



# Modeling Science

## Solar System Scroll

### 5E Lesson Plan

Source Material: [Solar System Scroll](#)

Mission Focused Area: [Solar System and Beyond](#)

### Flipped Lesson Video

#### Lesson Overview

One of the most persistent misconceptions for students (and even adults) is just how much space is in space! Our solar system is often depicted as a bunch of planets equidistant from one another, always in a straight line. However, as seen in this activity, the relative distance between planets doesn't fit very well on a single page.

In this activity, students will predict the scale of our solar system and the distance between planets, then check their answers using fractions.

#### NASA Connection

More than 250 robotic spacecraft – and 24 humans – have ventured into space since we first began exploring Earth's atmosphere in 1958. [Juno](#) is a NASA spacecraft that's been orbiting Jupiter since July 2016 to help scientists understand that planet's origin and evolution. The Parker Solar Probe launched on August 12, 2018 on a mission to understand our Sun. The [Mars 2020 Perseverance Rover](#) launched in July 2020 to seek signs of ancient life and collect rock and soil samples for possible return to Earth. When we send spacecraft to planets like Saturn, we end up having to travel vast distances of empty space to get there. This is why so few missions have gone to the outer planets and beyond.

#### Objectives

- Students overcome common misconceptions about our solar system relating to relative distances between planets

#### Guiding Questions

- What are the proportional distances of the planets in our solar system?
- What are the properties of the inner planets compared to the properties of the outer planets?

#### Materials

- Strip of some type of paper the length of one "wingspan" — from fingertip to fingertip when arms are spread apart. This could be poster board, toilet paper, paper towels, grocery store receipt, a few pieces of printer paper taped together, craft paper, or gift wrap paper
- Pencil or colored pencils
- Markers

### National STEM Standards

#### NGSS

- **5-ESS1-1** Support an argument that differences in the apparent brightness of the Sun compared to other stars is due to their relative distances from the Earth
- **MS-ESS1-1** Develop and use a model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and seasons.
- **MS-ESS1-3** Analyze and interpret data to determine scale properties of objects in the solar system.

#### 5E Instructional Model



# Teacher Action

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▶ [Play Limits of the Solar System Video](#)



**Engage** - NASA eClips Video-Real World Limits of the Solar System

*Scripted CFU questions*

- What are the limits of our solar system?



**Explore** - Students Guess Solar System Distances

- Using marker or crayon:
  1. Draw Sun on left side of strip
  2. Write Kuiper Belt on right side of strip
- Using pencil:
  1. Students draw the planets on the strip where they think they should be placed

*Scripted CFU questions*

- Where did you place your planets?



**Explain** - Solar System Actual Distances

Using marker:

1. Fold paper in half. Draw Uranus on the crease formed at the  $\frac{1}{2}$  mark.
2. Fold Sun to Uranus. Draw Saturn on the crease formed  $\frac{1}{4}$  mark.
3. Fold Kuiper belt side to Uranus. Draw Neptune on this crease  $\frac{3}{4}$  mark.
4. Fold Sun to Saturn. Draw Jupiter on this crease  $\frac{1}{8}$  mark.
5. Fold Sun to Jupiter. Draw asteroid belt on this crease  $\frac{1}{16}$  mark.
6. Fold Sun to asteroid belt. Draw Mars on this crease  $\frac{1}{32}$  mark.
7. Draw all remaining inner planets (Earth, Venus, and Mercury) between Mars and the Sun

*Scripted CFU questions*

- What are the proportional distances of the planets?



**Elaborate** - Guess to Proportional Distances Comparison

- Students add a key to their scroll to identify which marks are guesses (pencil) and which are the actual planets (marker)

*Scripted CFU questions*

1. How did your guess match the proportional distance of the planets?



**Evaluate** - Students Complete Questions

Students answer questions:

1. What surprised you about your guesses versus the actual scale of the solar system?
2. The solar system is split into two groups: the inner and outer planets. Which ones are the inner planets and which are the outer planets? Did you draw that correctly in your guess?

3. What do you know about the makeup of the inner planets versus the outer planets that could be used to distinguish them?
4. Some planets are closer to Earth, but small, while others are larger but farther away. Which do you think would be easier to see in the night sky?

## Student Action

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### **Engage** - NASA eClips Video-Real World Limits of the Solar System

- Watch video while considering the question: What are the limits of our solar system?

### **Explore** - Students Guess Solar System Distances

- Students draw the planets in pencil on the strip in the places they deem to be correct

### **Explain** - Solar System Actual Distances

- Students draw the planets with distances that are proportional to actual distances

### **Elaborate** - Guess to Proportional Distances Comparison

- Students compare their guess to the proportional distances on their strip

### **Evaluate** - Students Complete Questions

- Students answer questions, perhaps with some research regarding the properties of the inner and outer planets

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