Lesson 4.2
Nighttime Investigation
Lesson Overview

In this lesson, students consider how organizing data can reveal patterns. The class first adds a paper sun representation to the Sky Mural from the teacher’s second evening observation, which helps students consolidate their understanding that the pattern the sun makes in the sky repeats each day. Students then read Nighttime Investigation to learn how a scientist conducted an investigation, organized data, and discovered a pattern. Students reflect on the scientist’s investigation and then consider ways to reorganize their Sky Mural data. Finally, students create a data table in their Investigation Notebooks and post a key concept consolidating their understanding of the sun’s daily pattern.

The purpose of this lesson is for students to gain practice with organizing data as they solidify their understanding of the sun’s daily pattern.

Predicted Phenomenon: The pattern of the sun in the sky when Sai and his grandma talk on the phone tomorrow.

Investigative Phenomenon: The sun in the evening sky a second day.

Students learn:

- We will observe the sun make the same pattern in the sky every day.
- Scientists sometimes organize their data in a data table to reveal patterns.
- Organizing data in different ways highlights different patterns in data.
- Scientists use different ways to study the world.
- Scientists look for patterns and order when making observations about the world.
- Scientists assume natural events happen today as they happened in the past.
- Many events are repeated.
Reading Nighttime Investigation

In a Shared Reading of *Nighttime Investigation*, students learn about how a scientist investigated and organized data to reveal a pattern.

### Instructional Guide

1. **Introduce Nighttime Investigation.**

   - Before we organize our own data, we will read to see how another scientist organized data from an investigation. This might help us get some ideas for how we could organize our data in a different way.

   - This book is about a scientist who investigated a nocturnal animal. A nocturnal animal is an animal that sleeps during the daytime is awake and active during the nighttime.

2. **Display the front cover of the Nighttime Investigation big book.** Read the title and invite students to share what they notice on the cover.

3. **Revisit making predictions.**

   - In our work as sky scientists, we have been making predictions as we observe the sun’s position in the sky at different times. We have been using what we already know to decide what we think might happen.

   - Remember that readers also make predictions to learn from the books they read. Today, we will make predictions as we read *Nighttime Investigation*.

4. **Begin reading and pause at the end of page 5.**

   - On these pages, we read that as a child, Laura liked to learn about where animals live. I predict that she will investigate where different kinds of animals live.

   - What kinds of things do you predict that Laura will investigate?
Ask students to talk with their partners about their predictions. Invite volunteers to share their ideas with the class. Encourage them to share the rationales for their predictions.

5. **Continue reading and pause at the end of page 8.** Return to your prediction.

- Remember that as we read, we can check to see if the predictions we made before reading match what we read in the book.
- Before I read these pages, I predicted that Laura would investigate where different animals live. My prediction does not match what I read in the book. From reading, we learn that instead of investigating where different animals live, Laura investigates just one animal—the kangaroo rat. She investigates how many kangaroo rats live in one part of the desert.

6. **Have students make a new prediction.**

- The book tells us that Laura and her team of scientists went into the desert during the nighttime to figure out how many kangaroo rats there were in one part of the desert. What do you predict Laura and her team did in the desert during the nighttime?

Ask students to turn and talk with their partners. Invite volunteers to share their ideas with the class. Encourage them to share the rationales for their predictions.

7. **Continue reading and pause at the end of page 11.** Remind students of the predictions they made before reading these pages.

- The book tells us that Laura and her team observed the kangaroo rats in the desert during the nighttime. The scientists put a tag on each rat that went into the trap so they could keep track of them. Laura also observed the Moon each night.
- Does your prediction about what Laura and her team did in the desert during the nighttime match what we read in the book?

Ask students to turn and talk with a partner about whether their predictions match what they learned by reading the book. Invite volunteers to share with the class.

8. **On-the-Fly Assessment: Have students make a new prediction.**

- The book tells us that Laura gathered data by observing the kangaroo rats and the Moon during the nighttime.
- In our work as sky scientists, we have been gathering data and organizing it in different ways.
- How do you predict that Laura organized the data she gathered about the kangaroo rats and the Moon?
Ask students to turn and talk with a partner. Invite volunteers to share their ideas with the class. Encourage students to share the rationale for their predictions.

9. **Continue reading and pause at the end of page 14.** Remind students of the predictions they made before reading these pages.

   - The book tells us that Laura organized her data by recording it in a notebook. She also organized her data by creating a data table.

10. **On-the-Fly Assessment: Have students check their predictions.**

    - Does your prediction about how Laura organized her data match what we read in the book?

    Ask students to turn and talk with their partners about whether their predictions match what they learned by reading the book. Invite volunteers to share with the class.

11. **Continue reading to the end of the book.** Invite students to discuss the pattern that Laura found in her investigation.

    - What did the Moon look like when Laura observed the most rats?
      [The Moon was full on the night that Laura observed the most rats.]

    - What did the Moon look like when Laura observed the least rats?
      [The Moon was thin/just a sliver when Laura observed the smallest number of rats.]

    - By investigating, Laura found a pattern. On the nights when the Moon is full and bright in the sky, more kangaroo rats come out of their holes. The light from the Moon might help kangaroo rats see better. On the nights when the Moon is less full and less bright in the sky, fewer kangaroo rats come out of their holes. It might be harder for kangaroo rats to see on those nights. That is a pattern.
Embedded Formative Assessment

On-the-Fly Assessment 12: Making and Checking Predictions

Look for: As students are sharing what they predict about how Laura organized the data she gathered, listen for and make note of individual students or partners who are attending to clues in the pictures or using prior work in this unit to help make their predictions. For example, a student might say something such as When we observed the sky, we drew the sky and where the sun is in our notebook. She might draw what the Moon looks like in the sky each night in a notebook. Or, When we observed the sky from different places on Earth, we organized our data by making a table, so I predict that Laura will use a table to organize her data too.

Now what? If students are not using prior knowledge or attending to clues in the pictures to make and support their predictions, you may wish to restructure the way pairs are sharing predictions. First, invite pairs to share what they predict. Then, ask pairs what they see or read in the book, or what prior experience they have with organizing data in this unit, that leads them to predict that. Breaking the task of making predictions into two parts may help support students who still need practice making predictions. If students are having difficulty checking their predictions after reading the text, you may wish to record students’ initial predictions on the board or chart paper. Then you can support students to refer back to these initial predictions as they check to see if their ideas match what they learned from the book.

Teacher Support

Background

About the Book: Nighttime Investigation

Nighttime Investigation introduces Laura Prugh, a scientist who studies animals, through a Shared Reading. Laura investigates nocturnal animals, including kangaroo rats. During one investigation, she discovered something interesting by chance: contrary to her expectations, more kangaroo rats seemed to come out during brighter Moon phases. By gathering data and organizing it, Laura confirmed the pattern she had observed. Nighttime Investigation provides a fascinating model of a real-life scientist who organized data to find a pattern, just as students will be doing in the unit. The book clearly lays out the steps of the scientific investigation process—with a particular emphasis on collecting, recording, and organizing data—in an exciting and comprehensible context.

Instructional Suggestion

Going Further: Researching Local Scientists or Engineers

Nighttime Investigation provides students with an introduction to a scientist and her work. To provide students with more exposure, consider engaging them in learning about the scientists or engineers in your state who are working to improve existing technologies, develop new technologies, or improve society through applications of science. You can identify scientists and engineers through state and local institutions of higher education or through state organizations focused on the care of state wildlife or land such as state parks. If possible, choose scientists or engineers whose work connects to this unit and gather information about their work. Then, introduce those scientists or engineers to students and lead a discussion about their work. Alternatively, you can work with students to write a list of questions they have about being a scientist or engineer and invite local scientists and engineers to visit the class either in person or remotely to share their work and be interviewed by your students.
**Instructional Suggestion**

**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 call out eight understandings about the nature of science, which are woven throughout the Amplify Science curriculum. This unit gives students an opportunity to experience three understandings about the nature of science: Scientific Investigations Use a Variety of Methods, Scientific Knowledge Is Based on Empirical Evidence, and Scientific Knowledge Assumes an Order and Consistency in Natural Systems. Specifically, the book *Nighttime Investigation* features a scientist who investigates animals. Students read about how scientists make observations and record data from multiple sources. They observe how the scientist featured in the text organizes her data in different ways to search for patterns that repeat over time. Collectively, this text illustrates the ideas that scientists use different ways to study the world, scientists look for patterns and order when they make observations about the world, scientists assume natural events happen today as they happened in the past, and many events are repeated. Students get more experience with the ideas that scientists look for patterns and order when they make observations about the world, that scientists assume natural events happen today as they happened in the past, and that many events are repeated as they reorganize and discuss their Sky Mural data later in Activity 4.
Reading Nighttime Investigation

In a Shared Reading of *Nighttime Investigation*, students learn about how a scientist investigated and organized data to reveal a pattern.

Instructional Guide

1. Introduce *Nighttime Investigation*.

   Antes de que organicemos nuestros propios datos, leeremos para ver cómo otra científica organizó datos de una investigación. Esto podría ayudarnos a obtener algunas ideas de cómo podríamos organizar nuestros datos de una manera diferente.

   Este libro trata sobre una científica que estudió un animal nocturno. Un animal nocturno es un animal que duerme durante las horas diurnas, y que está despierto y activo durante las horas nocturnas.

2. Display the front cover of the *Nighttime Investigation* big book. Read the title and invite students to share what they notice on the cover.

3. Revisit making predictions.

   En nuestro trabajo como científicos del cielo, hemos estado haciendo predicciones mientras observamos la posición del sol en el cielo a diferentes horas. Hemos estado usando lo que ya sabemos para decidir lo que pensamos que podría pasar.

   Recuerden que los lectores también hacen predicciones para aprender de los libros que leen. Hoy haremos predicciones mientras leemos *Investigación de las horas nocturnas*.

4. Begin reading and pause at the end of page 5.

   En estas páginas, leímos que de niña, a Laura le gustaba aprender acerca de dónde viven los animales. Yo predigo que ella investigará dónde viven diferentes tipos de animales.
¿Qué tipos de cosas predicen que Laura investigará?

Ask students to talk with their partners about their predictions. Invite volunteers to share their ideas with the class. Encourage them to share the rationales for their predictions.

5. **Continue reading and pause at the end of page 8.** Return to your prediction.

Recuerden que mientras leemos, podemos revisar para ver si las predicciones que hicimos antes de leer coinciden con lo que leímos en el libro.

Antes de que leyera estas páginas, yo predije que Laura investigaría dónde viven diferentes animales. Mi predicción no coincide con lo que leí en el libro. Al leer, aprendemos que en lugar de investigar dónde viven diferentes animales, Laura investiga solo un animal: la rata canguro. Ella investiga cuántas ratas canguro viven en una parte del desierto.

6. **Have students make a new prediction.**

El libro nos dice que Laura y su equipo de científicos fueron al desierto durante las horas nocturnas para averiguar cuántas ratas canguro habia en una parte del desierto. ¿Qué predicen que Laura y su equipo hicieron en el desierto durante las horas nocturnas?

Ask students to turn and talk with their partners. Invite volunteers to share their ideas with the class. Encourage them to share the rationales for their predictions.

7. **Continue reading and pause at the end of page 11.** Remind students of the predictions they made before reading these pages.

El libro nos dice que Laura y su equipo de científicos observaron a las ratas canguro en el desierto durante las horas nocturnas. Los científicos le pusieron una etiqueta a cada rata que se metió en la trampa, para que pudieran llevar un registro de ellas. Laura también observó la Luna cada noche.

¿Su predicción sobre lo que Laura y su equipo hicieron en el desierto durante las horas nocturnas coincide con lo que leímos en el libro?

Ask students to turn and talk with a partner about whether their predictions match what they learned by reading the book. Invite volunteers to share with the class.

8. **On-the-Fly Assessment: Have students make a new prediction.**

El libro nos dice que Laura reunió datos observando a las ratas canguro y a la luna durante las horas nocturnas.

En nuestro trabajo como científicos del cielo, hemos estado reuniendo datos y organizándolos de diferentes maneras.
Ask students to turn and talk with a partner. Invite volunteers to share their ideas with the class. Encourage students to share the rationale for their predictions.

9. **Continue reading and pause at the end of page 14.** Remind students of the predictions they made before reading these pages.

El libro nos dice que Laura organizó sus datos apuntándolos en un cuaderno. También organizó sus datos creando una tabla de datos.

10. **On-the-Fly Assessment: Have students check their predictions.**

¿Su predicción sobre cómo organizó sus datos Laura coincide con lo que leímos en el libro?

Ask students to turn and talk with their partners about whether their predictions match what they learned by reading the book. Invite volunteers to share with the class.

11. **Continue reading to the end of the book.** Invite students to discuss the pattern that Laura found in her investigation.

¿Cómo estaba la Luna cuando Laura observó la mayor cantidad de ratas?
[La luna estaba llena la noche que Laura observó la mayor cantidad de ratas].

¿Cómo estaba la Luna cuando Laura observó la menor cantidad de ratas?
[La Luna estaba delgada/era solo un rayo de luz cuando Laura observó el número más pequeño de ratas].

Al investigar, Laura encontró un patrón. En las noches en que la Luna estaba llena y brillante en el cielo, salían más ratas canguro de sus agujeros. La luz de la Luna podría ayudar a las ratas canguro a ver mejor. En las noches en que la Luna estaba menos llena y menos brillante en el cielo, salían menos ratas canguro de sus agujeros. Para las ratas podría ser más difícil ver en esas noches. Eso es un patrón.
Embedded Formative Assessment

On-the-Fly Assessment 12: Making and Checking Predictions

Look for: As students are sharing what they predict about how Laura organized the data she gathered, listen for and make note of individual students or partners who are attending to clues in the pictures or using prior work in this unit to help make their predictions. For example, a student might say something such as *When we observed the sky, we drew the sky and where the sun is in our notebook. She might draw what the Moon looks like in the sky each night in a notebook.* Or, *When we observed the sky from different places on Earth, we organized our data by making a table, so I predict that Laura will use a table to organize her data too.*

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