Data and Math are Everywhere

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CURR 672: Math Connections in the STEM Classroom

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Data

The NASA data source being used is https://spaceplace.nasa.gov/topomap-clay/en/. Students will observe the topographic map below before creating their own model mountain out of model magic clay. Although this NASA source is not connected to any one particular mission, it is heavily related to imaging radar. Using measuring instruments, imaging radar creates an image of the terrain on Earth. This is applicable to space travel, as it can be done on other planets as well. This can help scientists learn more about Earth's, and other planet's, terrains. What are the surfaces like? Are there high mountains or steep valleys? Are the surfaces straight or curved? Imaging radar can also help scientists identify what type of surface they are exploring (ocean, grassland, pavement, etc.).

Students will create a map and then will use model magic clay to build the landforms that are outlined on the map. Students will first be shown the image of the topographic map on this website (shown below) and they will share what they notice and wonder about this map. They should realize that this map looks different than the ones hung up in our classroom, and we will talk about why that is. After students learn about topographic maps, they will draw their own topographic map of a mountain. After that, they will use their model magic clay to build a mountain, and will use dental floss to break the mountain into sections and reassemble it. Students can then compare their topographic map to their mountain and discuss the similarities and differences. They can also discuss how their topographic map and pieced-apart mountain is different from the maps we've made and structures we've built previously.

Engaging Context

In second grade, we have two math units that connects with this data. The units are Measurement and Data & Probability. In the measurement unit, students learn how to use rulers to measure objects using centimeters, inches, and feet. In this lesson, students can measure their model mountain using both units, and then compare those measurements with their classmates. In our Data & Probability unit, students learn how to read, create, and compare visual representations of data. In this lesson, we can write all of the model mountain's heights on the whiteboard for students to see. Using those numbers, students can create a bar graph and line plot to show the different heights represented by our class's mountains.

The different visuals will not only help them with their graphing, but also with their ability to compare numbers. Usually we create a bar graph about the class's favorite flavor of ice-cream, or something along those lines. By using this data set for the visual representation, students will have a strong connection to the data collection and shown. They are building and measuring the heights that they are graphing, so the data has a higher relevance and makes more of a connection to their learning.

Measurable Objective

- Students will be able to graph the heights of their models and compare it with their peers
- Students will be able to analyze the differences amongst the class model's heights
- Using firsthand observation and NASA data sources, students will be able to recognize patterns between topographic maps and landforms
- Students will be able to connect their vocabulary and knowledge gained from the topographic map to build models of landforms

- Students will be able to design and develop a model to represent patterns in the natural world
- Students will be able to connect their models to their topographic map
- Students will be able to compare similarities and differences between their map and model

Standards

Math

CCSS.MATH.CONTENT.2.MD.A.1: Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

CCSS.MATH.CONTENT.2.MD.A.4: Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

CCSS.MATH.CONTENT.2.MD.D.10: Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

CCSS.MATH.CONTENT.2.G.A.1: Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces.1 Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

Science

ESS2.B: Plate Tectonics and Large Scale System Interactions- Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2)

2 ESS2 2: Develop a model to represent the shapes and kinds of land and bodies of water in an area.

2 ESS2 3: Obtain information to identify where water is found on Earth and that it can be solid or liquid.

Social Studies

6.1.2.Geo.SV.1: Use maps to identify physical features (e.g., continents, oceans, rivers, lakes, mountains).

6.1.2.Geo.SV.3: Identify and describe the properties of a variety of maps and globes (e.g., title, legend, cardinal directions, scale, symbols,) and purposes (wayfinding, thematic).

Engineering Design

K 2 ETS1 2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Evidence

In order show evidence of student learning, there will be informal observation notes taken throughout the lesson to keep track of their work and thinking, and a summative assessment that will be given at the end of the unit. The summative assessment given at the end of the unit covers the measurement and data concepts that are taught.

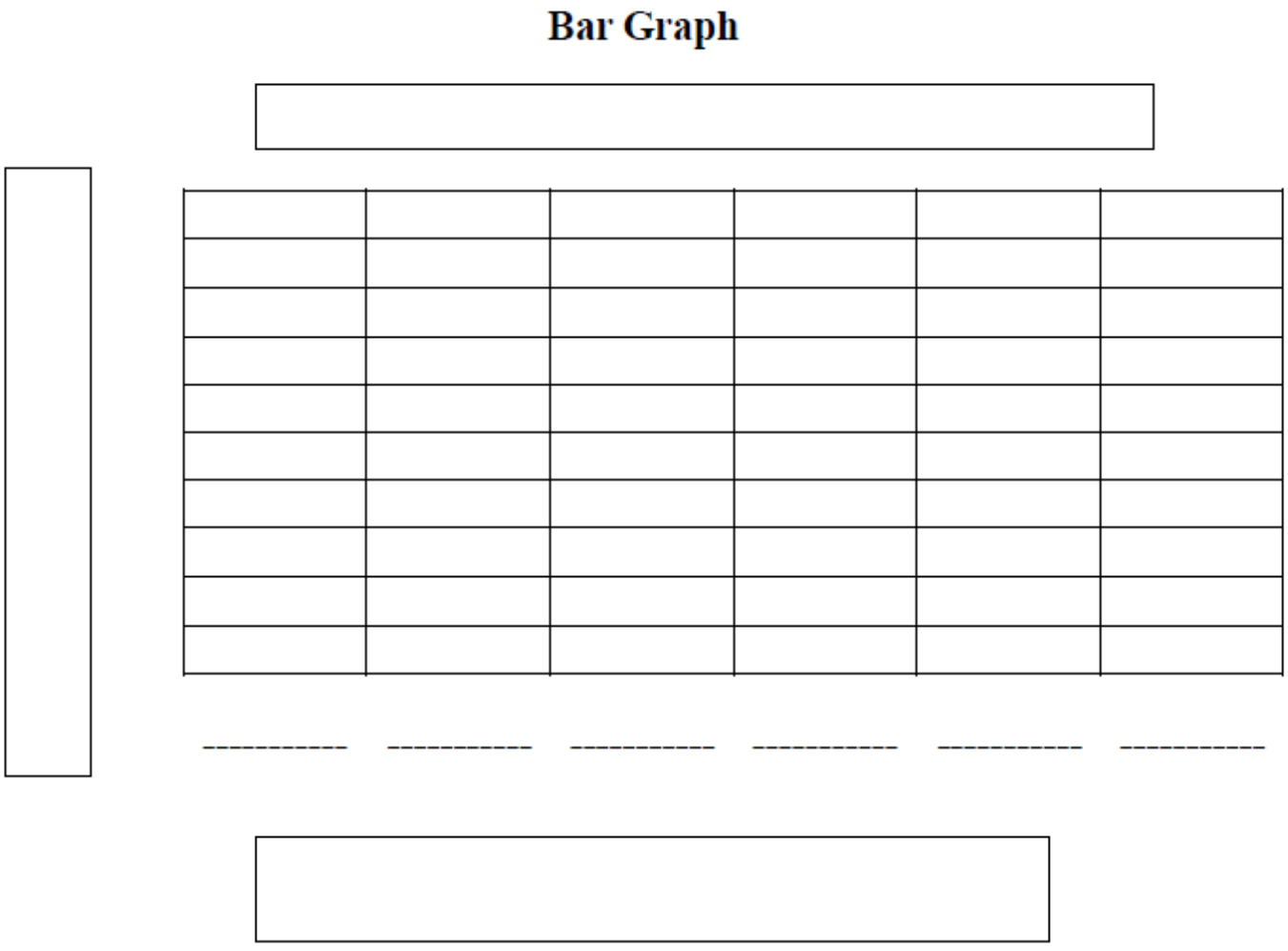
For the informal observation notes, the teacher will go around while the students are working and collect information based on a series of questions. Each student will get asked a few questions to gage their understanding of the concepts being taught. These questions include:

- What unit(s) are you using to measure your mountain?
- How is your model similar to your topographic map?
- How is your model different from your topographic map?
- How does your model represent your topographic map?
- Why is a topographic map important?

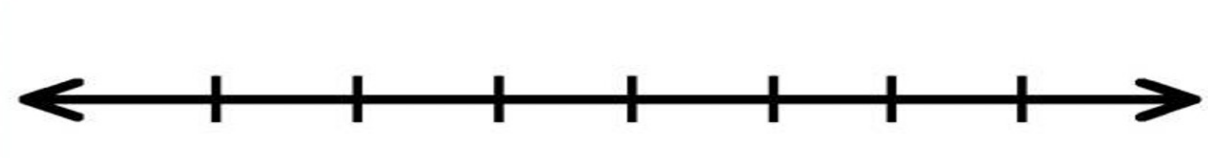
- How did you use your topographic map to help you build your model?
- How did your model help you understand/visualize a topographic map?

If the teacher cannot get to all of the students during the lesson, then these questions can be given as a questionnaire at the end of the lesson as an exit ticket.

In order to show that students learned about graphing and visual representation of data, they will create 2 graphs: a bar graph and a line plot. After they measure their models, we will record the heights on a whiteboard. Students will use the following templates to graph the class data set:

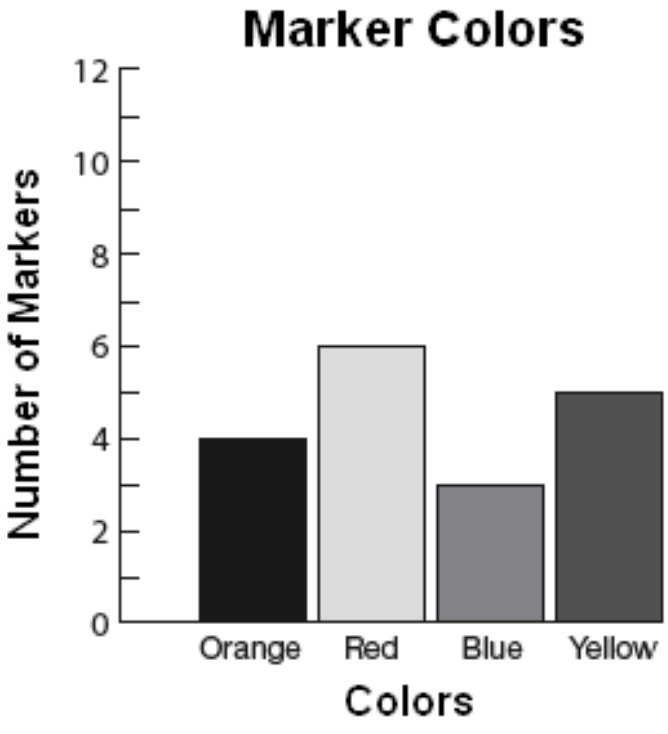


Line Plot



Title_____

There will also be a formative post assessment where students will show their learning growth with measurement and data. Below are some sample questions from the assessment. These questions measure student's abilities to analyze visual data, as well as their understanding of measurement concepts.



Use the abov

1. How many blue markers are there?_____

2. How many more red markers are there than orange markers?_____

3. How many markers are there in total? _____

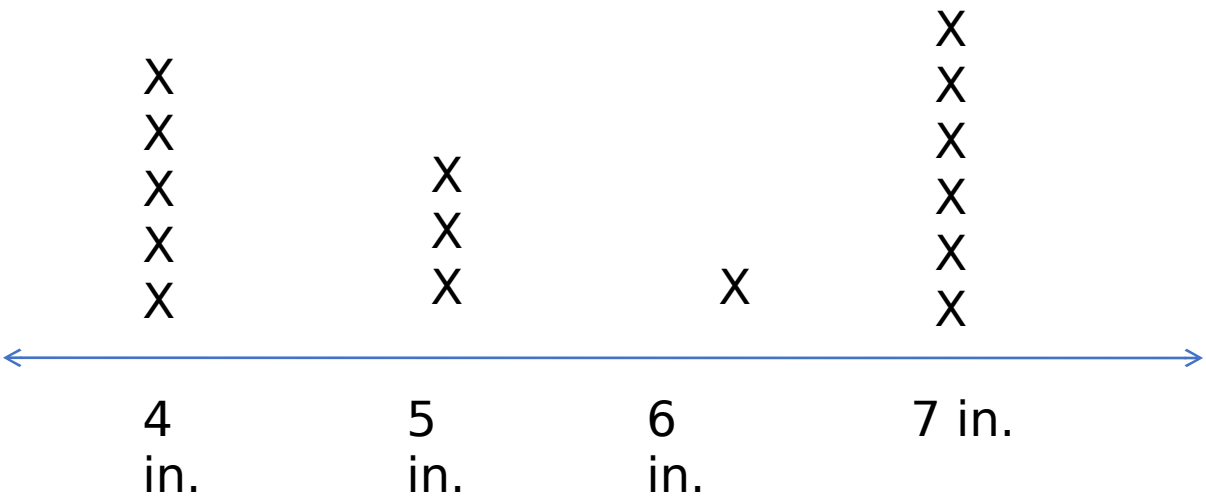
4. Mrs. Geisz took a survey about her students' favorite fruit. Below is a data chart showing the results. Use the data chart to make a bar graph. Don't forget to give your graph a title and labels.

Fruits	Number of Votes
Apples	||||
Bananas	𝍸
Grapes	𝍸 |
Strawberries	𝍸 |||

_____

Use the line plot to answer the following questions below (each X is one flower).

Measuring Flowers



5. How many flowers are 7 inches? _____

6. How many more flowers were 4 inches than 5 inches? _____

7. How many flowers were measured in all? _____

8. Measure the length of each object in Centimeters **and** Inches.

Object	**Centimeters**	**Inches**
An unsharpened pencil		
The length of this paper		

This activity enhances student's understandings of measurement, data representation, and data analysis. The survey asks questions directly related to the student objectives. The post assessment measures how well students took the learning that took place in the topographic/modeling lesson and carried that knowledge throughout their math unit.