My NASA Data - Lesson Plans

Earth System Satellite Images - Relationships Between Two Variables

Grade Band

- 3-5
- 6-8
- 9-12

Time

- 90 minutes

Overview

The Earth System Satellite Images available on My NASA Data provide teachers and students opportunities to explore data and identify relationships between/among different components of the Earth system. The Earth System Satellite Images, along with the Data Literacy Cubes, help the learner visualize how different Earth system variables change over time, establish cause and effect relationships for a specific variable, identify patterns, and determine relationships among variables.

In this lesson, students will explore the relationship between *two variables during three months.*

This lesson has been adapted and modified from the GLOBE Earth System Poster Learning Activities .

Materials Required

- 2024 Earth System Satellite Images - Global slides or 2024 Earth System Satellite Images - Global PDF
- Data Literacy Cube Template or number cube (1 per group)
- Data Literacy Cube Map Question Sheet (1 per student)
- Task Cards
- Pen, Pencil
  NOTE: Consider laminating the resources in this list for future use.

Procedure

Teacher preparation before the lesson:

1. There are sets of six image cards, one for every other month in a year, for each Earth system variable. The variables are:
    - Aerosols
    - Cloud Cover
    - Insolation (solar shortwave radiation)
    - Precipitation
    - Surface 'Skin' Temperature
    - Vegetation
2. Select ***two variables*** and print the images for the months of ***January, May, and September*** from the Earth System Satellite Images.
3. Print one Data Literacy Cube template for each group.
4. Print a map question sheet for each student.
5. There are four different levels of map cube question sheets.
    - Question Sheets are leveled for both Lexile and English-language proficiencies.
    - The leveled question sheets contain labeled (bottom left) and unlabeled versions for you to use at your discretion to help you differentiate your instruction.
    - *Note*: The Lexile range provided on each question sheet represents the text's difficulty.
    - The students' reading comprehension levels should be taken into account when selecting the appropriate question sheet.
    - Regardless of level, the students in each group will be able to follow along, because the cube has the same six set of question categories: Examine, Search and Find, Analyze, Ask, Connect, and Assess.
    - Some of the question sheets include sentence stems to help struggling readers/writers participate in responding to the questions.

Part I: Using the Cube

1. Divide the students into 6 groups. It is best not to have more than six students per group.
2. Each group will have one variable, one month:

    - Group one- January, variable 1
    - Group two- May, variable 1
    - Group three- September, variable 1
    - Group four- January, variable 2
    - Group five- May, variable 2
    - Group six- September, variable 2
3. Distribute:
    - Map question sheet (for each student)
    - Cube for each group
    - Earth System Satellite Images
4. Optional: Use the task card to assign their roles (project manager, data manager, chief engineer, and communications manager). Be creative and assign other roles!
5. Assign a person in each group to roll the cube.
6. In their groups, they will answer questions 1-6 on the map question sheet.

Part II: Jigsaw Activity

1. Form new groups so that in each group you have the following:
   January-variable 1 and 2
   May- variable 1 and 2
   September- variable 1 and 2
2. Have the students put the variables next to each other and compare the relationships between the two. Allow time in their groups to talk about their variables.
3. While the students are having their group discussion, create a three column chart on a dry-erase board, or other available writing source:
    - Write the names of all three months: January, May, and September.
    - Select one member of each group to present to the rest of the class the differences or similarities between the variables.
    - As each group begins to talk about the similarities and differences between the two variables, write some of those comments under each of the months.
    - After the group discussion, direct the students to begin the Venn diagram.
4. Use some or all of the following guiding questions:
    - What relationships do you see between variable 1 and variable 2 (use the names of each variable)?
    - How does each variable change between January, May, and September?
    - Do the relationships appear to be directly or inversely proportional? Explain.
    - What evidence do you observe that shows the differences between the variables? Explain.
    - You can generate your own question to use in this portion of the lesson.

Part III: Close Lesson

1. Complete a Venn-Diagram to help students compare the differences and similarities between the two variables.

NGSS Three Dimensional Learning

NGSS Disciplinary Core Ideas

- ESS2A: Earth Materials and Systems
- ESS2D: Weather and Climate
- ESS3C: Human Impacts on Earth Systems

NGSS Crosscutting Concepts

- Patterns
- Cause and Effect
- Systems and System Models

NGSS Science and Engineering Practices

- Developing and Using Models
- Analyzing and Interpreting Data
- Obtaining, Evaluating and Communicating Information

Learning Objectives

The learners will be able to:

- Discover, analyze, and interpret patterns in a graphic display of data
- Conduct an analysis of mapped data
- Develop descriptions and explanations using evidence
- Develop an understanding of the interactions within the Earth system
- Establish cause and effect relationships for a specific variable, identify patterns, and determine relationships between variables

Essential Questions

- What is the relationship between two variables?
- What patterns are observed when comparing two variables?

Why Does NASA Study This Phenomenon?

Studying how Earth's systems interact is as important as studying the individual systems. NASA and its international partners operate several Earth-observing satellites, collectively called the A-Train, that closely follow one after another along the same orbital track. The near-simultaneous observations of a wide variety of factors help the scientific community advance our knowledge of Earth-system science and apply this knowledge for the benefit of society. Source: NASA 60 Years and Counting

Teacher Background Information

The processes comprising the Earth's environment are interconnected. Understanding how these connections operate on a global scale is to understand the Earth as a system. Understanding the Earth as a system requires a quantitative exploration of the connections among various parts of the system. These processes take place in and between the atmosphere, oceans, fresh water, ice, soil, and living components. These processes also include energy from the Sun, and the gases and particles that enter the atmosphere and oceans from both natural and anthropogenic, or human-caused, sources. The activities in this guide will help students understand variations in environmental parameters by examining connections among different phenomena measured on local, regional and global scales. As students look at the connections between environmental data, they will see that the environment is the result of the interplay among many processes that take place on varying time and spatial scales. They will also understand that environmental processes are not bound by oceans, mountains, or country delineations–they are truly global in scope.

Source: The GLOBE Earth System Poster Learning Activities.

Google Docs Interactive Files

2024 Earth System Satellite Images - Global PDF

Google Slide interactive Files

2024 Earth System Satellite Images- Global