

## **Title**

Eyes in Space

## **Keywords**

## **Description**

In this lesson, students explore how remote sensing imagery can be used to examine the Earth's surface and the impact that human activity has on our planet.

## **Purpose**

In this lesson, students explore how remote sensing imagery can be used to examine the Earth's surface and the impact that human activity has on our planet.

## **Curriculum Match**

### **British Columbia, Social Studies, Grade 6**

*It is expected that students will:*

- research information using print, non-print, and electronic sources (Applications of Social Studies)
- interpret and use graphs, tables, aerial photos, scales, legends, and various types of maps (Environment)
- identify the relationship between time zones and lines of longitude (Environment)
- locate and describe major geographic features and selected nation states of the world (Environment)
- assess settlement patterns and population distribution in selected countries (Environment)

### **Ontario, History and Geography, Grade 7**

*By the end of Grade 7, students will:*

- locate relevant information from a variety of primary sources and secondary sources (Geography: The Themes of Geographic Inquiry)
- produce a wide variety of graphs, charts, diagrams, and models for different purposes (Geography: The Themes of Geographic Inquiry)
- communicate the results of inquiries stating different points of view on an issue using media works, oral presentations, written notes and reports, drawings, tables, charts, and graphs (Geography: The Themes of Geographic Inquiry)
- produce maps for a variety of purposes (Geography: The Themes of Geographic Inquiry)

## **Time**

2-3 hours

## **Materials**

- world map

- atlases (preferably one per student)

## Resources

Associated Feature(s)

- “Liftoff --Space Exploration”

Lesson Resources

- teacher resource: Gallery Walk Images

Additional Resources

- N/A

## Preparation

Please review the feature, procedures, and handouts used in this activity.

Set up a gallery walk using the following images displayed on computers monitors or as colour printouts:

- 1. Manicouagan Reservoir
- 2. Kuwaiti Oil Fires
- 3. Hurricane Michelle
- 4. Aral Sea
- 5. Egmont Volcano
- 6. Hawaiian Islands
- 7. Vancouver, British
- 8. The Earth at Night

At each image station, include a sheet of paper with the following focus questions:

- What do you see in this image?
- Why do you think this image was taken?

## Procedure

1. Divide the class into eight groups, and have each group start off at one of the gallery walk images. Allow groups two to three minutes to discuss and record their answers to the focus questions, then have them move to the next image. Continue until the groups have all had time to analyse all the images.
2. Bring the class back together, and ask students about their impressions of the images. Focus on how and why they think the images were taken. After some suggestions, tell them that all of the images were taken from space. Explain that taking photographs from space is called “remote sensing.” Referring to the teacher resource, Gallery Walk Images, inform students what each image depicts and why it was taken. End with the “Earth at Night” image and ask students what we can learn from it. Where are the brightest clusters of lights concentrated? What does that tell us about population density and human settlement?

3. Compare the “Earth at Night” image with a world map. Ask students to identify on the map the regions and countries that have the greatest concentrations of population. Briefly discuss reasons why people might have migrated to and settled in those areas (e.g., coastal region, moderate climate, fertile soil).
4. Ask students to compare the information contained in remote sensing images with that of regular maps. What can we learn from space images that we can’t learn from maps, and vice versa? Record students’ suggestions on the board or overhead under the headings “Remote Sensing” and “Regular Maps.”
5. Refer students to the feature, Liftoff—Space Exploration, and have them explore the section called The Earth from Above: An Astronaut’s View of the Planet. As they work through the feature, have them list five different ways scientists use remote sensing images to learn about our planet, as well as five ways maps are used.
6. Conduct a quick debrief on the information they acquired from the feature. Record any additional uses of remote sensing images or maps on to the board, and have students record this information in their notebooks. During the debrief, ask them which type of image they would want to access in the following situations:
  - if they wanted to learn about current weather systems in a particular area
  - if they were wanted to find the location of a specific country on the planet
  - if they were trying to locate a particular address in a city
  - if they wanted to monitor recent volcanic activity
  - if they wanted to know exactly how far a place was from the equator
  - if they wanted to know what time zone a particular city was in (you may want to tell them that for every 15 degrees of longitude, there is a different time zone)
  - if they wanted to study the land use of a particular area (e.g., urban, agricultural, forestry)
  - if they wanted to track pollutants in the Earth’s atmosphere
  - if they wanted to figure out how far one town was from another, and long it would take to travel from one to the other
  - if they wanted to analyse human settlement patterns in a particular region.
7. To conclude, have students select one of the following images:
  - Patagonian Ice Field Glacier
  - Islands of Hawaii
  - Sahara Desert
  - Oak Ridge Mountains
  - Lake Michigan
  - Sinai Peninsula
  - Mt. Cotopaxi
  - Great Barrier Reef
  - Ganges River Delta
  - Hudson Bay

Individually or in pairs, have students create a map of the same region depicted in the image, using their atlases as reference.

## **Assessment**

- As a class, discuss appropriate criteria for students' maps based on remote images. Collect [product assessment] their completed maps and assess based on the criteria. Criteria could include:
  - accurate depiction of the geographic feature
  - appropriate legend
  - accurate longitude and latitude references
  - depiction of at least two features not evident in the remote sensing image.
- Use the debrief questions from procedure step 6 as the basis for a written or oral quiz. In assessing students' responses, look for evidence that they are able to justify their responses using examples from the lesson, and can articulate the pros and cons of each type of mapping image.
- Distribute or display these two images from the feature: Vancouver, British Columbia and Street Map of Vancouver, British Columbia . Ask students to analyse the images for the following:
  - the different geological features they can identify in the pictures (e.g., islands, mountains, peninsulas, rivers)
  - the different possible uses for each type of image.

## **Adaptations**

- N/A

## **Extensions**

- Assign students a particular country, and research and prepare a presentation on how the geographic features of that country have affected the economic, social, and cultural development of the people who live there.
- Challenge students to learn more about laser and x-ray cameras and how these forms of technology are used in studying our bodies, our planet, and space.

## Gallery Walk Images

<p><b>IMAGE #1</b> <b>Manicouagan Reservoir</b></p>	<p>The Manicouagan Reservoir in northern Quebec is really an impact crater from an asteroid that hit the planet about 200 million years ago. It is one of the oldest known impact craters on the planet. Some scientists think the impact of this asteroid was responsible for a mass extinction that occurred at the end of the Triassic Period, when about 60 percent of Earth's species died.</p>
<p><b>IMAGE #2</b> <b>Kuwaiti Oil Fires</b></p>	<p>The fires set in the Kuwaiti oil fields during the 1990-91 Gulf War spewed pollutants into the Earth's atmosphere for months after they first started burning.</p>
<p><b>IMAGE #3</b> <b>Hurricane Michelle</b></p>	<p>This image shows the tightly formed eye of Hurricane Michelle.</p>
<p><b>IMAGE #4</b> <b>Aral Sea</b></p>	<p>Russia's Aral Sea was once one of the largest inland seas on the planet; however, since two of its rivers were diverted to irrigate cotton fields, it has shrunk to about half its original size. To make matters worse, chemicals used on the cotton fields have seeped into what remains of the sea, turning what used to support a thriving fishing industry into a toxic wasteland.</p>
<p><b>IMAGE #5</b> <b>Egmont Volcano</b></p>	<p>This image is of the Egmont Volcano in New Zealand. Notice other geological evidence of volcanism.</p>
<p><b>IMAGE #6</b> <b>Hawaiian Islands</b></p>	<p>Here we can see the big Island of Hawaii in the Hawaiian Islands. Islands in the ocean are really underwater mountains whose peaks are tall enough to push up through the surface of the water.</p>
<p><b>IMAGE #7</b> <b>Vancouver, British Columbia</b></p>	<p>This image is of the city of Vancouver, British Columbia, where we can see mountains, urban areas, roads, and rivers.</p>
<p><b>IMAGE #8</b> <b>The Earth at Night</b></p>	<p>This is a composite image, created from different satellite images taken of the Earth at night. By looking at the concentration of lights in different places, we can see where the world's most populated urban areas are.</p>