

Best of the Solar System

Topic Area:

Solar system, planets and moons

Purpose: Introduce students to planetary research and familiarize them with the planets and their features.

Key Questions:

What are the visible characteristics of the planets and moons in our solar system? In what ways have researchers recorded observations of moons and planets, and what trends or patterns have been discovered?

Learning Objectives

Students will:

- Understand that planetary images contain valuable information, but require interpretation, which is somewhat uncertain.
- Be able to recognize each planet or moon by its unique and identifiable features.
- Understand that scientists summarize findings to look for patterns in groups like planets and moons.

Key Concepts:

- Each planet has unique and identifiable features.
- Planets have some common features.
- Images can be used to study the planets and their features.

Grade Levels:

5 - 8

Time Requirements:

- Total class time required: approx 4 class periods (approx 60 minutes each).
- Total preparation time for the teacher: 1 hour.
- Class period 1: Introduction to planetary research, student journals, and group discussion.
- Class period 2: Lesson Part I - Observing Images: Students use computers: self-guided observation of uncaptioned planet images. Students describe planet features in journals.
- Class period 3: Lesson Part II - The Researcher's Description: Students use computers: self-guided activity to compare student descriptions of images with

- those of experienced researchers. For homework, students prepare tables of planet/moon vs. features.
- Class period 4: Lesson Part III - Summary: Discussion and review of planet features from homework, concept of terrestrial vs. gas giant planets. Further research options and extension if time permits.

Guiding Documents:

National Science Education Standards (NSES) grades 5-8:

Science as Inquiry

- Abilities necessary to do scientific research
- Understandings about scientific inquiry

Earth and Space Science

- Earth in the solar system

Science and Technology

- Understanding about science and technology

History and Nature of Science

- Nature of science

Science/Math Process Skills:

Observation

Communication

Comparison

Organization

Application

Materials:

- Computers wired for Internet access, with one computer for every two-three students.
- Student journals or notebook paper for each student.
- Student worksheets and questionnaires (provided in this lesson - printable as HTML or PDF formatted files).

Background Information:

- Read the Background Information & Suggestions to learn about the solar system and characteristics of planets and moons, their movement, and the history and

exploration surrounding planetary research. Teaching suggestions are also provided.

- Review student lesson sections Parts I, II, III. View the on-line planetary images. Print a hardcopy of the lesson plan and the researchers descriptions if desired.

Management/Preparation:

- *Student Prerequisites:* ability to read English at 5th grade level, perform basic functions on a computer, navigate a World Wide Web page, know the names of the planets and their order from the Sun.
- *Teacher:* Become familiar with the Best of the Solar System by reading all related materials, background, teacher and student work pages.
- Print a hardcopy of all student worksheets: worksheets for Part I, (PDF or HTML file) & Part II, (PDF or HTML file) and reproduce as needed.
- Read and print a hardcopy of the Student Questionnaire and Answer Key (tests student knowledge and attitudes) if desired.
- Prepare the computer equipment ahead of time. It is recommended that the lesson and its images be loaded onto your local hard drive. This facilitates a more rapid page change in order to keep students' attention focused. It takes approximately 20 minutes to load all the pages of the Best of the Solar System.
- Prepare student "science journals" by having students bring in small notebooks or binders, or simply staple 5-10 pages of notebook paper for each student to use as a science journal.
- Be prepared to guide students in setting up their journals (see directions in the Summary portion of the lesson).
- Discuss with students the importance of planetary research. Encourage them to observe and record observations just as space scientists would.

Procedure:

Before going to the computers:

- Introduce the Key Questions (see Discussion, below) to the students.
- Introduce the concept of making and using a scientific journal. Stress the importance of careful observation and descriptive written notes (images of planets).
- Students answer Pre Activity Questions individually or in small groups.
- Discuss answers with entire class.

Self-Guided Module:

- Assign students to their computer work stations.
- Review proper computer use procedures.

- Give students instructions for Part I - Observing Images. Remind them to follow directions and to record observations in their scientific journals.
- Students log on to:
<http://cse.ssl.berkeley.edu/SegwayEd/lessons/BOSS/student1.html>
- Provide further instruction if necessary and answer any questions or concerns that arise.
- Assign the sections of the site/lesson that the students are to cover during the allotted time period:
 - One class period: Students do Part I - Observing Images of the self-guided lesson.
 - One class period: Students do Part II - The Researcher's Description of the self-guided lesson.
 - One class period: Students do Part III - Summary of the self-guided lesson.

Note: The Student Questionnaire and Answer Key may be used as an assessment at the end of the lesson.

Discussion:

Before going to the computers:

- Prior to Part I: In small groups or individually, students respond to the following questions, and then discuss answers with the entire class.
 - Which planets do you think are visible from Earth with the unaided human eye?
 - What do you think planets look like when viewed from Earth with the unaided human eye?
 - Before the telescope was invented what were ancient astronomers able to learn about the planets?
 - When was the telescope first used to study astronomy?
 - What are some discoveries made with the telescope?
 - When did spacecraft first send back data and images from the planets?
 - What features do you think we can see in images of the planets?
- Prior to Part II : Peer review. Have students to pair up with a partner or someone from another group and read each other their descriptions. Students guess which image is being described by one another's journal entries and discuss.
- When students compare their journal notes with those of researchers, students should answer worksheet questions:
 - What does the image actually show?

- What visual characteristics will help you recognize this planet or special feature in the future?
- What else would you like to know about the planet or special feature in the image?

Assessment:

- Accurate responses to questions given by students prior to Part I - Observing Images indicate basic familiarity with the planets.
- You may ask for written feedback from peer review of journal entries to determine students initial ability to identify and describe the planets and their features.
- After students complete Part II - The Researcher's Description, the class could be shown slides of the planets such as those available from other solar system Web sites to see if the students recognize them.
- Student Questionnaire and Answer Key can be used for assessment.

Extensions:

- In Part II - The Researcher's Description students indicate additional information they would like to learn about particular planets and features.
- Students could conduct library or on-line research to gather this information.
- Findings could be submitted in written form or delivered in presentations to the class.
- Additional research topics for a report or presentation:
 - Summarize current knowledge about one of the planets
 - Compare our Moon to another planet's moon (satellite)
 - Compare impact craters to volcanic craters
 - Investigate volcanism on two or more planets
 - Investigate the origin and meanings of the name of the planets

Note: Images from this lesson could be downloaded and used in student multimedia presentations using Microsoft PowerPoint, HyperStudio, or other presentation software.

Curriculum Coordinates: Language and Art

- Write a news article on a planet, the historical implications, and background of its discovery.
- After researching and writing the article shorten it for presentation in a 30 second "TV" news broadcast to the class (visual aids optional).
- Students research examples of planetary imagery and its incorporation into famous works of art ,myths, modern allusions or expressions in cultural events.

Meeting Individual Needs:

- Multicultural Perspective: Students research contributions made to space exploration by Russia, China, Japan, the United States, or another country. They can also do historical research about planetary science in another culture.
- Visually Challenged: use a large screen projection system for the computer, a large TV monitor, or books with large planetary images.

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