

An aerial satellite-style image of a landscape. A dark green forested area is the central focus, with a winding road or path cutting through it. To the left, a river or stream flows through a lighter-colored, possibly marshy or agricultural area. The bottom of the image shows a large, bright white cloud partially obscuring the ground. The overall color palette is dominated by greens, blues, and greys.

5th GRADE
LESSON PLAN
*PLANETARY EXPLORATION
ON THE EARTH*

1 - 3 DAYS

Google

PLANETARY EXPLORATION ON THE EARTH

5th Grade: 1 - 3 Day Lesson Plan

GOOGLE EARTH USAGE OVERVIEW:

Teachers will use the Google Earth Voyager Story, [Planetary Exploration on the Earth](#), to **introduce** several examples of similarities between Earth and the other planets in our solar system.

LESSON SUMMARY:

- Teachers will **build background knowledge** about Planet Earth using the Newsela Text, [Exploring the Planets: Earth](#).
 - Teachers will use the Voyager Story, [Planetary Exploration on the Earth](#) to **introduce** several examples of similarities between Earth and the other planets in our solar system.
 - Students will choose one planet from the Voyager Story, [Planetary Exploration on the Earth](#) to **research**.
 - Students will **compare and contrast** Earth to another planet in our solar system.
 - Students will **work collaboratively** in small groups to **create a presentation** that compares and contrasts Planet Earth to another planet in the Milky Way Galaxy.
 - Students will **present** their work to an audience of their peers.
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LEARNING OBJECTIVES:

- Students will **determine the key details** of the Newsela Text, [Exploring the Planets: Earth](#).
 - Students will **conduct a short research project** to answer the question: How is Earth similar and different from the other planets in our solar system? Choose one planet highlighted in the Voyager Story, [Planetary Exploration on the Earth](#) to research.
 - Students will **compare and contrast** Earth to another planet in our solar system.
 - Students will **create a presentation** explaining the similarities and differences between Earth and another planet in the Milky Way Galaxy.
 - Students will **present** their work to an audience of their peers.
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CULMINATING TASK:

- Students will **work collaboratively** to **create a presentation** in response to the following prompt: *How is Earth similar and different from the other planets in the Milky Way Galaxy?* Create a presentation that compares and contrasts Earth to another planet in the Milky Way Galaxy.
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SUGGESTED STANDARDS

Lesson Outline

SUGGESTED STANDARDS:
GRADE RANGE - 5th GRADE

[NGSS.4-ESS1-1](#)- Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

[CCSS.ELA-LITERACY.RI.5.1](#)- Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

[CCSS.ELA-LITERACY.RI.5.3](#)- Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

[CCSS.ELA-LITERACY.RI.5.9](#)- Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

[CCSS.ELA-LITERACY.W.5.7](#)- Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

[CCSS.ELA-LITERACY.SL.5.4](#)- Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

LESSON OUTLINE WITH
ESTIMATED TIME ALLOTMENT:

TOTAL TIME: 1-3 instructional days

Day 1: 55 minutes
Introduce- 25 minutes
Explore- 30 minutes

Day 2: 60 minutes
Engage- 60 minutes

Day 3:
Extend- 80 minutes



Lesson Outline (continued)

MATERIALS NEEDED:

- Access to the Voyager Story, [Planetary Exploration on the Earth](#).
 - Student copies of the Text From the Voyager Story (below), the Group Presentation Rubric (below) and the Newsela Text, [Exploring the Planets: Earth](#) **OR** teachers can share documents with students using [Google Classroom](#).
 - Student access to [Google Search](#) to complete the research project.
 - Additional classroom supplies for small group presentation creation.
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VOCABULARY:

satellite (noun) ([reference here](#))

1. a celestial body orbiting the earth or another planet.

orbit (noun) ([reference here](#))

1. the curved path of a celestial object or spacecraft around a star, planet, or moon, especially a periodic elliptical revolution.

orbit (verb) ([reference here](#))

1. (of a celestial object or spacecraft) move in orbit around (a star, planet, or moon).

topography (noun) ([reference here](#))

1. the arrangement of the natural and artificial physical features of an area.

celestial body (noun) ([reference here](#))

1. a natural object which is located outside of Earth's atmosphere, such as the Moon, the Sun, an asteroid, planet, or star.
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LESSON PLAN

INTRODUCE (25 minutes) We are going to explore the ways that our planet, Earth, is both similar and different from the other planets in the Milky Way Galaxy. First, let's build our knowledge of Planet Earth.

1. Introduce the Newsela Text, [Exploring the Planets: Earth](#).
 2. As you read, highlight key facts and information about Planet Earth.
 3. Students read the text in partners or small groups.
 4. Working in partners or small groups, allow time for students to share 1-3 facts or details that they found to be interesting about Planet Earth.
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EXPLORE (30 minutes)

1. Now that we have some background knowledge of Planet Earth, we are going to look at some fascinating ways that Earth is similar to the other planets in the Milky Way Galaxy.
2. Introduce the Voyager Story, [Planetary Exploration on the Earth](#).
 - Read Slide 1. Students can follow along on the Student Copy of the Text from the Voyager Story, [Planetary Exploration on the Earth](#) (below). *There is no need to watch the Youtube Video as the text and video share the same information.
 - Go through the Voyager Story, [Planetary Exploration on the Earth](#), Slides 2-8. For each slide, read the text aloud. Prompt students to follow along and highlight key facts and details about the ways that Earth is similar to the other planets in the Milky Way Galaxy.
 - Read Slide 9. *There is no need to watch the Youtube Video as the text and video share the same information.
 - Turn and Talk: Which planet from the Voyager Story, [Planetary Exploration on the Earth](#) are you most interested in learning more about? Why?

LESSON PLAN (continued)

ENGAGE (60 minutes)

1. Introduce the research prompt: How is Earth similar and different from the other planets in the Milky Way Galaxy? Choose one of the following planets to research: Mercury, Venus, Mars, Saturn, or Jupiter. Research information that will help you to compare and contrast it to Planet Earth.
 2. Students will work in partners or small groups to research one of the planets highlighted in the the Voyager Story, [Planetary Exploration on the Earth](#) (Mercury, Venus, Mars, Saturn, Jupiter).
 3. Prompt each group to brainstorm a list of guiding questions. Allow time for groups to share their questions with the class. Chart questions for student reference. Example questions include:
 - What is the planet's position and distance from the Sun?
 - How many satellites does this planet have?
 - What is the range of temperatures on this planet? What is the average temperature on this planet?
 - What is this planet made up of?
 - Is there any liquid on this planet?
 - How long does it take for this planet to make a full orbit around the Sun?
 - How long does it take for this planet to complete a full rotation on its axis?
 - Does this planet have seasons?
 4. Students work in partners or small groups to research the answers to their guiding questions.
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LESSON PLAN (continued)

EXTEND (80 minutes)

1. Now that you have gathered information about Earth and another planet in the Milky Way Galaxy, your task is to work collaboratively to create a presentation of the similarities and differences between the two planets. Refer to specific evidence from the Newsela Text, [Exploring the Planets: Earth](#), the Voyager Story, [Planetary Exploration on the Earth](#), and additional sources found during your research.
 2. Presentations must have:
 - A clear main idea.
 - A minimum of 3 sources.
 - 10 facts or details about each planet that support the main idea.
 - A creative and engaging format.
 - Full participation from all members of the group.
 3. Presentations can be the form of a poster, brochure, PowerPoint, video, song or skit.
 4. Provide students with the Group Presentation Rubric so students have a clear understanding of presentation expectations.
 5. Students work collaboratively to create a presentation that compares and contrasts Earth to another planet in the Milky Way Galaxy.
 6. Allow time for each group to present in front of an audience of their peers.
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GROUP PRESENTATION RUBRIC

EXCEEDING:

- Presentation completely addresses the assignment.
 - Information is well organized with a clear main idea and focused supporting details.
 - Presentation has 10 or more facts/details about each planet that support the main idea.
 - Facts are referenced from more than 3 sources.
 - Information is presented in a creative and engaging way.
 - All group members participated in creating the presentation equally.
 - All group members participated in the presentation equally.
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MEETING:

- Presentation mostly addresses the assignment.
 - Information is loosely organized. Presentation has a clear main idea but only some supporting details relate to the main idea.
 - Presentation has 10 facts/details about each planet that support the main idea.
 - Facts are referenced from 3 sources.
 - Information is presented in a clear, engaging way.
 - All group members participated in creating the presentation, but not equally.
 - All group members participated in the presentation, but not equally.
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APPROACHING:

- Presentation partially addresses the assignment.
 - Information is disorganized. Main idea is unclear and details are unrelated.
 - Presentation has more than 5 facts/details about each planet or fact/details do not support the main idea.
 - Facts are referenced from 1-2 sources.
 - Information is presented in a simple way.
 - Some but not all group members participated in creating the presentation.
 - Some but not all group members participated in the presentation.
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BEGINNING:

- Presentation does not address the assignment.
 - Information is unfocused and details are random.
 - Presentation has 5 or fewer facts/details about each planet or fact/details do not support the main idea.
 - Facts and sources are not referenced.
 - Presentation is incomplete.
 - Most group members did not participate in creating the presentation.
 - Most group members did not participate in the presentation.
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RESOURCES

ADDITIONAL RESOURCES:

- Consider offering the following student friendly websites to use for their research:
 - <https://kids.nationalgeographic.com/>
 - <https://solarsystem.nasa.gov/>
 - <https://space-facts.com/>
 - http://www.cosmos4kids.com/files/solsyst_intro.html
 - <https://www.factmonster.com/science/solar-system>
 - <https://www.brainpop.com/science/space/> (requires subscription)
 - Introduce the Milky Way Galaxy and all of its planets using the National Geographic video, [Solar System 101](#).
 - Share the related Voyager Stories, [Google Earth View](#), [Scenes from Space](#), [Reading the ABC's from Space](#) and [Clouds from Space](#).
 - Share this Youtube Video: [Bill Nye the Science Guy Demonstrates the Distance Between Planets](#).
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OPTIONS FOR DIFFERENTIATION:

- Provide students with a list of guiding questions to focus their research.
 - Provide students with additional sources of information on the planet of their choosing. (For example, the leveled Newsela Texts, [Exploring the Planets: Venus](#), [Exploring the Planets: Jupiter](#), [Exploring the Planets: Saturn](#), [Exploring the Planets: Mars](#), [Exploring the Planets: Venus](#) and [Exploring the Planets: Mercury](#).
 - Provide students with a Venn Diagram to help them compare and contrast the planet they are researching to Planet Earth (below).
 - Assign group of students specific roles or questions to research to foster the collaboration process.
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CREDITS:

Written by Sarah Schwartz Johnson in collaboration with Kelley O'Connor.

*Note - this template is designed for teachers to modify for use with their grade level and standards.

Text from the Voyager Story, [Planetary Exploration on the Earth](#)

Slide 1

Beginning of the Journey

On this journey, what kind of celestial bodies will we encounter?

The Earth contains various environments. There are variations in water, air and temperature both in the ocean and on land. Because of these points the Earth is said to be special, even considering the other celestial bodies that make up the solar system. However, is the Earth really special? Are there no similarities to other planets that were born at the same time – about 4.6 billion years ago?

Many studies are exploring the mystery by collecting evidence using many methods such as the telescope, spacecraft and landed probes. As a result, we have found several celestial bodies with conditions similar to the Earth.

In this tour, we are going to explore the Earth comparing with other objects in the solar system. The Earth, which we've thought to be special, is actually the same as the fellow planets of the solar system – let's go on a journey to find the similarities and the stories they can tell.

Slide 2

Traces Where a Celestial Object Collided- Mercury Caloris Basin / Barringer Crater

One of the topographies many celestial bodies have in common is the crater, which is the trace of where an object that collided with the planet.

On the Earth, craters gradually disappear with weathering and erosion. However, on celestial bodies without air and water, they remain as they were long ago – especially, the Caloris Basin on Mercury. It is one of the largest craters in our solar system with a diameter of over 1,500 km.

Even on the Earth, craters in dry desert areas leave the appearance of the crash relatively clean. The Barringer crater in Arizona, U.S. is about 1.2 km wide and 180 meters deep and was made about 50,000 years ago.

Slide 3

A Mountain that Exceeds 10,000 Meters- Mars Olympus Mons / Mauna Kea

Everest, at 8,800 meters, is the highest mountain on the Earth.

However, if you include the height as measured from the bottom of the ocean, Mauna Kea on Island of Hawaii is over 10,000 meters and is the highest point. The mantle deep underground supplied a large amount of magma to the Earth's surface and created such a high mountain.

On the other hand, Olympus Mons on Mars, the highest mountain in solar system, is about 27,000 meters tall and its base spreads to more than 550 km. There are actively moving plates

on the Earth but there is no such movement on Mars. Therefore, it is thought the abundance of magma on Mars continued to erupt in the same place until exhausted which in turn formed that huge mountain.

Bathymetry Data Source: Main Hawaiian Islands Multibeam Bathymetry and Backscatter Synthesis

Slide 4

A Large Indentation Created by a Volcano- Venus Maat Mons / Mt. Aso's caldera

One of the topographies volcanoes create is the caldera.

It is a large indentation in the terrain that is formed by a collapse and accompanied by a massive eruption.

Many volcanoes and calderas are found on Venus. Especially at the summit of Maat Mons, the highest volcano on Venus, there is a gigantic caldera about 30 km in diameter. It is thought it was made by small repeating collapses.

There are many calderas on the Earth but Mt. Aso, in particular, is quite distinctive. The caldera isn't just the depression of the summit, but also the huge round hill that spreads around Mt. Aso. It was formed by frequent eruptions that occurred in the past. People built a city and now live in the caldera that extends 18 km east to west, and 25 km north to south.

Slide 5

Ocean Spreading Under Ice- Saturn II Enceladus / The Rodriguez Triple Junction

In celestial bodies far from the sun, it was thought that all the water was frozen.

However, on Jupiter and Saturn, we have found that there are moons where melted ice forms a vast ocean because of heat from inside the satellites. Through space probe investigations, studying the component of steam that emanates from the crack of the ice, it was discovered there is potentially a hot water outlet at the bottom of the sea.

Life may also exist in the vicinity of the outlet of hot water which is thought to be at the bottom of Saturn's moon, Enceladus.

A similar outlet is also found on the bottom of the Earth. There are unique ecosystems and it is one of the places where life was born on Earth. A lot of hot water outlets have been found on the Rodrigues Triple Junction, where three plates meet.

The original data of plate boundaries : Peter Bird (2003)

Slide 6

Aurora Shining at the Pole- Jupiter Polar Ice Cap / Auroral Oval

Just like Earth, Jupiter is one of the planets with an aurora, which forms when a plasma wind from the sun flows into the gap of the planet's magnetic field and collides with the atmosphere. However, the magnetic field on Jupiter is far stronger than on Earth. And there

is also the energy of the volcanic gas of Jupiter's moon Io. As a result, the aurora on Jupiter is 100 times brighter and more intense than the Earth's and so huge it could cover the entire Earth.

The color of the aurora varies with the atmospheric components of the planet. On Jupiter, whose atmosphere is mainly composed of hydrogen, it shines bright pink as seen with the naked eye.

Slide 7

Cracked Earth of the Permafrost- Mars Polar Regions / Tundra Area

The tundra is an area near the Arctic Ocean where the permafrost land spreads even in summer. One of the typical topographies found here is the ice-wedge polygon.

This terrain, where the ground is divided into several polygons, creates permanently frozen soil. After the frozen ground cracks, the melted surface water accumulates in the cracks and freezes as it is. By repeating this process, polygon patterns are engraved in the ground.

A landscape very similar to this polygonal terrain also has been found in the Arctic region of Mars. Research continues to elucidate how this topography is made.

Slide 8

The Star of Water and the Star of Methane- Saturn VI Titan / Primitive Earth

There is abundant water on the Earth. Many species have bred in the water that circulates through rains, rivers and seas, evaporation and ends in the clouds.

This circulation is also found in Titan, one of Saturn's moons. However, the liquid is not water but methane. Because of its moderate distance from the sun, the environment enabled methane to become liquid and gaseous.

Looking at the surface of Titan, there are rivers and lakes reminiscent of the Earth, and clouds that drop rain are also formed. Perhaps there is unknown life being born as well.

Slide 9

The End of the Trip and a New Journey

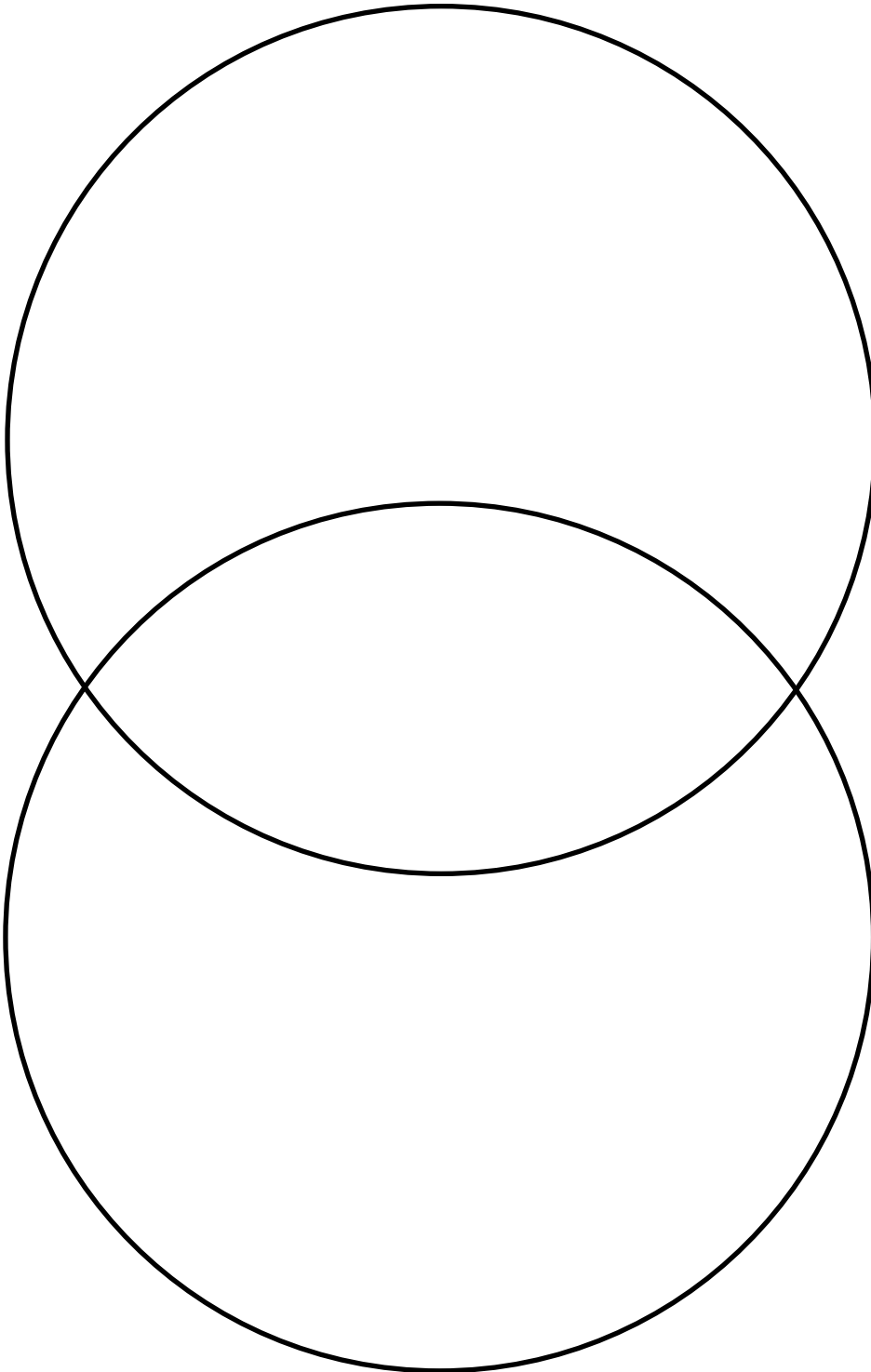
What was it like to compare the Earth to the other planets in the solar system?

This time we looked at only a small part. There are plenty of similar topographies and interesting environments on other planets and moons nearby. There will be new discoveries as the exploration progresses in the future.

Exploring the solar system's celestial bodies leads toward unraveling the secrets of the formation and growth of the Earth and the birth of life. It also leads us to find out how we can live better on Earth. The view of the Earth, life and the universe obtained through exploring the frontiers create our future.

On this tour, you experienced the exploration of the frontiers. It is you who will continue this exploration and discovery.

Compare and contrast
the planet you are researching to Planet Earth.

A vertical rectangular box with a black outline, positioned to the right of the upper circle of the Venn diagram. It is currently empty.A vertical rectangular box with a black outline, positioned to the right of the lower circle of the Venn diagram. It is currently empty.