart paper or smart board, while the students create one as well on the Favorite Present student record sheet. Discuss the selection of the picture that will represent the chart. Looking at the class' data, what number would be the best by which to count up? Could different numbers be used? Create a key at the bottom of your pictograph. Label each row and fill in the values using the pictures. Decide on a title for your picture graph. Discuss what the class had to do if the value of the picture did not equal the value of the data? Did they draw half of a picture? Repeat the questions above. Do the answers change even though the data did not, while the style of graph did?

For homework, have students take the Favorite Present student record sheet home and interview at least four family members. The next day, the class will present the data they have collected and combine to create a larger set of data. Then, students will work in small working groups or pairs to construct a new pictograph representing the new data. You can choose if the students will construct their pictographs on the Favorite Present student record sheet, chart paper or lined paper. Circulate and check student progress on their pictographs. When the class has completed, allow time for each group to present their pictographs and describe how they constructed them. You can ask the following questions for the students to answer using their pictographs (they can respond verbally or write the answers near their pictograph). After questioning, the students can create their own questions about the pictograph and partner with other groups to answer the questions.

1. How many people participated in this survey? How do you know?
2. How many people chose _____ as their favorite gift?
3. How many more people chose _____ than _____ as their favorite gift?
4. If _____ (insert a double digit number) more people chose _____ as their favorite gift, how would you show that in the pictograph?

Part III: Performance

Today we are going to practice constructing a single bar graph and a pictograph using data collected about Skittles. (Skittles were chosen because it is a peanut free candy). You can choose what works for your class as long as the amount of data is enough to show a variety of one type of item (M&Ms, Runts, Gobstoppers, fruit snacks) According to Google, fun size Skittles contain 25-30 pieces, regular bags contain about 60 pieces and one pound bags contain about 400 pieces. You can decide which amount your class can use to gather data. You can let the class use the Skittles student record sheet or they may use their own methods of collecting and organizing the data. The goal here is to see if they can take data and construct a single bar graph and pictograph that accurately displays the information and can be used to answer questions about the data.

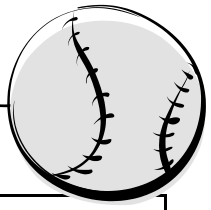
Allow time for students to present and explain their work.

FORMATIVE ASSESSMENT QUESTIONS

- How can you display data in a single bar graph?
- How can you display data in a pictograph?
- How does your graph communicate your data?
- What are the steps involved in making and reading graphs?
- How can you use a graph to solve the answer to a question?

DIFFERENTIATION

Extension: Students can create their own survey with questions about the school or community. (Best cafeteria food, types of books checked out, type of homework). They can present their data in both types of graphs. Share what they have found out about their community.
Intervention: Students can be given graphic organizers to help keep data organized as well as graph paper to allow the data to be filled in.



Name _____ Date _____

Favorite Sports

Favorite Sports	
Sport	Votes
Football	12
Basketball	6
Soccer	4
Baseball	8
Volleyball	6

Using the data in the frequency table, build your own single bar graph.

1. Write your title at the top of the single bar graph
2. Decide a number that would be easiest to count up by
3. Create your scale at the bottom of your single bar graph
4. Label each row
5. Fill in the value using a bar

Write three things you know about this class' favorite sports using the single bar graph.

1. _____

2. _____

3. _____

Name _____ Date _____

Our Favorite Sports
Student Record Sheet

Favorite Sports	
Sport	Votes

Using the data in the frequency table, build your own single bar graph.

1. Write your title at the top of the single bar graph
2. Decide a number that would be easiest to count up by
3. Create your scale at the bottom of your single bar graph
4. Label each row
5. Fill in the value using a bar

Write three things you know about this our class' favorite sports using the single bar graph.

1. _____

2. _____

3. _____

Name _____ Date _____

Favorite Presents

Favorite Presents	
Types of Presents	Votes

Using the data in the frequency table, build your own pictograph.

1. Write your title at the top of the pictograph
2. Decide on a picture that represents your pictograph
3. Decide on a number that would be easiest to count up by
4. Create your key at the bottom of your pictograph
5. Label each row
6. Fill in your values using pictures

Write 3 things you know about this class' favorite presents using the pictograph.

1. _____

2. _____

3. _____

Name _____ Date _____

Favorite Presents
Student Record Sheet- Homework

Favorite Presents	
Family Member	Favorite Present

Favorite Presents: Class Family Members Data	
Types of Presents	Votes

To be completed at school: Combine the data from the family member survey. Then using the data in from the entire class, build your own pictograph.

1. Write your title at the top of the pictograph
2. Decide on a picture that represents your pictograph
3. Decide on a number that would be easiest to count up by
4. Create your key at the bottom of your pictograph
5. Label each row
6. Fill in your values using pictures

Write 3 things you know about this class' favorite presents using the pictograph.

1. _____

2. _____

3. _____

Name _____ Date _____

Skittles Graphing
Student Record Sheet

Sort your Skittles by color. Complete the frequency chart with the correct totals

Skittles Color Frequency Chart		
Colors	(Use tallies, addition, multiplication)	Total
Red		
Orange		
Yellow		
Green		
Purple		

Use the following area to create your rough draft of the single bar graph and the pictograph

Graph Checklist	
Appropriate scale	
Colors labeled	
Values labeled	
Title for graphs	
Picture represents graph	