Lesson 2.1
Through the Eyes of a Geologist
Lesson Overview

In this lesson, students begin to explore ways that geologists use rocks and fossils to make inferences about what the environment of a place was like in the past. Students revisit the mystery in Desert Rocks Canyon and are introduced to the Chapter 2 Question: What was the environment of Desert Rocks National Park like in the past? Students then read Through the Eyes of a Geologist, which takes students on a journey back in time, highlighting how the environments in specific places have changed over millions of years. Students discuss and record what they read about the geologists’ observations at each place and the ideas and inferences geologists made about what the past environments might have been. At the end of the lesson, students are introduced to Fossil Hunter’s Handbook, the reference book they will use in the unit, and use it to identify the mystery fossil found in Desert Rocks Canyon—a Mosasaurus. They discuss what inferences they can make about the environment based on the ideas from the book and their observations of the full fossil skeleton. The purpose of this lesson is for students to learn how geologists use observations and ideas to make inferences about the past environments of a place and to see examples of real environments that have changed over time.

Anchor Phenomenon: A rocky outcrop in Desert Rocks National Park has a fossil in it.

Students learn:

- Geologists use observations of and ideas about rocks and fossils to make inferences about past environments.
- Inferences can be made based on what you observe combined with scientific ideas.
- Science theories are based on a body of evidence and many tests.
Partner Reading

Students read the book, which includes how to use rocks and fossils observed in an area to infer what the past environment was like.

Instructional Guide

1. Set the purpose for reading by using the Investigation Question. Hold up a copy of the book and read aloud the Investigation Question written on the board.

   How do geologists learn what a place was like in the past? To help us think like geologists about the past environment of Desert Rocks National Park, you’re going to read a book about how geologists learn what the environment of a place was like in the past.

2. Designate pairs and distribute books.

3. Read pages 4–5 together. Call on volunteers to take turns reading while the rest of the class follows along.

4. Discuss the structure of the text.

   • Explain how the book is organized.

   We just read about a place called Devils Postpile. On page 4 is a photograph of what this place really looks like. On page 5 is an illustration of what a geologist could infer about the past environment based on observations and ideas.

   For each place in this book, you will read about and see a photo of what the place is like today, including fossils that can be found there. Then, you will read about and see an illustration of what the place could have been like in the past.

   • Focus on the Geologists’ Observations.

   On page 5, you read about observations a geologist made of Devils Postpile. What observations did the geologist make?

   [There is smooth dark rock there called basalt. The rock is shaped like long straight posts.]
• Point out the scientific ideas about rock.

The scientific ideas from the book are that basalt is a kind of volcanic rock and the shapes of this rock form when lava cools and hardens.

• Ask what inference the geologist made about the past environment.

Based on these observations and scientific ideas, what can a geologist infer about the past environment of Devils Postpile? [A huge volcano erupted here. A lake of lava used to cover the ground.]

5. Point out the connection between observations, scientific ideas, and inferences.

Geologists make observations of the rocks and fossils in a place and use scientific ideas about them to make inferences about what the environment there may have been like in the past.

6. Remind students of the purpose for reading. Let students know you would like them to read pages 6–23 with their partners. Remind them to continue thinking about the question How do geologists learn what a place was like in the past? as they read.

7. Pairs read pages 6–23. Encourage students to examine the illustrations, photos, and captions in order to help them better understand the text. Circulate and provide support as pairs read.

Teacher Support

Background

About the Book: Through the Eyes of a Geologist

*Through the Eyes of Geologist* uses an innovative format to explore how geologists make inferences about the past based on rock and fossils. The book invites students to view present-day landscapes through the eyes of a geologist by making careful observations. Students learn what geologists can infer from observing rocks and fossils in a mountainous area of Canada that used to be an ocean, a desert area of Utah that used to be a swamp, and more. For each place, students can observe photographs of the present-day landscape and read about what it is like in the present, along with information about rocks and fossils that have been found there. Then, the book presents a detailed illustration of what the place may have looked like millions of years ago, with explanations of how geologists have made inferences about what the place was like in the past. *Through the Eyes of a Geologist* models the practice of making inferences based on observations and scientific principles, and provides context for the ideas that students are learning.

Instructional Suggestion

Literacy Note: Students Who Need More Support with Reading

While *Through the Eyes of a Geologist* was written to be accessible to fourth graders, you may wish to provide additional support for students. If this is the case, you can preview the book with students by highlighting vocabulary, familiarizing the class with the pattern of the book’s structure, or doing a “picture walk” through the book. You can also
vary the approach to reading the book based on the needs of your class, keeping in mind that even if you read the book aloud with struggling readers, it’s important that they themselves still have access to the book. Many teachers have been pleasantly surprised with how engagement with the books in this unit helped their students build familiarity with the necessary vocabulary and concepts, enabling more of their struggling readers to read independently.

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 call 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 understanding that Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena. In this lesson, Through the Eyes of a Geologist shows students how the environments of specific places have changed over millions of years, and illustrates the idea that scientific theories are based on an underlying body of evidence. By discussing geologists’ observations at each place, as well as the inferences geologists made about the past environments, students see how the evidence geologists gathered led to the ideas they have about the past environments.
Fossil Hunter’s Handbook

Students are introduced to the reference book and use it to identify the mystery fossil.

Instructional Guide

1. Remind students of the Chapter 2 Question.

One thing that geologists do is identify rocks and fossils. Let’s identify the fossil that was observed in the rocky outcrop in Desert Rocks National Park to help us get more information about our question *What was the environment of Desert Rocks National Park like in the past?*

2. Project What Was Observed. Remind students that this is the fossil that was found in Desert Rocks National Park.

3. Call on a few students to share thoughts about how geologists identify fossils.

How do you think a geologist might figure out what organism a fossil is from?
4. **Introduce the reference book.** Hold up a copy of *Fossil Hunter’s Handbook*.

One way geologists identify the fossils and rocks they find and learn scientific ideas about them is by using reference books. Reference books can help geologists with their observations. As you investigate what Desert Rocks Canyon was like in the past, you can use a reference book called *Fossil Hunter’s Handbook*. This is a book about many different kinds of fossils and rocks.

5. **Set purpose for reading.** Let students know that they will have a few minutes to identify the mystery fossil and read about it using the reference book.

A reference book is a book that you don’t read from cover to cover. Instead, you can use it to look up information to answer specific questions that you have. You will use the reference book to identify the mystery fossil and learn more about it.

6. **Distribute one book to each pair of students.** Ask them to briefly preview the text to see how it is organized. Then, provide students with a few minutes to search for and read information about the fossil.

7. **Lead a whole-class discussion about the mystery fossil.**

   - Ask students what they think the mystery fossil is. Make sure the class agrees that the fossil is from a *Mosasaurus*.
   - Project Full *Mosasaurus* Skeleton

   **Full Mosasaurus Skeleton**

   Here is an image showing a full *Mosasaurus* skeleton from a museum.

   - Students summarize what they read.

   What ideas did you read about *Mosasaurus* that might help you figure out the kind of environment it lived in?

   [It had paddles for swimming. It ate turtles.]
8. Wrap up the lesson.

What might you infer about the environment in which Mosasaurus lived using observations of the full skeleton and ideas from the book? [The environment had deep water.]


Teacher Support

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 locate specific information in the book. In later lessons, you will focus students on using the index to find information about rocks and fossils. Students will have many opportunities to work with the reference book throughout the rest of the unit. You may wish to provide additional instruction around the table of contents, glossary, and headings if students are not familiar with these features. This encourages students to read complex text both purposefully and carefully.

Instructional Suggestion

Student Thinking: Identifying the Mosasaurus Fossil
Based on their search in the reference book, it’s possible that students may incorrectly identify the fossil as a Brachiosaurus (page 12), an iguanodon (page 16), or a Machimosaurus (page 17). This is an opportunity to prompt students to make careful observations of the fossil image. Be mindful to do this in a way that supports students’ comfort in sharing their ideas. Try inviting other students to agree or disagree with their classmates’ statements, and provide evidence supporting why they think so. Help students do this respectfully by beginning their sentences with I disagree because . . . .

Background

About the Book: Fossil Hunter’s Handbook
Fossil Hunter’s Handbook is the reference book for this unit. The book provides detailed information about fossils, rocks, the process of sedimentary rock formation, and environments in which fossils are likely to form. The “Fossils” section includes information on fossils from many different plants and animals and explains what these fossils can tell us about the past. The “Rock” section has entries for eight different types of rock, including information about how and
where they form. The “Environments” section of the book describes these places and notes the sediments that commonly build up in them. Students use this reference book extensively in the unit to gather evidence, identify rocks and fossils, and learn about the process of sedimentary rock formation. *Fossil Hunter’s Handbook* supports students’ firsthand investigations by providing information that they can combine with their observations to make inferences about what environments may have been like in the past.
# Inferences in *Through the Eyes of a Geologist*

1. After reading *Through the Eyes of a Geologist*, complete the table below.
2. The place and the data from geologists’ observations for each place is done for you.
3. Record the idea that helped the geologists make the inference in the third column.
4. Record the inference that the geologists made about the past environment in the fourth column.

<table>
<thead>
<tr>
<th>Place</th>
<th>Geologists’ observations</th>
<th>Scientific ideas</th>
<th>Inferences about past environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burgess Shale Formation (pages 6–9)</td>
<td>Geologists observed fossilized algae.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>John Day Fossil Beds (pages 10–13)</td>
<td>Geologists find a lot of conglomerate rock here.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capitol Reef National Park: Chinle Formation (pages 14–17)</td>
<td>This area of Capitol Reef has a lot of siltstone.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Inferencias en Con ojos de geólogo**

1. Después de leer Con ojos de geólogo, completa la tabla debajo.
2. El lugar y los datos de las observaciones de los/as geólogos/as para cada lugar ya están hechos para ti.
3. En la tercera columna, apunta la idea que ayudó a los/as geólogos/as a hacer la inferencia.
4. En la cuarta columna, apunta la inferencia que hicieron los/as geólogos/as sobre el ambiente pasado.

<table>
<thead>
<tr>
<th>Lugar</th>
<th>Observaciones de los/as geólogos/as</th>
<th>Ideas científicas</th>
<th>Inferencias sobre ambiente pasado</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formación de pizarra Burgess (páginas 6–9)</td>
<td>Los/as geólogos/as observaron algas fosilizadas.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camas de fósiles John Day (páginas 10–13)</td>
<td>Los/as geólogos/as encuentran mucha roca de conglomerado aquí.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>