



Earth vs. Mars

LESSON DESCRIPTION

Remote satellite images of Earth and Mars are used to compare and contrast physical processes that occur on both planets.

OBJECTIVES

Students will

- Identify similarities and differences between the physical processes that occur on Earth and Mars
- Classify images of Earth and Mars by observing physical features in each image
- Speculate about the physical features observed in each image

NASA SUMMER OF INNOVATION

UNIT

Earth and Space Science and Remote Sensing

GRADE LEVELS

7–9

CONNECTION TO CURRICULUM

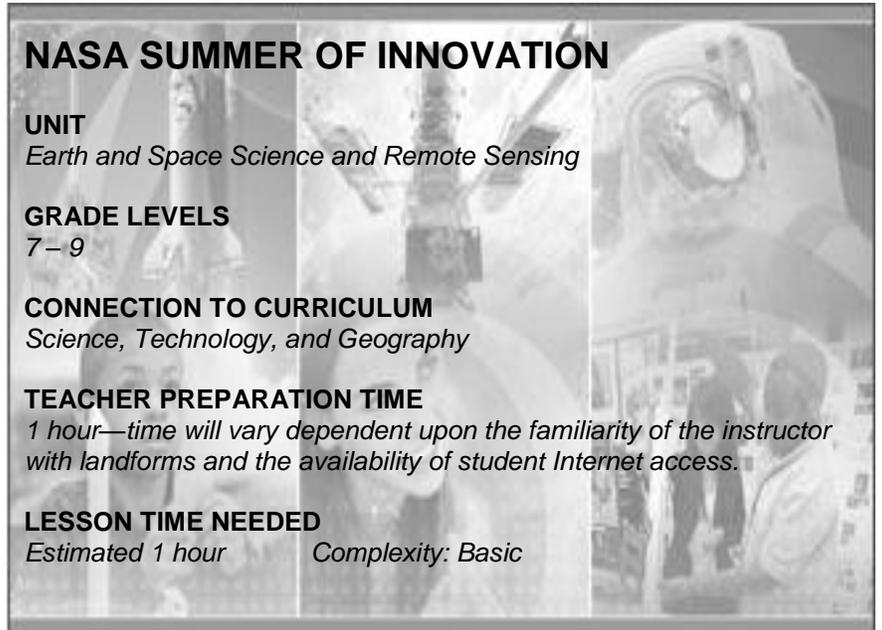
Science, Technology, and Geography

TEACHER PREPARATION TIME

1 hour—time will vary dependent upon the familiarity of the instructor with landforms and the availability of student Internet access.

LESSON TIME NEEDED

Estimated 1 hour Complexity: Basic



NATIONAL STANDARDS

National Science Education Standards (NSTA)

Science as Inquiry

- Skills necessary to become independent inquirers about the natural world

Physical Science

- Properties and changes of properties in matter
- Motion and forces
- Transfer of energy
- Interactions of energy and matter

Earth and Space Science

- Structure of the Earth system
- Earth's history
- Origin and evolution of the universe

Science and Technology

- Understanding of science and technology

National Geography Standards (NCGE)

- Places and Regions
- Physical Systems

ISTE NETS and Performance Indicators

- Research and Information Fluency

MANAGEMENT

This lesson uses the Mission Geography Educator's Guide, Module 2, Investigation 3, www.missiongeography.org/II-2-3.pdf. The student briefing and log sheets will need to be downloaded and printed in advance of the lessons. The satellite images will need to be downloaded and copied—one set per student or student group. It is recommended that these sets also be laminated for future frequent use.

Research various Mars and Earth facts resources that the students can use in the completing the compare and contrast chart. This chart entitled "Earth vs. Mars," may be found [here](#).

It is recommended that students work in pairs while scrutinizing their images as each may see and interpret images differently. This is also helpful with materials management.

CONTENT RESEARCH

Mars' and Earth's physical features and processes may be similar because they may share similar origins. One theory assumes that some planets in our solar system formed from the debris of an exploded star that was once in the location of the Sun. Different agents of erosion (wind, water, and ice) produce different landforms.

NASA scientists currently study satellite images for evidence of these physical processes. Satellite observation technology enables us to see landforms that we cannot see with our eyes alone. By comparing and contrasting the images of Mars and Earth, NASA scientists can draw conclusions as to whether or not the same processes occur on both planets and if they could create a suitable environment for life on Mars. Understanding Mars is an important task because NASA is currently investigating plans to send the first humans to Mars within the next two decades. Mars could possibly be the future home for explorers.

KEY TERMS

Plate tectonics: The movement of rigid plates (lithosphere) on a mobile upper mantle (asthenosphere).

Erosion: The movement or grinding away of surface materials by wind, water, ice, or gravity.

Dendritic drainage patterns: Networks of stream channels caused by flowing waters.

Permafrost: Frozen layer at variable depth below the surface in frigid regions of a planet.

Impact Craters: Craters formed when objects or impactors smashed into the surface.

Ejecta: Material thrown out of the area that becomes the crater during impact; does not account for all material since much is vaporized or melted.

Rays: Bright streaks starting from a crater and extending away for great distances.

Raised Rim: Rock thrown out of the crater and deposited in a ring-shaped pile at the crater's edge during an impact.

Crater Floor: Bowl-shaped or flat area of a crater, usually below the surrounding ground level unless filled in with lava.

LESSON ACTIVITIES

Earth vs. Mars—What similar physical processes occur on both Earth and Mars?

<http://www.missiongeography.org/II-2-3.pdf>

In this activity, students work in pairs to compare and contrast the physical processes that may be inferred through the observation of images of both Mars and Earth. They will discuss the processes that have occurred on the Earth and the outcomes that have resulted and transfer this knowledge to the interpretation of the processes that may have occurred on Mars.

MATERIALS

Student Briefing and Log:

[Student Worksheets](#)

Student pages 1–4; lesson pages 9–12

One per student or student group

Satellite Images of Landforms Set:

Lesson pages 4–8 (figures 3–12) copied and laminated

One per student or student group

Earth vs. Mars Chart

[Earth vs. Mars](#)

Page 15

One per student or student group

Various References on Earth and Mars

Earth vs. Mars—Charting the physical characteristics of both Earth and Mars

http://scifiles.larc.nasa.gov/docs/guides/guide3a_01.pdf, page 15

In this activity, students work together to fill in the missing information on the comparison chart (link above). They will then use other resources to create a representation (Venn diagram, graph, powerpoint, etc.) to share with the class. This representation will show how Earth and Mars are alike and different.

ADDITIONAL RESOURCES

In addition to the resources listed within the lesson guide, the following may be helpful in providing student research references:

- Explore Mars Inside and Out: This site has topography maps and Mars facts.
<http://www.lpi.usra.edu/education/explore/mars>
- Mars Links: This site has a mission theme for interaction.
<http://spacekids.hq.nasa.gov/osskids/mars/index.htm>
- Mars Reconnaissance Orbiter: This site has Mars facts as well as mission information.
<http://mars.jpl.nasa.gov/mro>

DISCUSSION QUESTIONS

- What are some of the physical processes that shape Earth? *Earthquakes, volcanoes, floods, water and wind erosion, glaciation, and mountain building*
 - Could these same processes occur on other planets? *Answers will vary.*
 - If you were to compare images of both Earth and Mars, what features would you expect to see that are similar? What features would you expect to see that are different? Why? *Answers will vary.*
 - What would you like to know about each planet that would help you decide? *Answers will vary.*
 - Can you tell from the images which feature was created first? How? *Answers will vary.*
- This leads to an excellent follow up activity:
<http://ares.jsc.nasa.gov/education/activities/destmars/destmarsLes4.pdf>.

ASSESSMENT ACTIVITIES

- Check each set of images to see if the students have accurately matched the image set.
- Ask each team to point out three features that are similar and three that are different. They should be able to offer an explanation for their classifications.
- As a class, determine the criteria for the representation the teams will create and present following their research on the Earth vs. Mars chart. The team presentations should then be scored using the criteria recommended.

ENRICHMENT

- This activity provides an opportunity for the student teams to further their knowledge about the physical processes that shaped both Earth and Mars. They will gain skills in observing the images by analyzing the images to determine which features are older. <http://ares.jsc.nasa.gov/education/activities/destmars/destmarsLes4.pdf>
- Instruct the students to research “terraforming.” See <http://quest.nasa.gov/mars/background/terra.html>
Activity One: Ask teams of students to create a topographic 3–D map of a section of the surface of Mars. They may then add elements that would be created during terraforming.
Activity Two: Instruct the teams of students to debate the pros and cons of terraforming Mars.