



## 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 minutes activity time

### Grade

- 3-6

### Next Generation Science Standards

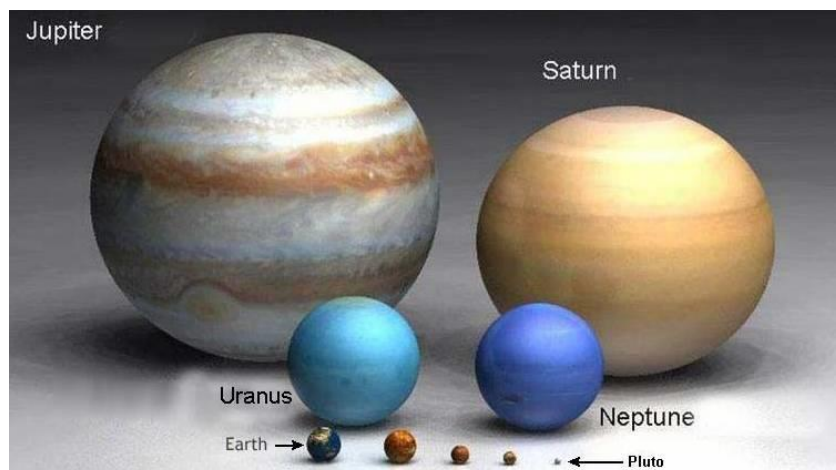
- 5-ESS1-1 Understanding relative distances through the solar systems scale
- MS- ESS1-3 Analyze and interpret data to determine scale of objects in the solar system

### Materials

- Common baking ingredients and Worlds in Comparison Play-Doh Recipe (on page 2 of this document)
- Homemade Play-Doh
- Planet boxes to print out OR 3 pieces of paper to create it yourself
- A plastic knife for each student

### Utah Science Core Standards

- 6.1.3 Use computational thinking to analyze data and determine the scale and properties of objects in the solar system. Scale can be size and distance. Data can be models.
- 6.3 Students will understand the relationship and attributes of objects in the solar system.



## Background information for Teachers/Parents

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 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?

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

## Kool-Aid/Play-Doh Recipe

This easy to make Play-Doh smells great and won't harm your child if they taste it!  
You can store it in a ziplock bag and reuse it.

### 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. Students should begin by using the Play-Doh/Kool-Aid recipe to create their own Play-Doh.
2. Print out the planet boxes. If you don't have access to a printer take 3 pieces of paper and separate it into thirds to create 9 sections. Write the names of all 8 planets and 1 dwarf planet (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto (a dwarf planet)).
3. Then students should follow the instructions below to divide up their Play-Doh and place the parts into the proper planet boxes.
4. **Divide the Entire Ball of Play-Doh into 10 Equal Parts**
  - a. *You may find it easiest to start by rolling the ball into one big hot dog shape. Then use a ruler to cut the shape into 10 equal parts.*
  - b. Combine 6 parts together and put them into the Jupiter box.
  - c. Similarly combine 3 parts and put them into the Saturn box.
5. **Cut the Remaining Part into 10 Equal Parts**
  - a. *Once again start by rolling the ball into one big hot dog shape. Then use a ruler to cut the shape into 10 equal parts.*
  - b. Take 5 parts and combine them with the ball in the Saturn box.
  - c. Combine 2 parts to put into the Neptune box.
  - d. Combine 2 parts to put into the Uranus box.
6. **Cut the Remaining Part into 4 Equal Parts**
  - a. Take 3 parts and combine them with the ball in the Saturn box.
7. **Cut the Remaining Part into 10 Equal Parts**
  - a. *You're an expert at this now. You'll start by rolling the ball into one big hot dog shape. Then use a ruler to cut the shape into 10 equal parts.*
  - b. Put 2 parts into the Earth box.
  - c. Put 2 parts into the Venus box.
  - d. Take 4 parts and combine them with the ball in the Uranus box.
8. **Combine the Remaining 2 Parts and Cut into 10 Equal Parts**
  - a. *That's right make that hot dog shape again and grab your ruler.*
  - b. Put 1 part into the Mars box.
  - c. Take 4 parts and combine them with the ball in the Neptune box.
  - d. Take 4 parts and combine them with the ball in the Uranus box.
9. **Cut the Remaining Part into 10 Equal Parts**
  - a. *Don't give up now- make your hot dog shape and grab your ruler.*
  - b. Put 7 parts into the Mercury box.
  - c. Take 2 parts and combine them with the ball in the Uranus box.
10. **Cut the Remaining Part into 10 Equal Parts**
  - a. *Last time! Roll the ball into one big hot dog shape and use a ruler to cut 10 equal parts.*
  - b. Take 9 parts and combine them with the ball in the Uranus box.
  - c. Put 1 part into the Pluto box.
11. ***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.***

## Going Deeper

1. After creating your planets ask yourself why the planets vary so much in size? Might it have something to do with how our Solar System was formed?
2. We have three videos you can watch on our webpage about the Solar System's formation. Find them at <http://www.greatbasinobservatory.org/lesson-plans/z-homeschool-worlds-comparison> You'll need to click on the video tab.
3. After watching one, two, or all, of the videos, try to explain to a sibling or adult
  - a. How the Solar System's planets formed. Remember to describe the force (*hint: it starts with a G*, that is key in the Solar System's, and in all the planet's formation)
4. Line up your Play-Doh planets in order from closest to the Sun to farthest from the Sun (leave Pluto-the dwarf planet out during this exercise).
  - a. Can you describe why the four inner planets are smaller and why the four outer planets are larger? Can you describe the differences in what the planets are made of? Attempt to explain the reasons the inner and outer planets are different. For example, how does their distance from the Sun, affects the temperature of the area they formed?

## You're a Super Star!

Hey, *super stars*, how about explaining what you learned to us? Make a video of yourself explaining one or all of the questions above. Show us your Play-Doh planets while you explain your knowledge about the Solar System's formation and the reasons the planets are so different. We would love to post it on our Facebook page! We will post the best explanations on our webpage. Send videos to [greatbasinobservaroy@gmail.com](mailto:greatbasinobservaroy@gmail.com).

We will only post with your permission, and we will only use your name with permission.

