My NASA Data - Lesson Plans

Connect the Spheres: Earth Systems

Grade Band

- 3-5
- 6-8

Time

- 50 minutes

Overview

This activity was developed by NASA's Global Precipitation Measurement (GPM) team as an introductory experience to a series of lessons about water resources on Earth. Students will investigate Earth systems by making observations in nature and identifying systems in the natural world. Ultimately, the students will understand how the four spheres/systems on Earth (biosphere, hydrosphere, geosphere, and atmosphere) are interconnected. This lesson is based on the Elementary GLOBE Earth Systems Learning Activity titled "We're All Connected: Earth System Interactions."

Materials Required

- Pencils
- Clipboards
- Masking tape
- Copies of "Connect the Spheres" student capture sheets, including partner capture sheets Pictures for "beat the clock" (in the "Connect the Spheres" PowerPoint)

Please Contact Us to Receive the Answer Keys
(please note, we can only provide the answer keys for "GPM Original" lesson plans)

Procedure

Engage

Give each student a pencil, capture sheet and clipboard. Explain that they are going outside on a

short nature walk (Slide 2). As they walk, students will record their observations. Some questions to think about as they walk and observe could include: What do you see? What's going on outside these days/today? What do you see happening in nature? Have you noticed any changes in nature around your home or school? The observations can seem simple, but they will all be important later on. Walk for about 5-10 minutes and ask students to record a minimum of 5 observations. If the students seem to struggle, point out a few things along the way to get their minds working: the ground is covered with leaves, a small plant is growing, a bird flew from bush to bush, etc.

Explore

Gather students back together in the classroom, or outdoor classroom. Show them the diagram of the components of Earth systems from the PowerPoint: Water, Soil, Air, Living Things, Sun (Slide 3). Ask students to write which system category each observation falls into. They can write this in the left column next to each observation on the capture sheet.

Now that they have categorized their observations, ask them to find a partner. As a pair, they will choose one of their observations to consider in more detail and describe the interactions between the systems. As you explain the task, model this process for the students (Slide 4). Hand out partner capture sheets. The pairs will write the observation and circle the picture of the system it belongs to. Then, draw arrows showing the connections between parts based on that observation. Students should write notes along the arrows to explain that connection. They should make as many connections as they can. Which group/observation will have the most connections? If they finish early, they can try another observation to see if they can get more interactions. If they seem to struggle finding many connections, show them Slide 5.

Depending on time, ask a few groups to present their observations and connections to the class. Another great technique would be to have students to post their paper around the room and do a quick gallery walk so students can see what other groups produced. Can anyone else find more connections in these examples?

Explain

Ask the students: From what they saw/heard, what overall message can they see? What are some conclusions they can make? What is this showing us? (Slide 6) Guide students to understand that all of Earth's systems are connected in some way. Each part cannot be on its own for anything to work or survive in nature.

Evaluate

Give the four scientific terms for each sphere and ask them to match them to the pictures as best as they can. Hint: use the prefixes to help!

Beat the clock! Show students a picture and ask them to write down as many connections between spheres as they can in 30 seconds.

Elaborate/Extend

- Conduct this same lesson in different seasons and compare the observations and interactions.

- Play a “Find that Observation” Game. Randomly give students an interaction pair (like sun-soil) and they must find one observation that illustrates that interaction. The observation can be from their list or from a set of cards made by the teacher.'
- “Earth System in a Bottle” lesson from Elementary GLOBE – students create terrariums to learn about the four spheres.
- Create a play to show what they have learned about Earth’s systems.

NGSS Three Dimensional Learning

NGSS Disciplinary Core Ideas

- ESS2A: Earth Materials and Systems

Learning Objectives

- Identify processes in Earth systems
- Describe connections between Earth systems

Essential Questions

- How are the spheres within the Earth System Connected?
- How does matter cycle through the systems?
- What drives the cycling of matter through the Earth System?

Teacher Background Information

Water is fundamental to life on Earth. Knowing where and how much rain or snow falls globally is vital to understanding how weather and climate impact both our environment and Earth’s water and energy cycles, including effects on agriculture, freshwater availability, and responses to natural disasters. The Global Precipitation Measurement (GPM) mission, launching in 2014, will help scientist to better understand how much rain and snow falls around the world.

Water cycles through all parts of Earth’s systems. Before students can study water availability, they must first have an understanding of Earth systems and how they are connected. This lesson helps students make observations of processes in nature and relate the observations to Earth systems.

As the first lesson introducing a series of more detailed lessons, the focus should be on allowing the students to make observations and think about connections in nature. It is recommended to provide vocabulary, more content, and context at the end of the lesson after students have developed their own understanding of connections between Earth systems.

Student Resources

- Student Capture Sheet

Teacher Resources

- Teachers Guide

- Presentation