



## Google Earth Classroom Activity : Discover ABCs on Earth with Satellite Imagery



Whether your students are just learning their ABCs or studying advanced remote sensing, send them on a global scavenger hunt to find letters of the alphabet hidden in the different landscapes of our planet as seen by satellites and astronauts. This classroom activity is a great introduction to Google Earth and will help reveal many of the planet's natural geological phenomena and man made features, as well as challenge your students to look at the entire world with a creative lens.

### Learning Objectives:

- Students will become comfortable with navigating and exploring Google Earth.
- Students will learn a bit about the imagery that powers Google Earth and how scientists use imagery from space to understand the changing world.
- Students will learn about different geological and manmade features found on Earth.
- Students will create a presentation of Earth Typography to share with their peers.

**Audience:** 5th-8th graders, however this activity can be tailored to suit ages 6+ years up through Higher Education.

**Categories:** Geography, Visual Art, Language Arts, Science

**Voyager Story:** 'Reading the APCs from Space' by NASA Earth Observatory, under the Nature category.

**Tools Required:** Access to a Chrome Browser, Google Earth, and Google Slides or an alternative presentation or drawing application.

**Time to Complete:** 1hr

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### Classroom Activity Guide:

Chapter A: Google Earth Orientation (5 - 10min)

Chapter B: Reading the ABCs from Space (10min)

Chapter C: Where does Google Earth imagery come from? (15min)

Chapter D: Google Earth Typography (25min +)

### Chapter A: Google Earth Orientation (5 - 10min)

1. Give your students 5-10 minutes just to click buttons and see what features they find. Make sure that they are comfortable with using the 2D/3D buttons and compass to pan, tilt, and zoom in and out around Google Earth as well as dropping down into Street View with pegman.



2. When you feel the time is right, have the class come together and ask students to share a cool feature or tip on navigating the site.

### Chapter B: Reading the ABCs from Space (10min)

3. Open up Voyager and find the story 'Reading the APCs from Space' by NASA Earth Observatory under the Nature category.
  - a. Younger students: Guide them through the Voyager story and have them write down words that begin with those letters.
  - b. Older students: Highlight different geological features that are pointed out by NASA. Have them make a list of locations where they might see similar phenomena or quiz them on Earth as a system as you fly to different locations around the world.
4. When you feel the time is right, have the class come back together and ask students to share their favorite letters or something that they felt was very interesting to look at.

### Chapter C: Where does Google Earth imagery come from? (For Older Students: 15min)

5. Ask the students where do they think the imagery of Google Earth is from?

Google Earth is built from information that is available from a broad range of providers, including public, government, and commercial sources.

Google Earth aerial and satellite imagery contain a great deal of information about the natural landscape and human infrastructure on the Earth's surface. The satellite imagery in Google Earth covers more than 59% of the world's land surface and 98% of the world's population in sub-meter high resolution. There are also 175 metros with more than one million people covered in full 3D.

The constantly growing Street View layer adds dimensionality to this imagery by offering a dense array of 360° panoramic photographs for many cities and towns, available across 82 countries, as well as parts of the Arctic and Antarctica (featuring penguins!).

6. In what ways can scientists and astronauts use the satellite imagery to understand the Earth? Come up with 3 examples. (Such as tracking deforestation in the Amazon)



Satellite imaging, or remote sensing, is the scanning of the earth by satellite or high-flying aircraft in order to obtain information about it. There are many different satellites scanning the Earth, each with its own unique purpose.

Satellites use different kinds of sensors to collect electromagnetic radiation reflected from the Earth. Passive sensors collect radiation which the Sun emits and the Earth reflects, and don't require energy. Active sensors emit radiation themselves, and analyze it after it is reflected back from the Earth. Active sensors require a significant amount of energy to emit radiation, but they are useful because they can be used during any season and time of day (passive sensors cannot be used on a part of Earth that is in shadow) and because they can emit types of radiation that the Sun does not provide.

Satellite images are useful because different surfaces and objects can be identified by the way they react to radiation. For instance, smooth surfaces, such as roads, reflect almost all of the energy which comes at them at a single direction. This is called specular reflection. Meanwhile, rough surfaces, such as trees, reflect energy in all directions. This is called diffuse reflection. Sensing different types of reflection is useful in measuring the density and amount of forests, and forest change.

Also, objects react differently to different wavelengths of radiation. For instance, there is a frequency of infrared light which can be used to determine plant health. Healthy leaves reflect this frequency well while unhealthy ones do not.

7. Ask your students to identify 3 different satellites used in the Voyager story and articulate the differences between them.
8. Why do satellite images often have "unnatural" colors?

While humans can perceive only a small portion of the EM spectrum (visible light), satellite sensors can use other types, like infrared light, ultraviolet light, or even microwaves. When satellite images are made, these invisible types of light are assigned a visible color. That is why satellite images often have "unnatural" colors.



9. Have the students list out 8 different geological features observed in the Voyager story and hypothesize where else in the world they might observe similar phenomena.

## Chapter D: Google Earth Typography (25min +)

10. Have your students find their name in Google Earth and take screenshots of the letters that they discover and save them to a Google Slide.
  - a. 5 ideas for parameters of their search:
    - i. Where is your family and extended family from?
    - ii. Famous places and monuments in Brazil.
    - iii. Places around the world that they have learned about.
    - iv. Predetermined locations that the teacher selects to narrow the scope.
    - v. Have the students use the 'I'm Feeling Lucky Button' for each letter.
  - b. Older students: Have the older students name the different geological features that they observe.
  - c. Have the students form small groups to share their names and the locations that they chose.



Example: Sophia

This classroom activity was created by **Terri Sallee**, a Teacher for the Pattonville School District Missouri, USA.