

Lesson 3: Play Dough Planets

This lesson is adapted from “3-D Model of the Earth and Moon,” an activity in *The Universe at Your Fingertips*, by the Astronomical Society of the Pacific (<http://www.astrosociety.org/education/astro/astropubs/universe.html>)

Purpose: To demonstrate the size (volume) differences between Earth, Earth’s Moon, and Mars through a hands-on activity.

Standards

National Science Education Standards

Science as Inquiry – Content Standard A

1. Abilities necessary to do scientific inquiry.
2. Understanding about scientific inquiry.

Physical Science – Content Standard B

Properties of objects and materials- objects have many observable properties such as size.

Principles and Standards for School

Mathematics

Geometry

1. Analyze characteristics and properties of three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.
2. Use visualization, spatial reasoning, and geometric modeling to solve problems.

Measurement

Understand measurable attributes of objects and the units, systems, and processes of measurement.

Connections

Recognize and apply mathematics in contexts outside of mathematics.

Overview

The size of and distance to Mars is important in planning robotic missions to the red planet. So, how big is Mars anyway? How far away is the planet? The size question is commonly answered in one of two ways. First the answer can come in terms of its diameter, 6,794 km (4,222 miles). Second is in terms of its volume, which is the way to answer the question more accurately. While Mars is roughly one-half the diameter of the Earth’s 12,756 km (7,926 miles) diameter, it is one-sixth the volume of Earth. This means you could fill the Earth with six planets the size of Mars. In this lesson, students will investigate the differences in

volume between the Earth, the Moon, and Mars. Students will also estimate the distance between the Earth and the Moon and the Earth and Mars using the scale of the play dough planets’ sizes.

Understandings

1. Our knowledge and understanding of our Earth and Solar System changes and/or expands as new discoveries are made.

Materials

1. Play dough (see recipe)

Play Dough Recipe

1 C flour
½ C salt
1 T oil
2 t cream of tartar
Food coloring
1 C water

Mix ingredients (it is helpful to mix the food coloring with the water before adding to other ingredients) and cook over medium to medium-low heat. Stir constantly until it forms a ball and all “mushy” spots are out. Knead slightly. Store in air-tight container.

Supplemental Materials

1. Poster – Earth and Mars: As Different as They Are Alike (JPL 400-935 03/01/01 EW-2001-02-009-JPL)*
2. Mars/Earth Comparison Web Site at JPL (<http://mars.jpl.nasa.gov/facts/>)
3. The Red Planet: A Survey of Mars— Slide Show by the Lunar and Planetary Institute (http://www.lpi.usra.edu/publications/slidesets/redplanet2/redplanet_index.shtml)

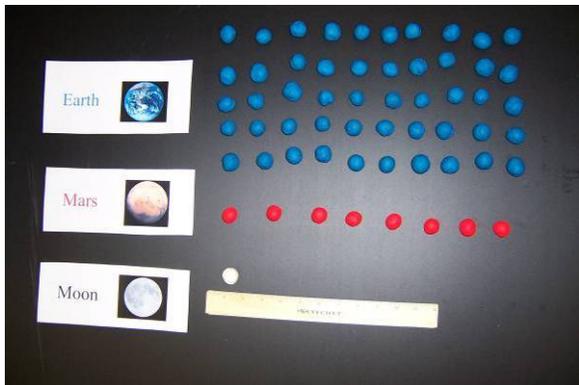
* Can be ordered from the NASA online catalog CORE (<http://catalog.core.nasa.gov/>) or receive a free teacher copy from <http://marsprogram.jpl.nasa.gov/classroom/earthMarsForm.html>

Time

One to two hours depending on size of groups and length of discussion.

Directions

1. Have students work in small groups. Instruct them to make a play dough ball about the size of a marble. Explain that this ball is the Moon.



2. Ask children how many “Moons” it would take to make a ball the size of the Mars. *After volunteers to share their ideas, tell students that it would take 8 of the Moon-sized balls to make Mars.*
3. Have students make and combine 8 of the Moon-size balls to make one “Mars” ball.
4. Ask the students how many “Moons” it would take to make a ball the size of Earth. *After several students share their ideas, tell the students it would take 50 Moon-sized balls to make up Earth.*
5. The students now have a Moon and a Mars, instruct groups to make combine 50 Moon-size balls, to make “Earth.”



6. Discuss the size differences of the Earth, Mars and the Moon. *Don't let the students mash their “planets” together if you plan on doing the extension*

Extension

Materials

1. Meter tapes, 1 per group
2. String or yarn, approximately 4 yards per group

Time

Fifteen to 20 minutes

Directions

1. After making a “Moon” and “Earth” ask students to estimate how far their Moon should be from their Earth. *Have students use meter tapes to measure their estimated distance. Discuss the students' estimates.*
2. Instruct students that the Moon is approximately 9.5 times the distance around the Earth's equator from the Earth. Have students use string or yarn to wrap around their earth 9.5 times and place the Moon at the proper scale distance.
3. Discuss the accuracy of their estimates.
4. Ask students to estimate the distance from the Earth to Mars. *The distance between the Earth and Mars ranges from approximately 72 million km (45 million miles) to 370 million km (230 million miles) or 1800 to 9200 wraps of the yarn around the play dough Earth. The difference is dependent on where Earth and Mars are in their orbits around the Sun. For more information on the distance between the Earth and*

Mars visit

http://athena.cornell.edu/kids/tommy_t

[t_issue3.html](#).

5. Discuss the students' estimates.