

Solar System Model

Strand Scientific Investigation

Topic Investigating the scale and size of the solar system

Primary SOL ES.3 The student will investigate and understand the characteristics of Earth and the solar system. Key concepts include

- a) position of Earth in the solar system;
- c) characteristics of the sun, planets and their moons, comets, meteors, and asteroids.

Related SOL ES.1 The student will plan and conduct investigations in which

- c) scales, diagrams, charts, graphs, tables, imagery, models, and profiles are constructed and interpreted.

Background Information

The solar system consists of the Sun and the astronomical objects gravitationally bound in orbit around it, all of which formed from the collapse of a giant molecular cloud approximately 4.6 billion years ago. The vast majority of the system's mass is in the Sun. Of the many objects that orbit the Sun, most of the mass is contained within eight relatively solitary planets whose orbits are almost circular and lie within a nearly flat disc called the ecliptic plane. The four smaller inner planets, Mercury, Venus, Earth and Mars, also called the terrestrial planets, are primarily composed of rock and metal. The four outer planets, the gas giants, are substantially more massive than the terrestrials. The two largest, Jupiter and Saturn, are composed mainly of hydrogen and helium; the two outermost planets, Uranus and Neptune, are composed largely of ices, such as water, ammonia and methane, and are often referred to separately as ice giants.

Students will see the order of the planets and review their sizes, characteristics, and distances from the sun.

Materials

- Colored pencils or fine-tip markers
- Metric rulers
- Long metric measuring tapes
- Index cards
- A clear space approximately 300 feet (about 100 meters) in length

Vocabulary

elliptical

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

Introduction

For this class activity, you will need a basketball-sized ball, a ping-pong sized ball, string, scissors and tape.

1. Select one student to hold the large ball representing Earth and one student to hold the smaller ball representing the moon.

2. Have the rest of the class decide to determine how far they should be apart to be an accurate scale.
3. Be sure to mark this distance off on the floor in a removable fashion.
4. Show the students a chart that contains the diameter of the Earth (approximately 12800 km), the diameter of the moon (approximately 3500 km) and the distance from the moon to the earth (approximately 384000 km). Have the students devise a scale using these numbers.
5. Use the string to depict your relationship and tape the designated length of string to the Earth and moon to help with spatial relationships.
6. Compare this to the distance the class came up with in the beginning of the activity.

Procedure

This activity works best if students are divided into nine groups—i.e., a group for each of the eight planets and one for the dwarf planet, Pluto. Each group can be responsible for making one card and for making their own set of measurements down the field. A football-field length (100 yards) is a useful size for this model.

1. Have each group draw their planet to scale on a Planet Card by drawing a circle of the appropriate size and color, as indicated in the table at right. Have them use fine-tip colored markers for the smaller planets. For Venus and Pluto, which are white, have them make a fine outline with the black marker and leave the interior white.
2. Take students to a 100-meter-long clear space—e.g., a football field, another type of recreation area, an empty parking lot.
3. Tape the sun card on a pole or wall at eye level at one end of the clear space. Make all measurements from this beginning point.
4. Have the student planet groups mark the locations of their planet’s scale distance from the sun, using the data shown in the table at right.
5. Ask the class to walk the entire solar system model, and have each planet group read their planet’s description when the class reaches their planet.
6. Once students have completed their trip through the scale-model solar system, ask them to answer teacher-created questions on the solar system.

Planet	Color	Diameter
Sun	Yellow	27.0 mm (25-cent coin)
Mercury	Gray	0.10 mm
Venus	White	0.24 mm
Earth	Blue	0.25 mm
Mars	Red	0.13 mm
Jupiter	Light brown	2.82 (a peppercorn)
Saturn	Light brown	2.38 mm
Uranus	Blue green	1.02 mm (a small bead)
Neptune	Blue	0.95 mm
Pluto	White	0.04 mm

Planet	Distance from Sun
Sun	0 m
Mercury	1.0 m
Venus	1.8 m
Earth	2.5 m
Mars	3.8 m
Jupiter	13.0 m
Saturn	23.8 m
Uranus	47.8 m
Neptune	75.0 m
Pluto	98.3 m

Assessment

- **Questions**
 - Have the students develop observation questions based on the distances from the activity.

- **Journal/Writing Prompts**

- Have the students transcribe these notes and observations to their science notebook or science journal.
- Have the students also write a journal entry about why they think the planets are arranged the way they are in our solar system.

- **Other**

- Take a picture of the scale model and to determine if the scale model is correct.

Extensions and Connections (for all students)

- Have students develop travel brochures for the planets, as if they are travel agents for the planets.

Strategies for Differentiation

- Base the distance from the sun to Pluto on a standard meter. Using the distances in the chart above, have the students identify where each planet should be placed in the sequence of the solar system.
- Assign a planet group project to the class. In this project/report the students will need to report on several predetermined characteristics of the planets. On the due date have the students teach their classmates about their assigned planet.