



Worlds in Comparison

How small is Earth compared to Jupiter or Saturn? How much bigger are the gas giants to the terrestrial planets? Have students use Play-Doh to find out in this perfectly scaled and perfectly fun activity!

GBO suggestion - follow this activity with the GBO Toilet Paper Solar System lesson plan.

Time

- 30 minutes prep time to make Play-Doh
- 30– 45 minutes activity time

Grade

· 5

Next Generation Science Standards

- ESS1.B--Earth and the Solar System
- Crosscutting concept-- Scale, Proportion, and Quantity

Materials

- Worlds in Comparison Play-Doh Recipe / Instruction Sheet for teacher
- Play-Doh (Enough for each student or group)
- Worlds in Comparison Planet Boxes print out or drawn (1 for each student or group)
- Plastic knife and ruler for each student or group
- Ruler for each student or group



Kitt Peak National Observatory

<http://www.noao.edu/kpno/>

This lesson is adapted from

Background Information for Teachers

It is difficult to compare the sizes of the planets in our solar system directly since the solar system is so vast and the planets are so large. In science, making models is a helpful, hands-on way to gain an understanding of hard to conceptualize subjects. Because our solar system's planets vary widely in size (both in diameter and mass), creating a model of comparison can be very helpful for conceptualization.

Our solar system's four inner planets are small and dense and made up of rock and metal. Our four outer planets are large, with low density, and are composed mainly of gas and ice. Tiny Pluto is not a planet at all, scientist's demoted Pluto to a dwarf planet in 2006.

Characteristics of material, size, and density help us to understand the differences between planets. This activity is also a good way to review the names of the planets. Older students can hypothesize why the inner planets are smaller than the outer planets. Might this have something to do with their proximity to our sun? What can we learn about the formation of the solar system and the force of gravity through understanding the sizes of planets?

If you have not done the Toilet Paper Solar System- a Scale Model activity yet, do that after this one. Through these two activities, students will gain a much better understanding of the scale of our solar system.

Kool-Aid/Play-Doh Recipe

You can prepare homemade Play-Doh or use store bought. This homemade Play-Doh can be stored in Ziploc bags for future use.

INGREDIENTS:

2 ½ cups flour

½ cup salt

2 packages of dry/unsweetened Kool-Aid (your color/flavor preference)

*If you don't have access to Kool-Aid, food coloring also works or the Play-Doh can be left plain.

2 cups boiling water

3 tablespoons vegetable oil

Mix the flour, salt, and Kool-Aid (food coloring) in a mixing bowl. Combine boiling water and oil then pour the liquid over the dry ingredients. Stir mixture until it forms a ball (this takes some time but just keep stirring). As the mixture cools, it becomes less sticky. When cooled sufficiently, remove it from the bowl and knead it until it is smooth.

Directions

1. You can start by having your students watch this fun introductory video on the activity:
<https://www.youtube.com/watch?v=RwFT8qGTsiE&t=1s>
2. Next print out the planet boxes. Or students can take 3 pieces of paper and separate each into thirds to create 9 sections. Write the names of all 8 planets and 1 dwarf planet in the sections.
3. Students then use the recipe to make their own Play-Doh at home. Last follow the instructions below to divide up the Play-Doh and place the parts into the proper planet boxes.

Divide the Entire Ball of Play-Doh into 10 Equal Parts

Roll the ball into one big hot dog shape. Then use a ruler to cut the shape into 10 equal parts.

- Combine 6 parts together and put them into the Jupiter box.
- Similarly combine 3 parts and put them into the Saturn box.

Cut the Remaining Part into 10 Equal Parts

Once again roll the ball into one big hot dog shape. Then use a ruler to cut the shape into 10 equal parts.

- Take 5 parts and combine them with the ball in the Saturn box.
- Combine 2 parts to put into the Neptune box.
- Combine 2 parts to put into the Uranus box.

Cut the Remaining Part into 4 Equal Parts

- Take 3 parts and combine them with the ball in the Saturn box.

Cut the Remaining Part into 10 Equal Parts

You're an expert at this now. Roll the ball into one big hot dog shape. Then use a ruler to cut the shape into 10 equal parts.

- Put 2 parts into the Earth box.
- Put 2 parts into the Venus box.
- Take 4 parts and combine them with the ball in the Uranus box.

Combine the Remaining 2 Parts and Cut into 10 Equal Parts

That's right make that hot dog shape again and grab your ruler.

- Put 1 part into the Mars box.
- Take 4 parts and combine them with the ball in the Neptune box.
- Take 4 parts and combine them with the ball in the Uranus box.

Cut the Remaining Part into 10 Equal Parts

That's right make that hot dog shape again and grab your ruler.

- Put 7 parts into the Mercury box.
- Take 2 parts and combine them with the ball in the Uranus box.

Cut the Remaining Part into 10 Equal Parts

Last time! Roll the ball into one big hot dog shape and use a ruler to cut 10 equal parts.

- Take 9 parts and combine them with the ball in the Uranus box.
- Put 1 part into the Pluto box.

Finally: Now that you have divided the Play-Doh to represent the planets by volume, roll the pieces in each planet's box into balls to best represent the shapes of the planets. These are now to the correct scale of the planets in our solar system!

- You can ask students to use the QR codes or the links below to learn about each planet after they make their scaled model. Or you can skip this and go to the last part of the lesson.

QR Code Website Links

- Mercury
 - <https://spaceplace.nasa.gov/all-about-mercury/en/>
- Venus
 - <https://spaceplace.nasa.gov/all-about-venus/en/>
- Earth
 - <https://spaceplace.nasa.gov/all-about-earth/en/>
- Mars
 - <https://spaceplace.nasa.gov/all-about-mars/en/>
- Jupiter
 - <https://spaceplace.nasa.gov/all-about-jupiter/en/>
- Saturn
 - <https://spaceplace.nasa.gov/all-about-saturn/en/>
- Uranus
 - <https://spaceplace.nasa.gov/all-about-uranus/en/>
- Neptune
 - <https://spaceplace.nasa.gov/all-about-neptune/en/>
- Pluto
 - <https://i.pinimg.com/originals/56/d8/9d/56d89dff9afed7bd3c48d59d73815262.jpg>

Invite students to learn a little about how the solar system formed.

- ***EITHER...*** Watch NASA Space Place: The Solar System's Formation on YouTube (https://www.youtube.com/watch?v=RT4OO0TFLHw&feature=emb_title) as a class and complete the fun informal assessment Kahoot style.
 - <https://create.kahoot.it/share/90dfe0de-155e-4c22-9017-5426deae45a0>
- ***OR...*** Have your students watch the video independently and answer the questions that pop up on the right of the video in this EdPuzzle.
 - NASA Space Place: The Solar System's Formation.
<https://edpuzzle.com/media/5f74bfcfcff16a4110f912d7>

This video gives you an opportunity to have students think about why the planets are different and how gravity is the force that created our solar system.