Lesson 4.4

How the Earth System Explains Dinosaur Extinction
Lesson Overview

Students read *How the Earth System Explains Dinosaur Extinction*, which explains how interactions between the atmosphere, geosphere, hydrosphere, and biosphere may have caused dinosaurs to go extinct. After reading, students synthesize what they learned about the Earth system with their investigations throughout the unit to come to an understanding about how the water shortage in East Ferris is an example of the parts of the Earth system interacting. Students then label interactions between parts of the Earth system in a diagram of Ferris Island and participate in a Word Relationships routine to practice using key vocabulary to discuss more examples of interactions these interactions. The purpose of this lesson is to provide students with the opportunity to understand phenomena on Earth as interactions between the parts of the Earth system.

**Anchor Phenomenon:** One side of Ferris Island has a water shortage and the other does not.  
**Investigative Phenomenon:** Dinosaurs went extinct.

**Students learn:**

- Changes in one part of the Earth system can cause changes in another part.
- Dinosaur extinction was caused by interactions between the parts of the Earth system.
- The rain shadow effect is created by interactions between the parts of the Earth system.
Partner Reading

Students read *How the Earth System Explains Dinosaur Extinction* in pairs with the purpose of thinking about how Earth functions as a system.

Instructional Guide

1. **Make a connection to the previous lesson.** Explain that students will read a book that can help them think about the situation on Ferris Island in a different way.

2. **Introduce *How the Earth System Explains Dinosaur Extinction***. Hold up the book and explain that the book they will read is about what caused dinosaurs to go extinct many millions of years ago.

   It might seem strange to read about dinosaur extinction when we’ve been investigating the water shortage in East Ferris. The connection between these two topics has to do with how Earth functions as a system.

3. **Discuss systems.** Point out the words “Earth System” in the book’s title.

   - What do you know about systems? [Systems have different parts that work together. The parts work together to make something happen.]
   - How is Earth a system? [It has different parts—the hydrosphere, biosphere, atmosphere, and geosphere—that interact.]

4. **Remind students of the parts of the Earth system.** Point out the Parts of the Earth System chart and remind students of the parts they have learned about.

   - You have been thinking about the parts of the Earth system as you investigate why it doesn’t rain much in East Ferris. These parts are the hydrosphere, the biosphere, the atmosphere, and the geosphere.
   - We have talked about some ways these parts interact with one another. The book you will read today provides more information about how parts of the Earth system interact.

5. **Set purpose for reading.** On the board, write “How does Earth function as a system?”
Your purpose for reading today is to understand how Earth functions as a system.

6. Distribute books. Distribute one copy of *How the Earth System Explains Dinosaur Extinction* to each pair of students. Explain that you will read the first few pages of the book together, keeping the purpose in mind.

7. Read aloud pages 4–7 and discuss Earth as a system. Have a volunteer read these pages aloud as the rest of the class follows along. Then, ask students to turn to their partners to discuss what they read about how Earth functions as a system.

What did you read about how Earth functions as a system?

[In order to explain how the dinosaurs died, scientists have to think of Earth as a system. All the parts of the Earth system are connected.]

8. Prompt students to continue reading with a purpose.

As you continue reading with your partner, think about this question: *How does Earth function as a system?* Discuss what you find out as you go.

9. Partners read. As students read, circulate to provide support as needed.

Teacher Support

Instructional Suggestion

Providing More Experience: Today’s Daily Written Reflection

*How do the hydrosphere, biosphere, atmosphere, and geosphere interact?* This prompt (on page 76 in the Investigation Notebook) asks students to think of interactions between different parts of the Earth system.

Background

About the Book: *How the Earth System Explains Dinosaur Extinction*

*How the Earth System Explains Dinosaur Extinction* is a book about how the parts of the Earth system—the hydrosphere, biosphere, geosphere, and atmosphere—interact. The explanation of how the dinosaurs could have gone extinct 65 million years ago provides a fascinating lens through which to view Earth system interactions. The book describes each of Earth system’s parts in detail, followed by the step-by-step explanation of how the interactions between parts could have caused the extinction of the dinosaurs. This explanation is presented as a chain of interactions: changes in one part caused changes in another part, which caused changes in another part, and so on. The book provides context for students’ investigations of the Earth system by helping them make connections between what they have been learning in class and a fascinating event in the history of Earth. It also encourages them to consider the many ways that Earth’s parts interact.
Instructional Suggestion

Providing More Experience: Examples of Systems
If students need more experience thinking about systems, you might remind them of the freshwater collection systems they designed. Show students one of the systems and ask: *What makes your freshwater collection system a system?* Emphasize that a system has parts that work together. You might also show and discuss other examples of systems with which your students are familiar.

Rationale

Pedagogical Goals: Why Read About the Dinosaur Extinction?
The idea of Earth as a system of interacting parts may be abstract for students and can be difficult to grasp when decontextualized. So, while dinosaur extinction may not seem related to the content of the rest of the unit, it provides an engaging context in which to learn about how Earth’s parts interact as part of a system. The extinction narrative in *How the Earth System Explains Dinosaur Extinction* provides an example of how to use the lens of Earth system interactions to explain a phenomenon. This supports students in using the same lens to explain other phenomena they are familiar with. Students can synthesize ideas from the book about Earth as a system to explain how the water shortage in East Ferris is an example of parts of the Earth system interacting.

Rationale

Literacy Note: Reading with a Purpose
In this lesson, students read about Earth as a system of interacting parts. As they read, they should be thinking about the crosscutting concept of systems as they read to understand how the Earth is a system. The story of dinosaur extinction is very compelling and provides an illustrative example of Earth’s parts interacting, but it’s also important to let students know that they are reading for the purpose of finding out about systems. After reading, students will apply what they learned back to the context of East Ferris’s water shortage. This application of ideas from one context to another is challenging, so it’s beneficial to have students keep their focus on systems throughout the lesson.
Partner Reading

Students read How the Earth System Explains Dinosaur Extinction in pairs with the purpose of thinking about how Earth functions as a system.

Instructional Guide

1. Make a connection to the previous lesson. Explain that students will read a book that can help them think about the situation on Ferris Island in a different way.

2. Introduce How the Earth System Explains Dinosaur Extinction. Hold up the book and explain that the book they will read is about what caused dinosaurs to go extinct many millions of years ago.

Podría parecer extraño leer sobre la extinción de los dinosaurios cuando hemos estado investigando la escasez de agua en Ferris del Este. La conexión entre estos dos temas tiene que ver con la manera en que funciona la Tierra como un sistema.

3. Discuss systems. Point out the words “Earth System” in the book’s title.

¿Qué saben acerca de los sistemas?
[Los sistemas tienen diferentes partes que trabajan juntas. Las partes trabajan juntas para hacer que algo suceda].

¿De qué manera la Tierra es un sistema?
[Tiene diferentes partes (la hidrosfera, la biosfera, la atmósfera y la geosfera) que interactúan].

4. Remind students of the parts of the Earth system. Point out the Parts of the Earth System chart and remind students of the parts they have learned about.

Han estado pensando en las partes del sistema Tierra mientras investigan por qué no llueve mucho en Ferris del Este. Estas partes son la hidrosfera, la biosfera, la atmósfera y la geosfera.

Hemos hablado sobre algunas maneras en las que interactúan estas partes. El libro que leerán hoy proporciona más información sobre cómo interactúan las partes del sistema Tierra.
5. Set purpose for reading. On the board, write “How does Earth function as a system?”

Su propósito para leer hoy es entender cómo funciona la Tierra como un sistema.

6. Distribute books. Distribute one copy of *How the Earth System Explains Dinosaur Extinction* to each pair of students. Explain that you will read the first few pages of the book together, keeping the purpose in mind.

7. Read aloud pages 4–7 and discuss Earth as a system. Have a volunteer read these pages aloud as the rest of the class follows along. Then, ask students to turn to their partners to discuss what they read about how Earth functions as a system.

¿Qué leyeron sobre cómo funciona la Tierra como un sistema? [Para explicar cómo murieron los dinosaurios, los científicos tienen que pensar en la Tierra como un sistema. Todas las partes del sistema Tierra están conectadas].

8. Prompt students to continue reading with a purpose.

Mientras continúan leyendo en parejas, piensen en esta pregunta: ¿De qué manera funciona la Tierra como un sistema? Discutan lo que averigüen mientras avanzan.

9. Partners read. As students read, circulate to provide support as needed.

Teacher Support

Instructional Suggestion

Providing More Experience: Today’s Daily Written Reflection

*How do the hydrosphere, biosphere, atmosphere, and geosphere interact?* This prompt (on page 76 in the Investigation Notebook) asks students to think of interactions between different parts of the Earth system.

Background

About the Book: *How the Earth System Explains Dinosaur Extinction*

*How the Earth System Explains Dinosaur Extinction* is a book about how the parts of the Earth system—the hydrosphere, biosphere, geosphere, and atmosphere—interact. The explanation of how the dinosaurs could have gone extinct 65 million years ago provides a fascinating lens through which to view Earth system interactions. The book describes each of Earth system’s parts in detail, followed by the step-by-step explanation of how the interactions between parts could have caused the extinction of the dinosaurs. This explanation is presented as a chain of interactions: changes in one part caused changes in another part, which caused changes in another part, and so on. The book provides context for students’ investigations of the Earth system by helping them make connections between what they have been learning in class and a fascinating event in the history of Earth. It also encourages them to consider the many ways that Earth’s parts interact.
Instructional Suggestion

Providing More Experience: Examples of Systems
If students need more experience thinking about systems, you might remind them of the freshwater collection systems they designed. Show students one of the systems and ask: \textit{What makes your freshwater collection system a system?} Emphasize that a system has parts that work together. You might also show and discuss other examples of systems with which your students are familiar.

Rationale

Pedagogical Goals: Why Read About the Dinosaur Extinction?
The idea of Earth as a system of interacting parts may be abstract for students and can be difficult to grasp when decontextualized. So, while dinosaur extinction may not seem related to the content of the rest of the unit, it provides an engaging context in which to learn about how Earth’s parts interact as part of a system. The extinction narrative in \textit{How the Earth System Explains Dinosaur Extinction} provides an example of how to use the lens of Earth system interactions to explain a phenomenon. This supports students in using the same lens to explain other phenomena they are familiar with. Students can synthesize ideas from the book about Earth as a system to explain how the water shortage in East Ferris is an example of parts of the Earth system interacting.

Rationale

Literacy Note: Reading with a Purpose
In this lesson, students read about Earth as a system of interacting parts. As they read, they should be thinking about the crosscutting concept of systems as they read to understand how the Earth is a system. The story of dinosaur extinction is very compelling and provides an illustrative example of Earth’s parts interacting, but it’s also important to let students know that they are reading for the purpose of finding out about systems. After reading, students will apply what they learned back to the context of East Ferris’s water shortage. This application of ideas from one context to another is challenging, so it’s beneficial to have students keep their focus on systems throughout the lesson.