Math Modeling

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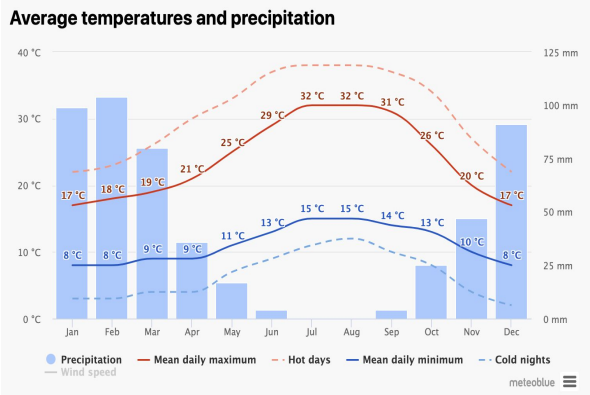
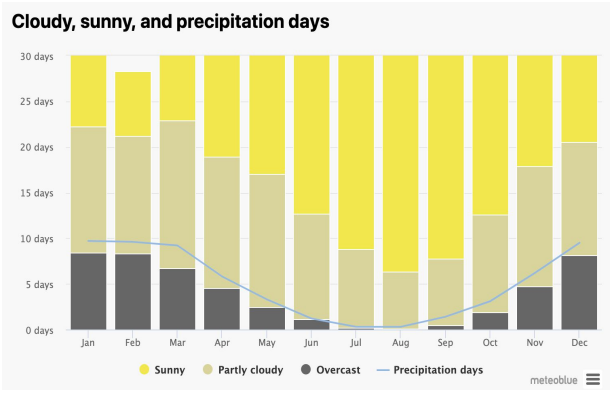
Modeling Activity

In this modeling activity, students will learn about weather and climate. They will learn climate is the pattern of weather over a long period of time, in a given region by interpreting and analyzing data from the real-world context. First, each student will be provided with a Science Notebook for the unit. The Science Notebook will allow students to record their learning and access and record various levels of Depth of Knowledge as guided by the teacher.

The students and teacher will complete a KWL (Know, Want to Know, and Learned) chart about weather and climate. This will serve as a formative assessment for the teacher to guide instruction throughout the unit and allow students a reference point throughout the unit. Next, students will read through the NASA Climate Kids website and read through the section of *What is A Climate Model?* After reading, students and teacher will discuss the article and record information in their Weather Notebook. The class may discuss such topics as: How do we observe weather? How do we observe climate?, and What's the difference between weather and climate?.

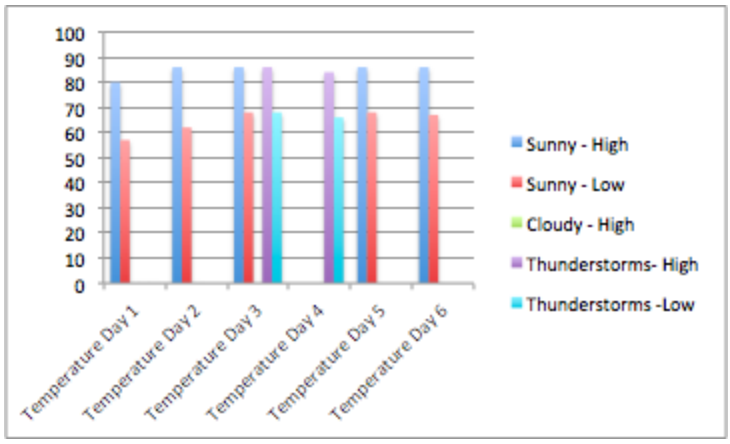
Students will then go outside to observe the weather over multiple days and record their observations in their Science Notebook. Each day, they record the weather with the information of average temperature, precipitation, and wind direction. Students will also use the Just for Kids website to help them study the weather patterns. They will search their local climate model from the Meteoblue website to learn about how scientists record patterns of the weather across different times and areas. For example, this is the climate model in Santa Clara, California.





Students who live in Santa Clara will focus on patterns of weather found in a certain season in their area, learning about the typical weather during that time, and compare their research results to their recording data to see if their data represent the typical weather. By recording in their Notebooks and studying the local model, they will use their collected information to analyze and interpret data about the weather and climate where they live.

Next, the students will create bar graphs and pictographs to represent their data and show their understanding of the data sets. (Example of a bar graph and pictograph shown below.)



Temperature	Weather
Day 1 (Saturday)	

Day 2 (Sunday)	
Day 3 (Monday)	
Day 4 (Tuesday)	
Day 5 (Wednesday)	
Day 6 (Thursday)	

Looking closely at their graphs, students will then write one- and two-step word problems using the data collected in the graph. Working in partners, students will share their graphs and questions with a peer to solve. Each student will solve their partner's math problems, citing the graph as evidence.

For students who need extension, or clarification, they can visit the Space Place website to get more information about what weather is, or to extend their learning to weather on other planets and create graphs from that information.

Engaging Contexts

This activity is engaging to third grade students because by using the weather websites, students are able to see the weather happening in their community live, helping them connect how weather is tracked and data collected. They will be able to see the weather outside the classroom and connect back to what they are seeing in the data being collected in this way, and begin to understand how that data is used. Through looking at the data and creating their own graphs, students are having to think critically about what information is important and which

type of graph would be best for displaying their data. Having students then solve one another's problems gives them the chance to apply their experience with their own graphs to a new context, sharpening those skills and deepening the connection to the math learning.

Standards Addressed

NGSS Standard

- 3-ESS2-1 Earth's Systems – Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

NGSS Disciplinary Core Ideas

- ESS2.D Weather and Climate – Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.

NGSS Cross Cutting Concepts

- Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
- Science Is a Human Endeavor

NGSS Science and Engineering Practices

- Analyzing and Interpreting Data
- Obtaining, Evaluating, and Communicating Information

Common Core Math Standards

- CCSS.MATH.CONTENT.3.MD.B.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 Mathematical Practice

- CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively.
- CCSS.MATH.PRACTICE.MP4 Model with mathematics.
- CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically.

Measurable Objectives

1. Students will be able to identify weather patterns in the local community.
2. Students will be able to explain how patterns of weather can be interpreted as climate.

3. Students will be able to classify and organize the weather patterns into data sets for graphing.
4. Students will be able to collect and display the collected data to create bar graphs using a variety of data sources, such as average temperature, precipitation, and wind direction.
5. Students will be able to design and develop one and two-step word problems using data from graphs.
6. Students will be able to formulate answers to a word problem using evidence from a graph.

Evidence

During the unit, the Science Notebook will serve as a continuing piece of growing evidence for the students' learning. The teacher may choose to collect Science Notebooks at various points throughout the unit to record students understandings. Additionally, the teacher will take anecdotal notes and record observations about student discussions, observations, and participation. The Science Notebooks and teacher notes will serve as formative assessments and allow the teacher to reteach, modify, and/or extend lessons as needed. At the end of the unit, students will be asked to complete an exit ticket in which they explain their observations of the weather and how weather can be described as climate to address objective 1. Students will be able to identify weather patterns in the local community and students will be able to explain how patterns of weather can be interpreted as climate to meet objective 2.

To address objective 3, students will be able to classify and organize the weather patterns into data sets for graphing and display the collected data to create bar graphs using a variety of data sources, such as average temperature, precipitation, and wind direction for objective 4. For objective 5, students will be able to design and develop one and two-step word problems using data from graphs. Student work samples will be collected and scored based on a 15 point scale with 5 points awarded for each objective.

To address objective 6, Students will be able to formulate answers to a peer's word problems by citing evidence from the graphs, students will be scored using the following rubric for solving the problem.

4	· Uses multiple strategies to accurately calculate the answer · Correct answer is given, with a label for units · Explains all steps using correct math vocabulary, for multiple strategies · Justifies why the answer is reasonable
3* (Mastery)	· Uses an efficient strategy to accurately calculate the answer · Correct answer is given · Explanation of all steps used to solve, with correct math vocabulary · Justifies why the answer is reasonable
2	· Uses a strategy but is inefficient or incorrect · Incorrect but reasonable answer · Partial explanation is given · Unable to justify the answer or justification is not reasonable
1	· Does not use an appropriate strategy · Incorrect and unreasonable answer · Unable to explain thinking or how the problem was solved · No attempt made to justify the answer

Collaboration

Our group utilized Google Hangouts to connect and begin sharing ideas for the project, and which standards to cover. We all shared ideas about concepts we could use and resources that we knew of tied to NASA that would integrate well with the math concepts. Next, we used Google Docs so everyone would be able to work at their own pace and in their time available. Within the document, we pasted the rubric temporarily to help not only format the activity, but to

record who had responsibility for the different parts and what we had worked on. We also utilized the 'comment' feature in the document to make suggestions and share ideas.

References

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