

Discovery Science Library

The Basics: Space Science

Teacher's Guide

Grade Level: 6–8

Curriculum Focus: Space Science

Lesson Duration: Three class periods

Program Description

From exploring Jupiter and the Hubble Space Telescope to flight and how we use the stars, introduce middle school students to a wide variety of space science topics with these segments drawn from Discovery Channel School's award-winning series.

Lesson Plan

Student Objectives

- Watch "Exploring Jupiter," a segment in *Discovery Science Library: The Basics: Space Science*.
- Find out about the Levy-Shoemaker comet and why it is important.
- Write a summary sheet explaining the significance of the comet's collision with Jupiter.

Materials

- *Discovery Science Library: The Basics: Space Science* video
- Computer with Internet access
- Paper and pencils

Procedures

1. Begin the lesson by asking students to watch the segment "Exploring Jupiter" in the *Discovery Science Library: The Basics: Space Science*. Have them pay close attention to information about the Levy-Shoemaker comet and the significance of its discovery.
2. After viewing the video, review the main points. Make sure students understand the following facts:
 - On March 23, 1993, amateur astronomers Eugene and Carolyn Shoemaker and David Levy first observed the comet that came to be called the Levy-Shoemaker comet.
 - Through observations, they determined that the comet was in orbit around Jupiter and would strike the planet during the third week of July 1994.

- Three probes and the Hubble Space Telescope photographed the July 1994 collision.
 - The collision of a comet with a planet is an unusual event that humans usually cannot see.
3. Tell students that they will conduct research to find out what scientists learned from the collision of the Levy-Shoemaker comet with Jupiter. To summarize their findings, students should answer the questions below:

Levy-Shoemaker Summary Sheet

- When did the collision take place?
 - What was significance of this event?
 - What questions did the event raise for scientists?
 - Have scientists witnessed a similar event since the 1994 collision of the Levy-Shoemaker comet?
4. Suggest that students go to the following Web sites for additional information about the Levy- Shoemaker comet.
- http://www.sciencentral.com/articles/view.php3?article_id=218391445&cat=3_1
 - <http://www2.jpl.nasa.gov/sl9/background.html>
 - <http://www2.jpl.nasa.gov/sl9/back1.html>
 - <http://www.wff.nasa.gov/news/newsletters/w20000320.pdf>
 - http://www.strayreality.com/Lanis_Strayreality/cometneat.htm
5. Give students time in class to work on their summary sheets or let them finish the sheets for homework.
6. During the next class period, ask students to share their ideas. What was the most significant result of collision of the Levy-Shoemaker comet? Help students understand that in science, the questions raised by events are often just as important as the discoveries that emerge from them. To conclude, hold a brief discussion about questions raised by the collision of the Levy-Shoemaker comet with Jupiter.

Assessment

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

- 3 points: Students were highly engaged in class discussions; researched the topic thoroughly and carefully; and answered the questions on the summary sheet accurately.

- 2 points: Students participated in class discussions; researched the topic adequately; and answered the questions on the summary sheet somewhat accurately.
- 1 point: Students participated minimally in class discussions; did not complete their research of the topic; and did not complete the summary sheet.

Vocabulary

comet

Definition: A bright heavenly body that develops a cloudy tail as it moves closer to the sun in its orbit

Context: The main parts of a comet are the nucleus, the coma, and the tail.

Jupiter

Definition: A gas planet with an atmosphere that is mostly hydrogen and helium

Context: Jupiter is the largest planet in the solar system.

Levy-Shoemaker comet

Definition: A comet discovered in 1992 by amateur astronomers Eugene and Carolyn Shoemaker and David Levy.

Context: The Levy-Shoemaker comet collided with Jupiter the third week of July in 1994.

Hubble Space Telescope

Definition: A reflecting telescope that orbits above Earth's atmosphere and can produce images in visible light that are more detailed than those that can be obtained from earthbound telescopes

Context: The Hubble Space Telescope photographed the Levy-Shoemaker comet's collision with Jupiter.

Academic Standards

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/>.

This lesson plan addresses the following national standards:

- Earth and Space Sciences--Understands the composition and structure of the universe and Earth's place in it
- Language Arts – Viewing: Uses a range of strategies to interpret visual media

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:

<http://books.nap.edu/html/nses/html/overview.html#content>.

This discussion guide addresses the following science standards:

Grades 5-8

- Earth and Space Science: Structure of the earth system
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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>
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DVD Content

This program is available in an interactive DVD format. The following information and activities are specific to the DVD version.

How To Use the DVD

The DVD starting screen has the following options:

Play Video—This plays the video from start to finish. There are no programmed stops, except by using a remote control. With a computer, depending on the particular software player, a pause button is included with the other video controls.

Video Index—Here the video is divided into sections indicated by video thumbnail icons; brief descriptions are noted for each one. Watching all parts in sequence is similar to watching the video from start to finish. To play a particular segment, press Enter on the remote for TV playback; on a computer, click once to highlight a thumbnail and read the accompanying text description and click again to start the video.

Standards Link—Selecting this option displays a single screen that lists the national academic standards the video addresses.

Teacher Resources—This screen gives the technical support number and Web site address.



Video Index

Segment 1: Planets and Stars (7 min.)

Explore the vast universe and learn about its composition. Visit Jupiter and its moons, and find out where stars form.

Pre-viewing question

What do you know about planets and stars?

Answer: Answers will vary.

Post-viewing question

Where do stars form?

Answer: Stars form in nebulae, which are sometimes called star nurseries.

Segment 2: The Hubble Space Telescope (6 min.)

Learn about the Hubble Space Telescope, observe images it has sent back to Earth, and find out why it has deepened scientific knowledge of the universe.

Pre-viewing question

What is unique about the Hubble Space Telescope?

Answer: While it orbits, the Hubble Space Telescope can observe space from outside Earth's atmosphere.

Post-viewing question

What is one example of information from the Hubble Space Telescope?

Answer: Images from the Hubble Space Telescope have helped scientists understand the life cycle of stars.

Segment 3: Exploring Jupiter (11 min.)

Observe images of Jupiter, the largest planet in our solar system, and watch a comet strike it. Learn about its unique characteristics, and find out about its moons.

Pre-viewing question

What do you know about Jupiter?

Answer: Answers may include that Jupiter is one of the outer planets with a dense, gaseous atmosphere.

Post-viewing question

What are the names of Jupiter's two moons, and what is unique about each one?

Answer: Io's surface is covered with active volcanoes. Europa is extremely cold and has an icy crust.

Segment 4: Comets and Meteors (4 min.)

What is a comet and when was such a celestial body first observed? Discover the differences between comets, meteors, and asteroids.

Pre-viewing question

What do you think a comet is?

Answer: Some students may know that comets are chunks of ice and dust orbiting in space.

Post-viewing question

What distinguishes Halley's Comet from other comets?

Answer: Halley's Comet reappears every 76 years, which was predicted by Edmond Halley, the English astronomer who first observed it in 1705. The comet was named in his honor.

Segment 5: The Origin of the Moon (4 min.)

Hear what scientists say about how the moon formed. Observe images of each theory, and find out why one seems the most plausible.

Pre-viewing question

What do you know about Earth's moon?

Answer: Most students will know that the moon is Earth's only natural satellite.

Post-viewing question

What is the most likely scientific explanation of how the moon formed?

Answer: Scientists think that the moon was originally a large object that collided with Earth, splintered off to begin orbiting the planet.

Segment 6: Space Travel (5 min.)

Learn about the history of space travel, including recent accomplishments and dreams of future space travel. Observe photographs taken on the moon.

Pre-viewing question

Who sent the first rocket into space?

Answer: Answers will vary, but some students may know that the Russians sent the first rocket into space.

Post-viewing question

What planet would American astronauts like to visit?

Answer: Americans would like to visit Mars.

Segment 7: Flight (4 min.)

Watch birds in the sky and find out how they inspired humans to fly. Learn about lift and why it is essential to flight, as well as how boomerangs fly through the air.

Pre-viewing question

What can we learn from observing birds in flight?

Answer: Answers may include that the shape of a bird's wing helps propel it into the air; a similar shape is necessary for all objects to take flight.

Post-viewing question

How does the shape of an airplane wing create lift?

Answer: The top of the airplane wing is curved, which causes the air over it to move faster, exerting less pressure than air moving underneath. This is the force known as lift: the difference in pressure that causes the wing to move into the air.

Segment 8: Using the Stars (6 min.)

Discover the tools navigators use to stay on course in open water. Find out how the chronometer was invented, and learn how sailors rely on tools of the past.

Pre-viewing question

Why are the stars a key element in navigation?

Answer: Students may know that the stars can be used to determine latitude, or north-south position.

Post-viewing question

What is a chronometer, and who invented it?

Answer: A chronometer is a mechanical clock that allows sailors to keep accurate time on the open sea. John Harrison, an English carpenter, invented this device, and he spent 40 years perfecting it.

Segment 9: The Scientific Method (10 min.)

Learn how the scientific method helped the Wright brothers modify the design of their airplane so it could fly. Watch modern-day builders try to replicate the Wright brothers' first plane.

Pre-viewing question

Who flew the first airplane?

Answer: Most students will know that Wilbur and Orville Wright designed and built the first airplane to take flight.

Post-viewing question

How did the scientific method help the Wright brothers develop a successful airplane design?

Answer: The Wright brothers continually tested their airplane designs, following the structure of the scientific method: asking questions, developing hypotheses, and conducting experiments to learn if the hypothesis was correct. If their plane failed to fly, they asked new questions and tried to answer them. The Wright brothers followed this step-by-step process until they were successful.