

Introduction to Earth Systems

Grade Level:

- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

Lesson Time:

60 minutes

Objective:

Students will be able to make connections between the different spheres of the Earth system by observing their outdoors and categorizing their observations.

Preparation

Before going to the classroom, you will need to:

1. Contact the teacher to find out the length of the class period, as well as how many copies of handouts and sets of materials you need to bring.
2. Alert the teacher that this investigation is set up for groups of four and that you will need his/her help when you take the students outside to make observations.
3. Find out what technology is available and make either a PowerPoint or overhead copy of the Earth Systems Concept Map Poster.
4. Collect all the materials in the list below and organize them into one Tool Bag for each group of four students
5. Make photocopies of the handouts. Collect any giveaways for the students, such as posters or Geologic time bookmarks.
6. Run through the investigation yourself and record the data, just to see how long it takes. Adjust the timing to the class period, remembering that you will need time to introduce the investigation, clean up afterwards and re-set up for the next class (if you are working with more than one

class).

Materials:

Provide students, in groups of four, with the following:

- Large sheets of poster paper
- Markers
- Earth Systems diagram

All students:

- Notepads to record observations
- Pen or pencil

For instructional purposes:

- Access to the outdoors
- Sample of Earth Systems Concept Map Poster (you could put this on an overhead or PowerPoint)

Purpose

Background:

The geosphere includes the crust and the interior of the planet. It contains all of the rocky parts of the planet, the processes that cause them to form, and the processes that have caused them to change during Earth's history. There are thousands of parts and processes in the geosphere. It has parts that can be as small as a mineral grain or as large as the ocean floor. Some processes act slowly, like the gradual wearing away of cliffs by the sea. Others are more dramatic, like the violent release of gases and magma during a volcanic eruption.

The fluid spheres are the liquid and gas parts of the Earth system. The atmosphere includes the mixture of gases that surrounds the Earth. The hydrosphere includes the planet's water system. Its parts include oceans, lakes, rivers, and frozen water in glaciers. A special property of the fluid spheres is that their materials flow. Processes in the fluid spheres include the water cycle, the circulation of the atmosphere and oceans, and weather.

The biosphere contains the living and once-living parts of the Earth system. It is organized into complex webs of microorganisms, animals, and plants. It also includes dead and decomposing living things and special molecules from once-living material. Processes vary from simple predator-prey relationships to changes over millions of years in the kinds of living things that make up communities. This part of the Earth system is distributed widely across the Earth, from the cold dark depths of the oceans, to the thick rainforest near the Equator.

Purpose:

This investigation is designed to help participants make connections between the different components of the Earth System (biosphere, hydrosphere, atmosphere and geosphere) through observing their local outdoor area, categorizing the observations into one or more "spheres", and drawing links between the spheres.

Safety

This investigation is considered generally safe to do with students. You will want to have the classroom teacher help you monitor students when you move outside to make observations. However, please review it for the

specific setting, materials, students, and conventional safety precautions.

Investigation Question

What are the spheres of the Earth System and what parts and processes occur in these spheres?

What to do

1. **(5 minutes)** Share your experience as a scientist with the students. Be sure to keep it simple and emphasize how you make observations.
2. **(5 minutes)** Hand out copies of the Earth Systems diagram to each group of three or four participants. Read the diagram over with the participants to make sure that they understand what each system comprises.
3. **(10-15 minutes)** Provide participants with paper. They will be going outside with you to write down as many observations about the outside world as they can. Encourage them to use not just their sight, but also their hearing, and senses of touch and smell as they make their observations. For example, they might not see any birds or insects, but they might hear bird song and insects buzzing. They also might hear the wind through the trees or smell flowers. They can feel the dampness from dew on the grass or hear water flowing. (Ask the classroom teacher to help you with managing the class outside and making sure that students stay on task.)
4. **(5-10 minutes)** When they come back inside, ask them to work in small groups to categorize all their observations into the sphere where they best fit. Caution them that there will be overlap, but not to be concerned about that.
5. **(10-15 minutes)** Next, ask participants to work in their groups to make a poster showing the interaction of the parts and processes of the Earth's systems, using their observations as specific examples. They could use a concept map format for this, but they should feel free to use their creativity. They might want to use arrows between the different systems, for example, possibly using different colored arrows for positive and negative effects. They could also use Post-it notes to show processes or examples. *[Note: An example of one possible poster is attached. You could share this example with the class to give them one idea of how they might want to organize their observations.]*
6. **(10-15 minutes)** When each group finishes its poster, they should have the opportunity to present what they have discovered about the parts and processes of the Earth systems and the links between them.
7. **(2 minutes)** Thank students for their time and attention. You can leave giveaways behind for the classroom teacher to distribute.

