Lesson 2.2
Learning More About Models
Lesson Overview

Students make sense of their Warming Model investigation data and learn more about how and why scientists use models. Students share their recorded observations from the Warming Model and the teacher combines these observations in the Warming Graph, then students interpret the graph to conclude that surfaces get warmer when light is shining on them. Students are introduced to the unit reference book, *Handbook of Models*, and the teacher reads aloud different sections about how scientists use models to investigate things that are too big to study directly. Students learn how to use thermometers to take the temperature of their playground surface and begin to record this data on the Class Playground Temperature chart. The purpose of this lesson is for students to interpret the findings from their first investigation and to learn more about how and why scientists use models.

**Anchor Phenomenon:** Students at Carver Elementary School are too cold during morning recess, while students at Woodland Elementary School are too hot during afternoon recess.

**Investigative Phenomenon:** A surface gets warmer when light is shining on it.

**Students learn:**

- Scientists use models to investigate things that are too big to study directly.
- Scientists use models to make predictions about the real world.
- Scientists use different ways to study the world.
- Scientists use drawings, sketches, and models as a way to communicate ideas.
- Men and women of diverse backgrounds are scientists and engineers.
- Scientists study the natural and material world.
Reading About Models of Big Things

The teacher reads aloud the reference book introduction, as well as a section about using models to study things that are too big to observe all at once.

Instructional Guide

1. Display the front cover of the Handbook of Models big book.

   Sometimes scientists read books to gather new information. Today, we will read a book to help us learn more about how other scientists use models.

   This book is a reference book. The purpose of a reference book is to provide a lot of information about a topic. Instead of reading the book from beginning to end, you can read certain parts of the book to find out about something you want to learn.

   Read the reference book title aloud.

   Handbook of Models. What kind of information do you think we can gather from this book?
   [We can learn about different kinds of models. We can learn about how scientists use models.]


   This is the contents page. The contents page tells readers the important sections of the book. It also tells them what pages contain the information they are looking for so that they can find it.

3. Point out the first heading on the contents page.

   Some things are hard to investigate.

   Scientists use models to learn more about things that are hard to investigate. The contents show that I can find out more about why some things are hard to investigate in the section on page 4. I am going to turn there.
We just learned that there are different reasons why scientists use models.

Why do you think we made a model to study how a surface gets warm in the light?

Accept all responses.

The book let us know that sometimes scientists make models when things are too big to observe all at once. We made a model of the sun because it is too big for us to study all at once in the classroom.

What is a model?

The book let us know that scientists make models that are like the real thing in some ways, but different from the real thing in other ways.

How is our model similar to the sun?
[The lamp and the sun both shine light.]

How is our model different from the sun?
[The sun is much bigger than the lamp.]

Who uses models?

We just learned that many different kinds of scientists use models to investigate. Just like these scientists, we are using models to investigate in our work as weather scientists.

Models help scientists investigate big things. Just like we are using a model to investigate the sun because it is so big, other scientists also use models to investigate big things.

Read aloud page 10.
Invite students to share their observations of the photos on page 11. Help students see that each pair of pictures depicts a model and the thing that the model represents.

The crater model and the bridge model are two models that help scientists investigate big things.

8. Turn to page 12 and read aloud pages 12 and 13 about the Crater Model. Pause at the end of page 13 to discuss the Crater Model.

Why did the scientists need a model?
[A moon crater is too big to investigate.]

How is the model like a real moon crater?
[The model is made of the same thing as a real moon crater. The marbles are like real space rocks that crash into the moon.]

How is the model different from a real moon crater?
[The model and the marbles are smaller than a real moon crater and space rocks.]

9. Introduce the vocabulary word **model** with the vocabulary routine. Hold up the vocabulary card for **model**.

This is the word **model**. A model is something scientists make to answer questions about the real world.

We are going to practice saying the word. Say the word after me: **model**.

Now say the word together: **model**.

Now whisper the word **model** to your partner.

A model is something scientists make to answer questions about the real world.

Post the vocabulary card for **model** to the Vocabulary section of the classroom wall.

10. Add to the What Scientists Do chart. Very briefly review the cards on the chart, then post the cards for **read** and its image.

We are doing another thing that scientists do to answer their questions— scientists sometimes read books to find answers.

We read part of *Handbook of Models* to gather information about models and why scientists use models.
Teacher Support

Background

About the Book: *Handbook of Models*

*Handbook of Models* is the reference book for this unit, giving students a place to see examples of many different kinds of scientific models and how people use them to understand the world. Models can help us investigate things that are too big or too small to study otherwise and can help us investigate things that happen too quickly or too slowly to observe directly. Models also help us study one part of a complex system at a time and allow us to test our predictions. As students build and manipulate their own scientific models, they can use this reference book to make connections between what they are doing and the larger idea that models help facilitate learning in a variety of ways. *Handbook of Models* is used as a Shared Reading throughout the unit and helps build a foundation for understanding scientific models that will support students throughout the unit and throughout their entire science education.

Background

Literacy Note: About Reference Books

Reference books provide in-depth information about specific topics and are typically read for particular purposes. For this reason, students do not read every section in reference books, nor do they read reference books from beginning to end. Rather, they search for the information they need and then read the relevant sections carefully. In this lesson, students will be introduced to the table of contents, introduction, and glossary, and will be given the opportunity to explore the book. This will prepare students to use the reference book in later lessons in this unit, as a scientist might, and it encourages students to read complex text both purposefully and carefully.

Instructional Suggestion

What One Teacher Did: Time for Exploration of the Reference Book

Students may want to spend more time exploring models in *Handbook of Models* to familiarize themselves with the structure of the reference book and to explore the different kinds of models that scientists use. Providing extra time can be valuable for students who are learning about informational text, as they may notice text features, photographs, words they know, and other elements. Exploration time can spark interest in reading and finding information in the reference book. This type of open-ended exploration also provides students with the opportunity to share their thinking and learn from their peers as they look through the book with a partner and talk about what they notice.

Rationale

Pedagogical Goals: Understanding the Nature of Science

One goal set forth by the Next Generation Science Standards (NGSS) is for students to understand the nature of science as a discipline and how scientific knowledge develops over time. The NGSS calls out eight understandings about the nature of science that are woven throughout the Amplify Science curriculum. This unit gives students an opportunity to experience the understandings that Scientific Investigations Use a Variety of Methods; Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena; Science Is a Human Endeavor; and Science Addresses Questions About the Natural and Material World. In particular, this activity, in which the class learns more about how and why scientists use models, illustrates the ideas that scientists use different ways to study the world, and scientists study the natural and material world. In addition, students learn from *Handbook of Models* that men and women of diverse backgrounds are scientists and engineers and that scientists use drawings, sketches, and models as a way to communicate ideas.
Reading About Models of Big Things

The teacher reads aloud the reference book introduction, as well as a section about using models to study things that are too big to observe all at once.

Instructional Guide

1. Display the front cover of the *Handbook of Models* big book.

   A veces los científicos leen libros para reunir nueva información. Hoy leeremos un libro para ayudarnos a aprender más acerca de cómo usan modelos otros científicos.

   Este libro es un libro de referencia. El propósito de un libro de referencia es proporcionar mucha información sobre un tema. En vez de leer el libro desde el principio hasta el final, pueden leer ciertas partes del libro para averiguar sobre algo que quieren aprender.

   Read the reference book title aloud.

   *Manual de modelos.* ¿Qué tipo de información piensan que podemos reunir de este libro? [Podemos aprender acerca de diferentes tipos de modelos. Podemos aprender acerca de cómo usan modelos los científicos].

2. Display the contents page of the *Handbook of Models* big book.

   Esta es la página del Contenido. La página del contenido les dice a los lectores las secciones importantes del libro. También les dice qué páginas contienen la información que están buscando, para que puedan encontrarla.

3. Point out the first heading on the contents page.

   *Algunas cosas son difíciles de investigar.*
Los científicos usan modelos para aprender acerca de cosas que son difíciles de investigar. La página de Contenido muestra que puedo averiguar más sobre por qué algunas cosas son difíciles de investigar en la sección en la página 4. Voy a pasar a esa página.

4. Turn to page 4 and read aloud pages 4 and 5 to students.

Acabamos de aprender que hay diferentes razones por las que los científicos usan modelos.

¿Por qué piensan que hicimos un modelo para estudiar cómo se calienta una superficie en la luz?

Accept all responses.

El libro nos informa que a veces los científicos crean modelos cuando las cosas son demasiado grandes para observarlas de una vez. Hicimos un modelo del sol porque es demasiado grande para que lo estudiemos de una vez en el salón de clases.

5. Turn to page 6 to read aloud the heading and page to students.

¿Qué es un modelo?

Read aloud pages 6 and 7.

El libro nos informa que los científicos crean modelos que son iguales a la cosa real de algunas maneras, pero diferente a la cosa real de algunas otras maneras.

¿De qué manera nuestro modelo es similar al sol? [Tanto la lámpara como el sol alumbran].

¿De qué manera nuestro modelo es diferente al sol? [El sol es mucho más grande que la lámpara].

6. Turn to page 8 to read aloud the heading and page to students.

¿Quién usa modelos?

Read aloud pages 8 and 9.

Hemos aprendido que muchos tipos diferentes de científicos usan modelos para investigar. Tal como estos científicos, estamos usando modelos para investigar en nuestro trabajo como científicos del clima.

7. Turn to page 10 to read aloud the heading and page to students.
Los modelos ayudan a los científicos a investigar cosas grandes. Tal como nosotros estamos usando un modelo para investigar el sol porque es tan grande, otros científicos también usan modelos para investigar cosas grandes.

Read aloud page 10.

Invite students to share their observations of the photos on page 11. Help students see that each pair of pictures depicts a model and the thing that the model represents.

El modelo del cráter y el modelo del puente son dos modelos que ayudan a los científicos a estudiar cosas grandes.

¿Por qué necesitan un modelo los científicos?
[Un cráter lunar es demasiado grande para investigarlo].

¿De qué manera es igual el modelo a un cráter lunar real?
[El modelo está hecho de la misma cosa que un cráter lunar real. Las canicas son como rocas del espacio reales que chocan contra la Luna].

¿De qué manera es diferente el modelo a un cráter lunar real?
[El modelo y las canicas son más pequeños que un cráter lunar real y rocas espaciales].

9. Introduce the vocabulary word *modelo* with the vocabulary routine. Hold up the vocabulary card for *modelo*.

Esta es la palabra *modelo*. Un modelo es algo que crean los científicos para responder preguntas sobre el mundo real.

Vamos a practicar decir la palabra. Digan la palabra después de mí: *modelo*.

Ahora digan la palabra juntos: *modelo*.

Ahora susurren la palabra *modelo* a su compañero o compañera.

Un modelo es algo que crean los científicos para responder preguntas sobre el mundo real.

Post the vocabulary card for *modelo* to the Vocabulary section of the classroom wall.

10. Add to the What Scientists Do chart. Very briefly review the cards on the chart, then post the cards for *read* and its image.
Estamos haciendo otra cosa que hacen los científicos para responder sus preguntas: los científicos a veces leen libros para encontrar respuestas.

Leímos parte del Manual de modelos para reunir información sobre los modelos y por qué los científicos usan modelos.

Teacher Support

Background

About the Book: Handbook of Models

Handbook of Models is the reference book for this unit, giving students a place to see examples of many different kinds of scientific models and how people use them to understand the world. Models can help us investigate things that are too big or too small to study otherwise and can help us investigate things that happen too quickly or too slowly to observe directly. Models also help us study one part of a complex system at a time and allow us to test our predictions. As students build and manipulate their own scientific models, they can use this reference book to make connections between what they are doing and the larger idea that models help facilitate learning in a variety of ways. Handbook of Models is used as a Shared Reading throughout the unit and helps build a foundation for understanding scientific models that will support students throughout the unit and throughout their entire science education.

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