



Toilet Paper Solar System - Scale Model

The distances between our planets are so vast they are almost incomprehensible. Visualize the expansiveness of our “cosmic neighborhood” with a roll of toilet paper to create a “scale” model.

Time

- 5 minutes prep time
- 30 minutes class time

Grade

3-6

Next Gen 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.

Utah Core Science Standards

3.5.1 Provide evidence showing that the sun is the source of heat and light for Earth.

6.3 Students will understand the relationship and attributes of objects in the solar system.

6.3.1c Use models that accurately depict the scale to compare sizes and distances between objects in the solar system.

Materials

- ◇ 4 rolls of toilet paper
- ◇ Clear tape to repair toilet paper tears
- ◇ 4 markers
- ◇ A way to mark the sun
- ◇ Rocks/weights to keep TP from blowing if outside
- ◇ Toilet Paper Solar System Worksheet for each student or student group
- ◇ Printouts of planets (see note below), stickers for planets, or other way to denote planets. (Optional)

If you use the planet print outs, you must let students know that the distance between planets is to scale, and the sizes of planets are to scale, BUT THEY ARE NOT ON THE SAME SCALE!

If planet size were on the same scale as distance, you would hardly be able to see any of the planets, they would be teeny tiny!

You may want to end your activity and discussion with these fun Youtube videos:

Bill Nye Demonstrates Distance Between Planets

<http://www.greatbasinobservatory.org/lesson-plans/toilet-paper-solar-system-scale-model>



Overview

Our solar system is so immense that the distances in space can be difficult for anyone to comprehend. In this activity, students will unroll a roll of toilet paper to build a scale model of distances in the solar system. While understanding these distances, students will explore why the sun is so essential to life on earth by examining the temperatures of each planet relative to the distance away from the sun. They will grasp that the location of the earth from the sun allows for life to be sustained due to the perfect amount of heat and energy produced by the sun.

Directions

- Give each student or student group a worksheet.
- Divide your students into 4 groups.
- Assign each group one close planet (Mercury, Venus, Earth, Mars) and one far planet (Jupiter, Saturn, Uranus, Neptune).
- Place a marker to designate the sun.
- Instruct students to use their worksheet table and toilet paper to find the scaled distance of their planet from the sun, affixing their planet and toilet paper to the ground (using tape or pins, depending on your ground) as they go.
- The number in the table is the number of sheets of toilet paper needed to reach the orbit of each planet. Each time they will start their unrolling of toilet paper from the sun.
- Have them repeat this as a group for their second planet.
- Have students write the planets average temperature in marker on the toilet paper under each planet.
- Have students answer the questions on the worksheet to make connection about the sun's role in temperature throughout the solar system and in the temperature of planets.



Notes for teachers

- 100 sheets of toilet paper stretch out to nearly 42 feet. Make sure you have room for your model before you start, a hallway, multipurpose room, or field works well.
- Be aware that even slight wind can blow toilet paper, you can ask students to place rocks on TP if working outdoors.
- Planets do not have to all be in a line! The planets in our solar system lie in a general circle around our sun. If you have the space- tell students to spread out. It will demonstrate distance better than if planets are all in one line.

Answers/Additional Information for worksheet

1. Why Earth is called the “Goldilocks Planet”- it is not too hot and not too cold for life to exist.
2. Could any of Earth’s life forms live on another planet? Why or why not? – This question is designed to help your students think critically. There is no right answer. You can dig deeper by discussing *extremophiles* and showing the videos on our video tab.
Life forms that exist in extreme conditions may be able to live on other planets. Scientists call these extremophiles (an organism, that lives in conditions of extreme temperature, acidity, alkalinity, or chemical concentration). Astrobiologists (scientists who study and look for life in outer space as well as on Earth) study extremophiles to learn about what life forms may exist beyond our world.
3. The sun is essential for supporting almost all of life on Earth- Why? Heat and energy. Life on Earth can exist because of our location, we are not “too hot or too cold” and because the sun provides energy to plants, which in turn provide energy to herbivores and omnivores, which in turn provide energy for carnivores. The sun is the source of almost all life on Earth. The few exceptions are the extremophiles discussed earlier.
4. What would happen to all living things if the earth was where Jupiter is? Most likely every living thing would perish.
5. Imagine we discover life in outer-space- in a neighboring solar system. What is most likely to support that life? A sun. Help students understand that each star in the sky is a sun. Each star/sun is smaller or larger than our sun. Many planets exist around these suns. To date, NASA's Kepler space telescope has discovered roughly 30 Earth-size exoplanets in their host stars' “habitable zone”. Scientists discovered the first planet outside our solar system (what we call an exoplanet) in 1988. Since then scientists have discovered 3,706 planets!