Title of lesson plan
Classroom Planetarium

Length of lesson
Two class periods

Grade level
5–6

Subject area
Astronomy/Space

Credit
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Objectives
Students will:

1. Understand the relationship of the 8 planets in our solar system to the Sun by creating a 3-dimensional representation.

2. Understand the planets' relative distance from the Sun and their approximate size in relation to Earth.

Materials
For this lesson, you will need:

- Round balloons of different sizes
- Tempera paint and paint brushes
- Fishing line (or strong string)
- Construction paper
- Newspaper torn into strips about 1" wide
- Space paste (see "Procedure" for instructions)

- S-clips to suspend models from ceiling tile frames (large paper clips bent into L shapes or strong loops of tape will work as substitutes)

- Planet Information Sheets (one per student)

Procedure

1. Before you begin the activity, you will need to create a batch of space paste. You can do this by mixing papier-mâché mix (or flour) and water to make a thick paste. Use about one part mix (or flour) to 3 parts water.

2. When the paste is ready, divide your students into 8 groups. Assign each group a planet. Provide each student with a copy of the Planet Information Sheet. Ask your students to fill in the sheets using information they gather from library books, the Internet, or the TLC Elementary School documentary *Astronomy.*

3. While they are working, turn a class bulletin board into a huge sun using construction paper. Invite any students who finish their research early to add solar flare designs to the sun.

4. Give each group a balloon. Explain to your students that all of the balloons should not be blown up to the same size. Stress that approximate size is all that is necessary, but that the big planets should be noticeably larger than the smaller ones.

5. Provide each group with a long piece of fishing line. Ask each group to tie the line around the end of their balloon.

6. Provide each group with a supply of space paste and newspaper strips. Instruct students to dip each strip into the paste, gently pull it through their fingers to wipe off extra clumps, and then paste it onto the balloon. They should use many layers, working until the balloon is covered completely. Encourage students to apply extra layers to make their balloons seem as round as possible. (The planets aren't perfect spheres, so students don't need to worry too much about roundness.)

7. Allow the balloons to dry. While the balloons are drying, students should decide how they are going to paint the surface of their balloons. Which colors will really bring out the physical landscape? When the balloons are ready—which might not be for a while—have students paint them.

8. While the painted planets are drying, meet with each group to determine where its planet should hang in relation to the Sun image. You can use these approximations for distance from the Sun: Mercury, 57.9 million km; Venus, 108.2 million km; Earth, 149.6 million km; Mars, 227.9 million km; Jupiter, 778 million km; Saturn, 1,427 million km; Uranus, 2,871 million km; and Neptune,

4,498 million km. When the group has chosen a location, affix the dried planet model to the ceiling using fishing line and an S-clip. Attach the appropriate Planet Information Sheet to each model.

9. When the project is complete, you might want to invite other classes to come visit.

Adaptations

Begin by leading the class in creating a web of planet facts to tap students' prior knowledge of astronomy topics. When the web is as big as it's going to get, share some basic planet facts with your students: Mercury is closest to the Sun, Venus is the hottest planet, Earth is mostly water, Mars is red because of rust, Jupiter is the largest planet and has a spot, Saturn's rings are made of ice and rock, Uranus spins like a bowling ball, and Neptune's blue color is methane. After sharing this information, provide your students with pictures of the planets, then have them paint balloons—you can inflate them and cover them with paper ahead of time—to reflect what students have learned.

Discussion questions

1. Have you ever noticed how the Moon is a different shape every night? Half of the Moon is always lit up by the Sun, but the half that's lit isn't always facing directly toward us. What if you were a Moon creature looking at Earth night after night? Would Earth be a different shape every night too? Why?

2. Did you know that gravity is weaker on the Moon than on Earth? If you're standing on the Moon, it's a lot easier to move around and lift heavy objects. Think of your favorite game or sport. How would it be different if you played it on the Moon?

3. Uranus is different from the other planets. It spins like a bowling ball instead of like a top. Can you think of a reason why it does that?

Evaluation

Have each group present an oral report to the class about its model and research. Students should explain their model. Why did they make their choices (color, size, and distance from the "Sun")? They should also share everything they learned and recorded on their Planet Information Sheet. This will allow you to assess student understanding of the information. It will also allow other students in the class to learn about the planets they did not research.

Extension

This Is Some Field Trip!

Have your students make picture books about a trip they took with their classmates to one of the other bodies in the solar system—the Moon, the Sun, or one of the planets. Illustrations and text should teach their "readers" about astronomy. Your students can

share their work with a younger class.

Outer Orbits
Students work individually or in groups to design a board game that takes players through the solar system as they move around the board. The path from START to STOP could spiral out with stops on each planet. On each planet players could be asked a space science question. Each student or group can decide on specific rules of play.

Moon Mania
Provide students with a chart on which they are to draw the way the Moon appears each night for a month. As students come in each day and share their observations, tell them the name of the phase of the moon they saw. When the full moon is approaching, ask them to predict what the next phase will look like. Repeat for the new moon.

Space Mail
Students design postcards from the planets and the Moon, complete with a commemorative stamp. They should write a short message to a friend at home on Earth explaining how their space vacation is going—the sights they have seen, what the terrain looks like, and how long it will take them to return.

Suggested readings
Stars and Planets
David H. Levy. U.S. Weldon Owen Inc., 1996.
This reference contains lively and interactive text with amazing space trivia. Along with the story of our universe, it contains historical sidebars about space exploration and famous astronomers. You'll enjoy the 4-page foldout, exciting photographs, and large-scale illustrations.

The Kingfisher Young People's Book of Space
Martin Redfern. Kingfisher Publications, 1998.
This guide to the universe sets engaging text against 2-page spreads of stunning photography taken from space. Your interest will rise as you learn about the big bang, time travel, and the impossible questions of the cosmos.

Web links
Ask the Space Scientist
This site allows students to ask astronomy questions of an expert in the field and view archives of previously asked questions on Earth, the Moon, the solar system, the cosmos, and everything else.
http://image.gsfc.nasa.gov/poetry/ask/askmag.html

Astronomy for Kids
This is a very good site for researching astronomy topics. It is well organized, and it contains many facts useful for student-conducted research. It also features a section with weekly astronomy questions that allows students to email their responses.
http://www.frontiernet.net/~kidpower/astronomy.html

Vocabulary
axis
A straight line about which a body or a geometric figure rotates.
Context:
A planet spins, or rotates, around its axis.

fusion
The union of atomic nuclei to form heavier nuclei, resulting in the release of enormous quantities of energy.
Context:
Fusion occurs when 4 hydrogen atoms are squeezed together to form 2 helium atoms.

nebula
Any of numerous clouds of gas or dust in interstellar space.
Context:
A nebula is a giant cloud of gas and dust swirling around in space that will pull together, go through a chemical reaction called fusion, and produce the core of a new star.

satellite
A celestial body orbiting another of larger size.
Context:
Planet Earth has one satellite, the Moon, revolving around it.

solar system
The Sun and the group of celestial bodies held by its attraction and revolving around it.
Context:
The Sun, the center of our solar system, has 8 planets orbiting it.

Academic standards

Grade level
3–5

Subject area
Science

Standard
Understands essential ideas about the composition and structure of the universe and

Earth's place in it.

Benchmarks

- Knows that Earth is one of several planets orbiting the Sun and that the Moon orbits Earth.

- Knows that planets look like stars but over time appear to wander among the constellations.

- Knows that astronomical objects in space are massive in size and are separated from one another by vast distances (e.g., many stars are more massive than our Sun but so distant they look like points of light).

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