Program Description

What’s Out There? Our Solar System and Beyond — Like its neighboring planets, Earth orbits around the sun, the star at the center of our solar system. The sun is just one of many stars found in our galaxy, the spiral-shaped star system we call the Milky Way. This program explores the beginning of the solar system and provides a simple yet comprehensive look at the planets and other celestial bodies that orbit the sun, including asteroids, comets, and meteors. Intriguing clues from the Hubble space telescope remind us that we don’t know how many solar systems exist or whether there are life-forms elsewhere in the universe. For these and other reasons, our exploration of outer space will continue.

Discussion Questions

- What is the Milky Way?
- What makes Earth unique among the planets in the solar system?
- What locations in the solar system have humans explored in person?
- How do scientists learn about planets, stars, and galaxies that are too far away for us to visit with our current technology?

Lesson Plan

Student Objectives

- Identify the components of our solar system, including the sun, planets, asteroids, comets, and meteors.
- List the major characteristics of the planets and their moons.
- Write a report about the conditions on one of the planets in the solar system.

Materials

- What’s Out There? Our Solar System and Beyond video
- Computer with Internet access
- Print resources about the planets in our solar system
Procedures

1. Review information from the video with students.
   - How did observations by the Hubble space telescope change our estimates about the number of galaxies in the universe? (The Hubble telescope revealed a large number of galaxies in a small area of the universe. Based on these observations, astronomers now believe that there may be over 40 billion galaxies in the universe.)
   - Where is the sun located? (It is one star in a galaxy called the Milky Way.)
   - What makes up our solar system? (the sun in the center, orbited by planets, asteroids, meteors, and comets.)
   - How do scientists believe the solar system formed? (Spinning clouds of dust and gas came together to form the sun and planets.)
   - What are the inner planets? (the four planets with orbits closest to the sun: Mercury, Venus, Earth, Mars.)
   - What are the outer planets? (the five planets with orbits much farther away from the sun: Jupiter, Saturn, Uranus, Neptune, Pluto.)
   - In what major ways do the inner planets differ from the outer planets? (The inner planets tend to be small and dense with rocky surfaces. Except for Pluto, the outer planets are very large, less dense, and do not have solid surfaces.)
   - What determines the length of a planet’s year? (the length of time it takes the planet to orbit the sun)
   - What determines the length of a planet’s day? (the length of time it takes a planet to make one complete revolution on its axis)
   - What is an asteroid? (a piece of rock smaller than a planet that orbits the sun)
   - What is a meteor? (a piece of rock from space that enters Earth’s atmosphere and burns up)
   - What is a comet? (a body of ice and dust with an elliptical orbit around the sun)
   - What one quality makes Earth unique among the planets? (It supports life.)
   - What conditions on Earth make life possible? (an abundance of water and oxygen)

2. Ask students to brainstorm ways in which the environmental conditions on the surface of the other planets in the solar system are very different from conditions on Earth. Record their responses and read any of those below not offered by students. Possible responses include the following:
   - They are much hotter or much colder.
   - They do not have enough oxygen in their atmosphere.
   - The length of their day-night cycle is either longer or shorter than Earth’s.
• Their year (and therefore their seasons) is shorter or longer than Earth’s.
• They get much more or much less sunlight than Earth.
• Some have much more volcanic or storm activity than Earth.
• None has the variety of landscapes found on Earth.
• None has the abundance of water found on Earth.
• Most have more moons than Earth (which could affect conditions on the planets’ surface, as the moon affects Earth’s tides)

3. Challenge students to learn more about conditions on the other eight planets in our solar system and why they could not support life as we know it. Tell them they will research the planets and choose one about which they will create a report. Have them consider these questions: How far is the planet from the sun? How much sunlight reaches its surface? How hot or cold is it? What gases make up the atmosphere? How long is the day? How long is the year? Does it have a solid surface or is the planet itself made up of liquid or gas? What landscapes exist? Does it have volcanic or storm activity? Does it have water? How many moons does it have? Could life exist on any of its moons?

4. Have students use print and Web resources to choose and research a planet for their report. The following Web sites are good starting points:

• Our Solar System  
  http://www.windows.ucar.edu/tour/link=/our_solar_system/solar_system.html
• The Nine Planets: A Multimedia Tour of the Solar System  
  http://www.nineplanets.org/
• Life on Mars, Life on Earth  
  http://www.riverdeep.net/current/2002/09/090902_mars.jhtml
• Summary of the Solar System  
  http://www.solstation.com/stars/sol-sum.htm
• Astronomy for Kids: The Planets  
  http://www.dustbunny.com/afk/planets/
• World Almanac For Kids: Solar System  
  http://www.worldalmanacforkids.com/explore/space/solarsystem html
• NASA’s Astrobiology Page  
  http://astrobiology.arc.nasa.gov/index.cfm
• Yahooligans: Planet Links  
  http://yahooligans.yahoo.com/Science_and_Nature/Astronomy_and_Space/Solar_System/Planets/

5. When students have completed their research, ask them to summarize their findings in a one-page report, explaining why life-forms from Earth could not live on the planet they chose. Also
ask students to design and draw a life-form with the adaptations it would need to live and thrive on the planet, labeling and explaining at least three of the adaptations. For example, on a cold planet, the life-form might need many layers of blubber and fur to insulate it and retain body heat.

6. Have students summarize their reports and life-form drawings for the rest of the class, presenting their case for why they believe the planet they chose would be an impossible place for life-forms from Earth to live, and citing at least three adaptations an organism would need to survive there (and to what conditions it would have to adapt).

**Assessment**

Use the following three-point rubric to evaluate students’ work during this lesson.

- 3 points: Students were highly engaged in class discussions; produced a complete report and drawing, including all of the requested information; accurately summarized their report and cited three adaptations.
- 2 points: Students participated in class discussions; produced an adequate report and drawing, including most of the requested information; satisfactorily summarized their report and cited two adaptations.
- 1 point: Students participated minimally in class discussions; created an incomplete report and drawing with little or none of the requested information; did not summarize their reports or recall any adaptations.

**Vocabulary**

**asteroid**

*Definition*: Space objects made of rock that never came together to form planets

*Context*: More than 7,000 asteroids circulate within the solar system, most between the orbits of Jupiter and Mars.

**comet**

*Definition*: Large chunks of ice and dust that make elliptical, or oval-shaped, orbits around the sun

*Context*: Energy from the sun pushes gas away from the head of a comet, creating a tail that may be millions of kilometers long.

**core**

*Definition*: The center part of a planet

*Context*: Scientists believe that the core of the planet Mercury is made of iron, the same material they believe makes up Earth’s core.

**corona**

*Definition*: The outermost atmospheric layer of the sun
Context: We see the sun’s corona only during a solar eclipse, when the moon blocks some of the sun’s overall brightness.

crust
Definition: The top layer of Earth and of other solid planets
Context: Earth’s crust provides the most varied landscapes of any planet in the solar system.

galaxy
Definition: A system of many stars
Context: Our galaxy, the Milky Way, contains hundreds of billions of stars.

gravity
Definition: Force of attraction exerted by a celestial body
Context: Without the sun’s gravity holding Earth in place, the planet would careen out of its orbit.

mantle
Definition: The layer of a planet between its surface and its core
Context: Mercury has a very thin mantle compared with the other planets.

meteor
Definition: A rock that enters Earth’s atmosphere
Context: Friction between a meteor and Earth’s atmosphere causes the meteor to burn up.

meteorite
Definition: A rock from space that reaches Earth’s surface
Context: Any part of a meteor that reaches the ground without burning up is called a meteorite.

solar prominence
Definition: A tongue-like cloud of flaming gas rising from the surface of the sun
Context: A solar prominence eruption creates spectacular displays of streamers, arches, and loops of flame through the sun’s corona.

Academic Standards

National Academy of Sciences
The National Academy of Sciences provides guidelines for teaching science in grades K–12 to promote scientific literacy. To view the standards, visit this Web site:

This lesson plan addresses the following national standards:

- Earth and Space Science: Structure of the Earth system; Earth’s history; Earth in the solar system
Mid-continent Research for Education and Learning (McREL)

McREL’s Content Knowledge: A Compendium of Standards and Benchmarks for K–12 Education addresses 14 content areas. To view the standards and benchmarks, visit: http://www.mcrel.org/compendium/browse.asp.

This lesson plan addresses the following national standards:

- Science—Earth and Space Sciences: Understands Earth’s composition and structure; Understands the composition and structure of the universe and the Earth’s place in it
- Science—Life Sciences: Understands relationships among organisms and their physical environment
- Science—Physical Sciences: Understands forces and motion
- Science—Nature of Science: Understands the nature of scientific knowledge; Understands the nature of scientific inquiry
- Technology: Understands the nature and uses of different forms of technology
- Language Arts—Viewing: Uses viewing skills and strategies to understand and interpret visual media

Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the DiscoverySchool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit http://school.discovery.com/teachingtools/teachingtools.html.

Credit

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