Interactions Between Earth's Spheres

Habitat Lab Field Investigation Lesson Plans & Resources

Online Lesson Plans & Resources available on the Alabama Wildlife Federation website

Students will explore the habitat lab to find examples of Earth's four spheres (geosphere, hydrosphere, atmosphere, and biosphere). They will then answer questions about the interactions among these spheres.

Materials: Copies of the "Interactions Between Earth's Spheres" Field Investigation Activity Page, Clipboards, & Pencils

Duration: Intro Discussion – 30 min. | Outdoor Exploration – 20 min. | Review Observations – 30 min.

STEP 1: Engage through Discussion

The background information and questions below can be used to help introduce the topic, engage the students, and build a foundation to discuss the topic:

Background Information & Vocabulary (online as a PDF or Word Doc)

Everything in an ecosystem can be categorized into one of the spheres of Earth. The **geosphere** (also called the lithosphere) contains the solid parts of the earth including rocks, sand, dust, soil, metals, and related materials. The geosphere is layered with the crust being the outermost layer, followed by the mantle, and the core at the center of the earth. The **hydrosphere** contains the water on the earth including oceans, lakes, rivers, groundwater, rain, snow, and other forms of precipitation. Icebergs, ice caps, and glaciers are frozen parts of the hydrosphere called the cryosphere. The **atmosphere** is the envelope of gases that surrounds the earth and includes air, wind, ozone, oxygen, nitrogen, and other gases. The **biosphere** includes all living things including animals, plants, fungi, bacteria, and other organisms.

The spheres of the earth can interact with each other in a variety of ways. As rain falls or a river runs over rock, the hydrosphere interacts with the geosphere. As wind blows and carries tiny particles, they atmosphere interacts with the geosphere as these tiny particles cause erosion on larger rocks. The biosphere interacts with the hydrosphere as animals drink water or plants take up water through their roots. The biosphere interacts with the geosphere as animals dig burrows or as plants anchor into the soil. The biosphere interacts with the atmosphere as animals breathe and plants perform the process of photosynthesis. They hydrosphere interacts with the atmosphere during various stages of the water cycle such as evaporation.

Example Discussion Questions & Answers (online as an Interactive PowerPoint or PDF)

Q: What parts of the Earth are visible from this view?
A: *You can see some of the continents (land), the oceans (water), and some clouds*
Q: What are some living and non-living things you see in these photos?
A: *Birds, the ocean, sand, clouds, stream, rocks, trees, moss, tree branches, ferns*
Q: How could you group or categorize the things you saw in the previous pictures?
A: *Things on earth can be classified as living and non-living. The living and non-living components of Earth can be classified into one of four spheres. They are called "spheres" because the earth is a sphere, and each is a part of the earth.*
Q: What are the four spheres of Earth?

A: *Geosphere (also called lithosphere), Hydrosphere, Atmosphere, and Biosphere*

Q: What is the geosphere (or lithosphere)?
A: *The geosphere contains the solid parts of the earth including rock, dust, soil, sand, metal, and other related materials. The layers of the geosphere include Earth's core (toward the center of the earth), the mantle, and the crust.*
Q: What is the hydrosphere?
A: *The hydrosphere includes the water found on earth. It includes oceans, lakes, rivers, groundwater, rain, and snow. Frozen parts of the hydrosphere are called the cryosphere and include glaciers, ice caps, and icebergs.*
Q: What is the atmosphere?
A: *The atmosphere is the envelope of gases surrounding the earth. It includes the air, wind, ozone, oxygen, nitrogen, and other gases.*
Q: What is the biosphere?
A: *The biosphere includes all living organisms on the earth including plants, animals, fungi, and other life like microscopic organisms.*
Q: Do interactions occur between the Earth's spheres?
A: *YES!! All of Earth's spheres and cycles are interconnected. They make up the Earth's system (a complex whole unit with smaller connected parts working together).*
Q: How does the biosphere interact with the other spheres?
A: *Animals interact with the geosphere by digging burrows while plants interact with the geosphere with their roots. Roots provide a way for the plant to anchor and absorb nutrients from the soil.*
Animals interact with the hydrosphere by drinking water or living in the water. Plants take up water through their roots and lose water through their leaves during a process called transpiration.
Animals interact with the atmosphere when they breathe, and plants interact with the atmosphere during the process of photosynthesis.
Q: How does the geosphere interact with the other spheres?
A: *Erosion and weathering are examples of how they hydrosphere and atmosphere interact with the geosphere.*
Q: How does the hydrosphere interact with the atmosphere?
A: *When water evaporates, the hydrosphere interacts with the atmosphere. Clouds contain water vapor and are located in the atmosphere.*
Q: How can multiple systems interact at one time?
A: *Some events include interactions among several spheres at one time or can cause interactions among various spheres. For example, Larger events like volcanic eruptions can cause interactions among all spheres. When a volcano (the **geosphere**) erupts, gases like carbon dioxide are released into the **atmosphere**. This can cause water vapor to attach to additional molecules, causing an increase in rain (**hydrosphere**). The increase in rain can promote additional plant growth (**biosphere**).*
*A volcano can also cause lava flows (**geosphere**) that melts surrounding ice (**hydrosphere**) and can cause mudflows (**geosphere**).*

STEP 2: Explore with Literature

These books can be used to further explore the topic with your students:

- *The Four Spheres of Earth* by Paul Larson
  (ISBN: 978-1480747258)

STEP 3: Explain using Technology

These videos can be used to further explain the topic to your students

- Crash Course Kids: Four Spheres (Part 1: Geosphere and Biosphere) (4:00 min) https://www.youtube.com/watch?v=VMxjzWHbyFM
- Crash Course Kids: Four Spheres (Part 2: Hydrosphere and Atmosphere) (3:30 min) https://www.youtube.com/watch?v=UXh_7wbnS3A
- Equatoro: The Four Spheres: Interactions that Shape the World (5:13 min) https://www.youtube.com/watch?v=gWHE4ug1xpc

STEP 4: Elaborate with a Field Investigation in the Habitat Lab 

The Habitat lab Field Investigation Observation Page(s) allow students to apply what they have learned as they investigate and record their real-world observations in their field journals. Before you go outside, don't forget to review the activity instructions and your Habitat Lab Rules:

Indoor Discussion:

1. Introduce the students to the concept of Earth's four spheres.
2. Discuss some examples of each sphere.

Outdoor Discovery:

3. Have the students explore the habitat lab to look for examples of each of the four spheres. They should list or draw their examples on the activity page.
4. As the students are making their observations, have them think about how the different spheres can interact with each other. They should answer the questions about the interactions among Earth's spheres on their activity page.

Indoor Discussion:

5. Discuss the examples of the earth's spheres that your students were able to observe in the habitat lab.
6. Have the students share what interactions among the spheres they observed in the habitat lab and what interactions that could occur in the habitat lab.
7. Discuss additional small-scale and large-scale interactions among the spheres.

STEP 5: Review and Assess

Review and assess the students' observations and answers on their observation pages. As an assessment, have students complete the Interactions Between Earth's Spheres Assessment Page (online as a PDF or Word Doc)

Alabama Course of Study Standards for Fifth Grade

Language Arts (2021):

ELA21.5.R2: Use context clues to determine meanings of unfamiliar spoken or written words.

ELA21.5.11: Acquire and use grade-level vocabulary, clarifying the meaning of unknown and multiple-meaning words and phrases in text, choosing flexibly from a range of strategies.

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ELA21.5.17: Demonstrate comprehension of text by asking and responding to questions about literary elements used in the text.

ELA21.5.32: Respond in writing to literature and informational text, including stories, dramas, poetry, and cross-curricular texts, independently and with grade-level proficiency.

Science (2023):

SC23.5.1: Use a model to represent how any two of Earth's systems (atmosphere, biosphere, geosphere, and hydrosphere) interact and support life.