Lesson 3.3
Arguing to Solve a Mystery
Lesson Overview

In this lesson, students read and discuss how scientists use data and ideas about rock layers to make arguments about what caused the dinosaurs to go extinct. First, students read a book, *Arguing to Solve a Mystery*, which presents arguments from multiple scientists about dinosaur extinction. Next, students write about which argument is most convincing and why. They then discuss their responses in a Think-Pair-Share routine. The purpose of this lesson is for students to see examples of arguments in which scientists use data and ideas about rock layers to support their claims.

**Anchor Phenomenon:** A rocky outcrop in Desert Rocks National Park has fossils in it and layers of different sedimentary rock.

**Investigative Phenomenon:** Dinosaurs went extinct.

**Students learn:**

- Scientists make arguments based on evidence.
- As scientists continue to gather more evidence, they can revise their arguments.
- Geologists are still studying rock layers to get more evidence to support their claims about what happened to the dinosaurs.
- Making inferences can help readers understand informational text.
- Science explanations describe the way natural events happen.
- Science is both a body of knowledge and processes that add new knowledge.
- Men and women from all cultures and backgrounds choose careers as scientists and engineers.
## Partner Reading

Students read *Arguing to Solve a Mystery* in pairs and make inferences about what they read.

### Instructional Guide

1. **Set purpose for reading.** Let students know that as they read, they should pay attention to the data and ideas that the scientists in the book use to support their claims about what killed off the dinosaurs.

2. **Remind students about making inferences while reading.**

   You have been practicing making inferences. When you read an informational text such as this one, making inferences can help you think carefully about what you are reading. You can put what you read together with what you already know to make inferences.


   I read on page 5 that as scientists continue to observe and measure, they revise their arguments. I know that the purpose of an argument is to convince others that a claim is the best, using evidence. So, an inference I can make is that when scientists revise their arguments, they probably make them more convincing.

4. **Read pages 6–7 of the book and invite students to make inferences.** Have students read pages 6–7 aloud as the rest of the class follows along. Ask students to think about an inference they can make from the text, and have volunteers share a few examples with the class. Accept all responses.

5. **Introduce notebook page 55.** Have students turn to page 55, *Making Inferences While Reading* *Arguing to Solve a Mystery*, in their notebooks. Explain that this page has space for students to record the inferences they make while reading.

   As you read, pay attention to when you are making inferences by putting together what you read with what you already know. Record what page in the text you made the inference, and what your inference was. There is no one right way to make inferences; you will probably have different inferences from others. This is a chance for you to show your own thinking as you read.
6. On-the-Fly Assessment: Students read and make inferences. Have partners continue reading from page 8 through the end of the book, pausing to discuss and record inferences they make. Circulate while pairs read and notice how they are making inferences from the text.

7. Discuss inferences students made while reading. Have students share an inference they made as they read and, if possible, explain how it helped them understand the text.

8. Discuss the evidence the geologists found. Lead a discussion of the text by asking students to describe the evidence that each geologist found, and how they used this evidence to support their claims.

9. Highlight how patterns of rock formations can provide evidence for changes at local, regional, and global scales. Emphasize how the geologist in Arguing to Solve a Mystery found patterns of rock formations at local, regional, and global scales.
   - Ask students to share an example of a local pattern in a rock formation that provided evidence for the geologists’ claims. [The iridium layer in the rocky outcrop that Alvarez found (pages 8–9).]
   - Ask for an example of a regional pattern in rock formations that provided evidence for the geologists’ claims. [The volcanic layers in the Deccan Traps (pages 12–13).]
   - Ask for an example of a global pattern in rock formations that provided evidence for the geologists’ claims. [The pattern of iridium clay layers in many places around the world (page 10).]

Geologists study patterns of rock formations at different scales—local, regional, and global—to figure out changes that have happened over time.
Embedded Formative Assessment

On-the-Fly Assessment 10: Making Inferences While Reading Arguing to Solve a Mystery

Look for: This is students’ third opportunity to focus on inferences when reading. Look for students to clearly combine the text with an idea from their background knowledge to make an inference. This inference should be something that is not explicitly stated in the text. Students’ inferences may vary widely, and that is okay in this context. To engage in the practice of making inferences, it is most important that students can combine what they read with their own ideas to draw a conclusion.

Now what? If students need more support with making inferences, guide them to make inferences about specific parts of the text in Arguing to Solve a Mystery. For example, have students turn to page 6 and read the sentence “Most scientists agree that dinosaurs all over the world—and most other organisms—went extinct at about the same time.” Then ask them what inference they can make about why scientists agree. [They have found evidence that shows that dinosaurs went extinct at the same time.] Consider pointing out some of the following sentences from which students can make inferences:

- This map shows the places where the iridium layer has been found around the world. It shows the continents where they were 65 million years ago. (page 10) What can you infer about the continents?
- Not all scientists agreed with Alvarez’s claim. (page 12) What can you infer about why they didn’t agree?
- This also means that Earth could have gotten a lot warmer. That’s why some scientists argued that erupting volcanoes caused the dinosaurs and other organisms to die off. (page 13) What can you infer about the temperatures that dinosaurs can or cannot live in?
- Scientists know that there were volcanoes around the other big extinctions in Earth’s history, too. (page 19) What can you infer about how scientists know this?

Teacher Support

Background

About the Book: Arguing to Solve a Mystery

Arguing to Solve a Mystery explores the fascinating mystery of why the dinosaurs went extinct, and describes how scientists use argumentation to further our understanding of what might have happened. The book follows the work of geologist Walter Alvarez, exploring his claim that a massive asteroid was the catalyst for the dinosaur extinction event. The evidence that Alvarez used to support this claim is described in detail. Another claim, that volcanoes caused the extinction, is proposed by geologist Courtney Sprain, and her work finding evidence to support new and more complete arguments about what happened is explained. Through reading about the mystery of why the dinosaurs went extinct, students learn that argumentation is the way in which science moves forward. Arguing to Solve a Mystery models the scientific practice of argumentation, and helps students understand how evidence can be used in support of claims.
Rationale

Literacy Note: Making Inferences
Students have been practicing making inferences throughout this unit. In this lesson, students are reminded of the sense-making strategy of making inferences and of how it can be useful when reading. Since it has been several lessons since students made inferences when reading, you will model making an inference and invite students to share some of their own inferences with the class before applying this strategy when reading with a partner. (Feel free to modify this modeling to suit the needs of your class at this time.) Since students have had many opportunities to practice making inferences in a guided way, this lesson provides the opportunity for students to make inferences in an open-ended way as they read with their partners. Students’ inferences should be plausibly based on the text, but they should be allowed to try out thinking about the text and drawing their own conclusions as they can.

Background

Sciences Practices: Connecting Inferences to Argumentation
In this lesson, students read arguments that scientists have made about how the dinosaurs went extinct. The book provides examples of how these scientists used data and ideas to make inferences, which then lead to a claim. Students engage in this same practice when they write scientific arguments in Chapters 2 and 3. This practice is authentic to geology; because geologists primarily make sense of past events, they must rely on inferential thinking. This inferential thinking and writing is what some refer to as reasoning in an argument.

Instructional Suggestion

Literacy Note: Helping Students to Access a Challenging Text
While Arguing to Solve a Mystery was written to be accessible and interesting for fourth graders, it does present a number of new ideas and asks students to apply what they have learned. You may wish to provide additional support for students who find this book challenging. 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 calls 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 concepts about the nature of science: that Scientific Models, Laws, Mechanisms, and Theories Explain Natural Phenomena, that Science Is a Way of Knowing, and that Science Is a Human Endeavor. In Arguing to Solve a Mystery, students see pictures of men and women engaging in scientific debate, experimentation, and field work. They read about the process of gathering data to find evidence that supports a claim, and how that method of investigation leads to a growing body of knowledge about how the world works. Students also discuss the ideas and arguments presented in the book about what natural event may have caused the extinction of the dinosaurs.
Collectively, this text illustrates the ideas that science explanations describe the way natural events happen, science is both a body of knowledge and processes that add new knowledge, and men and women from all cultures and backgrounds choose careers as scientists and engineers.
Making Inferences While Reading
*Arguing to Solve a Mystery*

1. As you read *Arguing to Solve a Mystery*, put what you read together with what you know to make inferences.
2. Record the page number on which you made an inference and what you read (in your own words) in the left-hand column.
3. Record the inference you made in the right-hand column.

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