How do images help us learn about our planet Earth?

Investigation Overview

Students interpret a nighttime image of the world using the distribution of lights to identify broad patterns of world population. They use maps of landforms and climate to help explain these patterns.

Time required: One 45-minute session

Materials/Resources

Figure 1: Nighttime lights of the world (transparency and student copies)
Log: True or false?
Globe
1 apple (as round as possible, or if allowed, Terry's Chocolate Orange)
Knife
Atlases (one per group of students)

Content Preview

The nighttime lights of the world illustrate the uneven distribution of the world's population. In the image, light is evidence of large numbers of people; dark indicates the absence of people. Settlements are clustered near water and other resources needed for transportation and economic activities.

Classroom Procedures
Beginning the Investigation

1. **Where Do People Live?** Tell students that you will use an apple to help them see why people live where they do. Show an apple and tell them it represents Earth. Ask them to compare this shape to a globe and note that even the roundest apple is not a sphere, like a globe. An orange would be better but is difficult to cut into small slices. Note: If candy is allowable, use Terry's Chocolate Orange which is precut into slices.

   - Ask the students to look at a globe and guess on what portion of Earth people live: more than half or less than half?
   - Quarter the apple; place three-quarters in one hand, one-quarter in the other.
   - Explain that the three-quarters represents water. Nearly three-quarters of Earth's surface is covered with water. No one can live there. Set these pieces aside.
   - Hold up the fourth quarter. It represents land.

Geography Standards

Standard 1: The World in Spatial Terms
How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective
- Identify and describe the characteristics and purposes of geographic representations, tools, and technologies.

Standard 17: The Uses of Geography
How to apply geography to interpret the past
- Describe how the physical and human characteristics of places change over time.

- Ask the students to guess what portion of the land is too cold, too dry, too wet, or too mountainous for people to live on. (*About half.*) Slice the quarter apple lengthwise in half and set aside one of the slices.
- The remaining slice—an eighth of the apple—represents the area of Earth on which the human population lives.

Developing the Investigation

2. Next show students the transparency of the figure: Nighttime lights of the world. Ask them what the white "dots" might represent. Explain that they are the lights of towns and cities. Lights are evidence of large numbers of people; dark means few people. Note the clustering of people in certain parts of the world. In some places, there are so many people that large areas are lit up. Have the students take turns pointing out the continents and discuss whether each continent has a large or small population. Are these populations clustered in particular places? If so, where?

3. Place the students in small groups and give each group an atlas and a copy of the **Log**. Tell students to cut out the sentence strips. Next, they read the facts on the strips and determine which strips contain true facts about the nighttime lights and place them in one group. The other groups of strips contain information that is not true about the image. Tell students to look carefully at the image and discuss the information before making their decision. They may need to look up the locations in their atlases in order to find them on the image. Discuss their decisions when the groups have completed the activity.

Concluding the Investigation

4. Tell the students to look again at the figure: Nighttime lights of the world and to point to places where there are not many lights. Give each group an atlas, and assign each group a continent. Have them identify landforms and climate characteristics on their continents and speculate with the whole class whether those features would deter people from living there. On the board write the names of the continents and under each continent list the physical features in the unpopulated areas as students identify them.
North America—mountains, forests, deserts, lakes
South America—mountains, forests, desert
Africa—desert, forests, mountains
Europe—mountains, tundra
Asia—mountains, desert, tundra, lakes (Be certain that the students understand the definition of desert and tundra.)

Background
The nighttime lights of the world dataset contains the first satellite-based global inventory of human settlements, derived from nighttime data from the Defense Meteorological Satellite Program (DMSP) and Operational Linescan System (OLS). The DMSP-OLS has the unique capability to observe faint sources of visible-near infrared emissions present at Earth's surface, including cities, towns, villages, gas flares, and fires. Lights in the Gulf of Mexico are not people and cities. What you see are flares from the burn-off of offshore oil and natural gas fields. This can be explained to the students as appropriate.

Evaluation
Log
True statements:
- There are more lights east of the Mississippi River than west of it.
- There are very few lights in the Amazon Basin region of South America.
- Many lights can be seen on the continent of Europe.
- Most of the cities in Asia are along the coastlines.

False statements:
- Africa has many lights in the center of the continent.
- In the middle of Australia there are many big cities.

Additional Resources
Geography from Space—This free video resource guide contains background material and classroom activities related to the geography and geology of North and South America, Europe, Asia, Africa, and Australia as seen from the vantage point of orbit. The free videotape to accompany this guide may be ordered from NASA CORE at http://education.nasa.gov/.
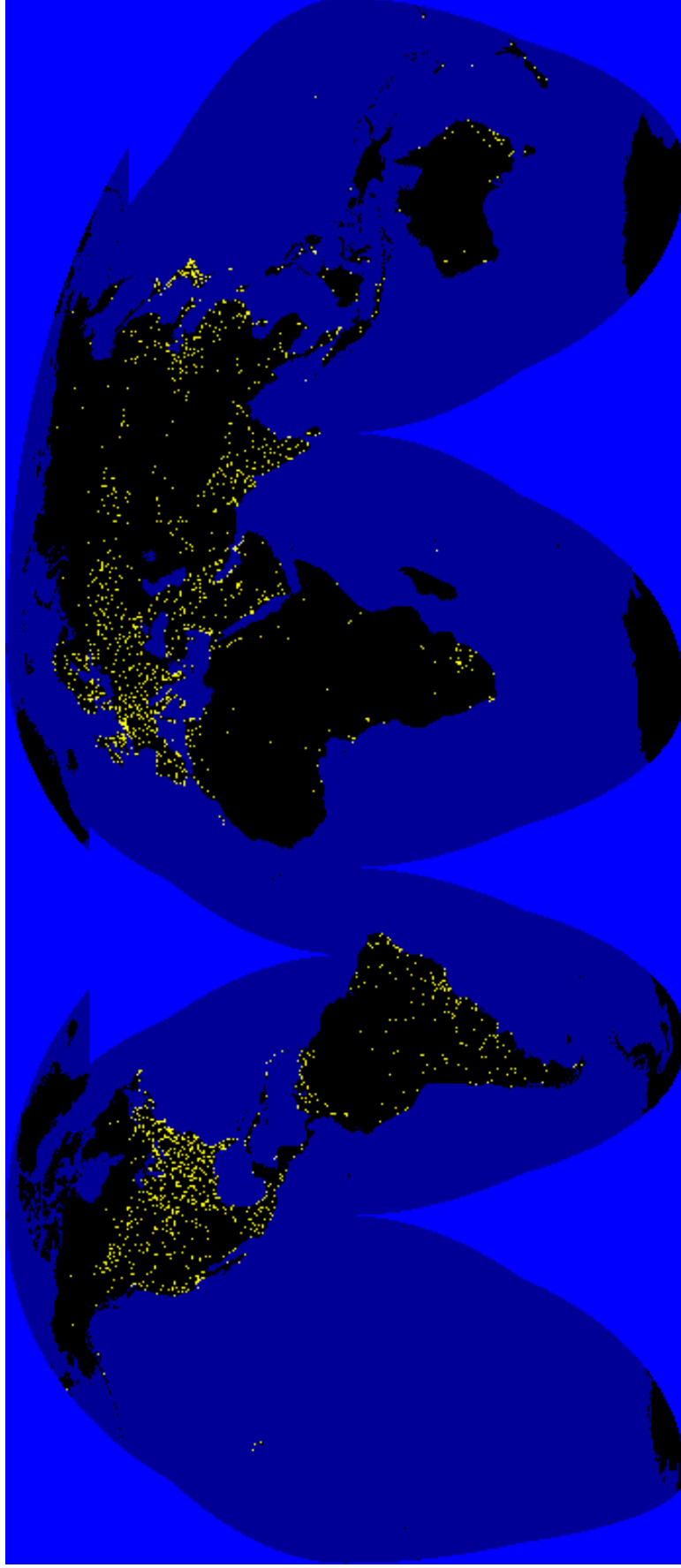
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Module 3, Investigation 3: Figure 1
Nighttime lights of the world

Circle the continents on this image.

Source: http://julius.ngdc.noaa.gov:8080/production/html/BIOMASS/night.html

Name _____ Date _____

Directions: Cut out each of the strips. Sort the strips into two groups: true statements about the nighttime lights image and false statements about the image. Look carefully at the image and discuss the information. Refer to your student atlas for help.

Africa has many lights in the center of the continent.

There are more lights east of the Mississippi River than west of it.

There are very few lights in the Amazon Basin region of South America.

Many lights can be seen on the continent of Europe.

In the middle of Australia there are many big cities.

Most of the cities in Asia are along the coastlines.