

STEAM Subject: Astronomy Lab: Solar System Model

Grades: 4th-8th

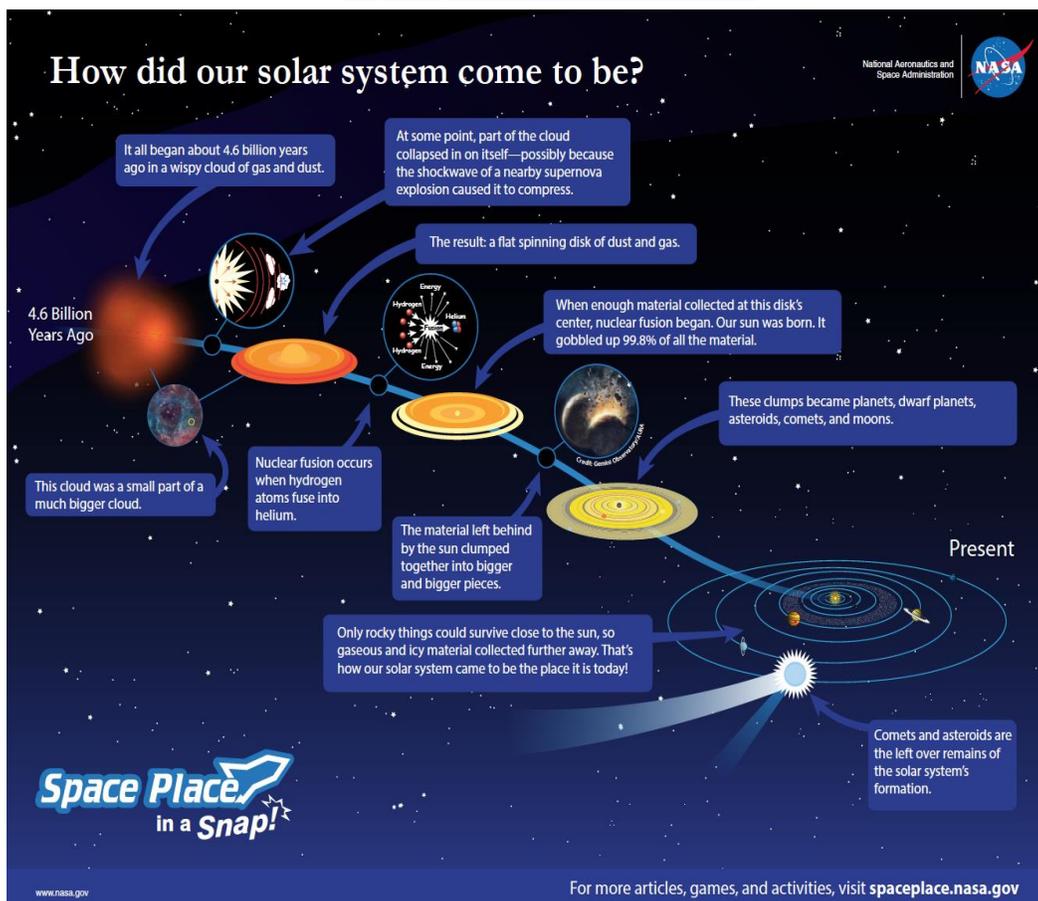
Learning objective:

Students will explore the planets in our solar system and create a model of the solar system.

ENGAGE:

Ask students the following questions:

- Can you name all the planets in the solar system? Which is your favorite planet?
- Why is Earth such a special planet?
 - *It has liquid water on its surface and supports life!*
- What are other objects in the solar system?
 - *Dwarf planets, asteroids, stars, comets, meteoroids, etc.*
- How did our solar system form?
 - *Watch this video: <https://youtu.be/libKVRa01L8>*



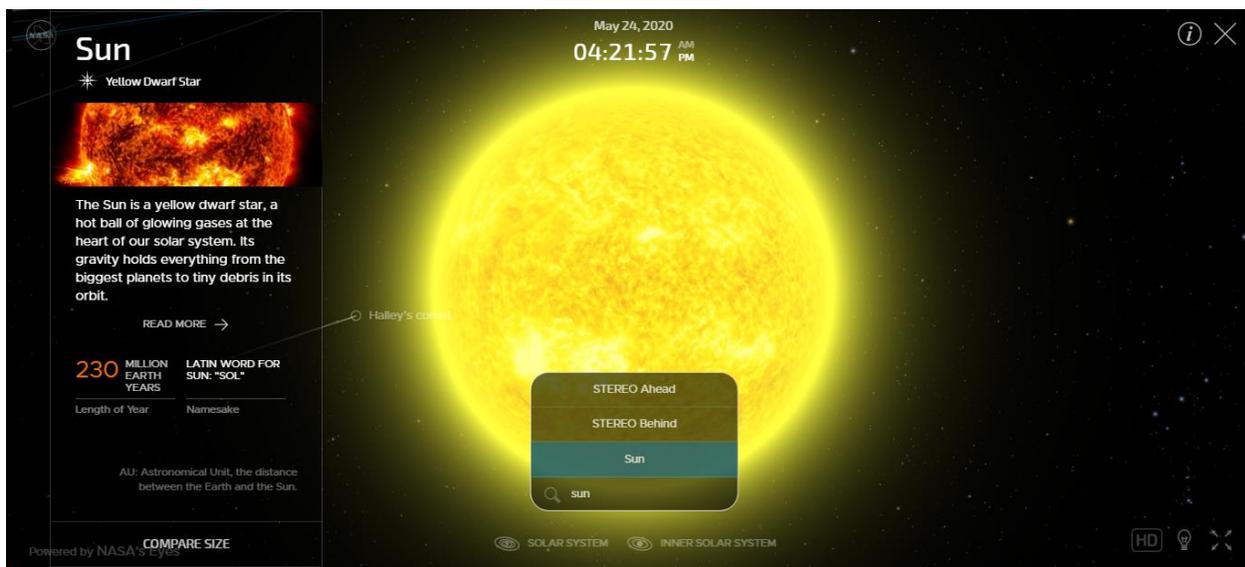
EXPLORE:

Part 1: Explore the Solar System

1. Navigate to <https://solarsystem.nasa.gov/> and click on the  orbit logo in the toolbar. This is the link to NASA's interactive solar system viewer.



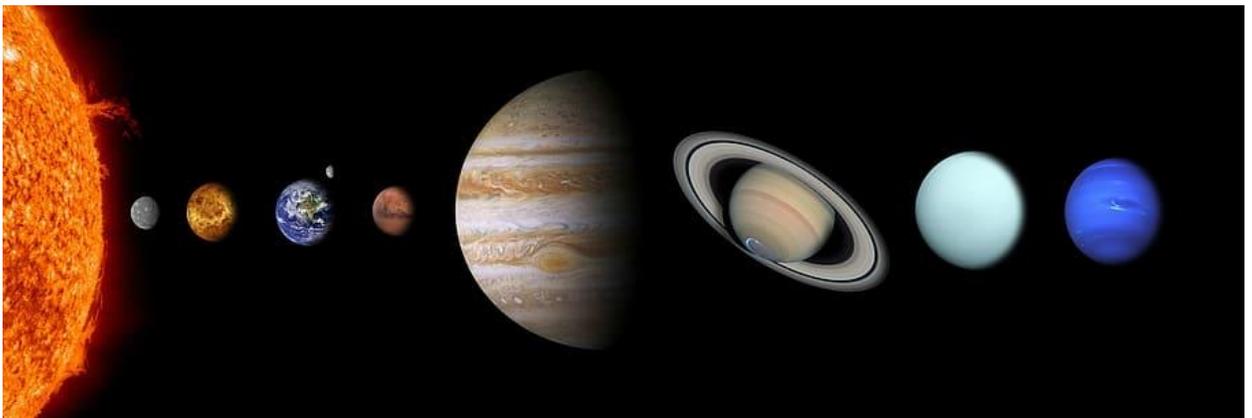
2. In the viewer, type in "Sun" to navigate to our star. There you can read some amazing facts and interact with the page. See the image below for an example of how your screen should look.



3. Type in the names of each of the planets listed below. Explore each of them as you read information about their features.
 - **Mercury:** The smallest terrestrial planet. Click on compare size on the bottom left side of your screen, click next until you see the Moon. Are they similar or different in size? Which one is bigger? What other similarities or differences do you notice between the Moon and Mercury?
 - **Venus:** The hottest planet in the solar system, it is about 800°F on Venus! Click on size comparison again, and compare the size of Venus and Earth. They are almost identical! In many ways, Venus and Earth are very similar, but Venus encountered a runaway greenhouse gas effect from carbon dioxide that heated the planet to the blistering hot temperatures it experiences today.
 - **Earth:** Planet Earth, the only planetary body known to harbor life and have liquid oceans. While visiting Earth on this viewer, turn the planet to the dark side with your mouse by clicking and dragging it to one side of the screen, can you see lights illuminating the darkness, what causes this?

- **Mars:** The “red planet” is really a desert world with a giant volcano and deep canyons. Don’t forget to search for water! Can you find the ice caps at the poles? The northern ice cap is made of frozen water!
- **Jupiter:** The largest planet in the solar system, with bands of light clouds, circular storms, and a massive ~350-year-old storm called the Great Red Spot! What colors is Jupiter’s atmosphere?
- **Saturn:** All of the Jovian planets have rings, but Saturn’s are the largest! The rings are held in place by orbiting moons. Enceladus is one of these moons and scientists have it in their sights to possibly visit this moon in hopes of finding life in its deep liquid oceans.
- **Uranus:** This blue-green planet gets its color from the methane in its atmosphere. Uranus spins on its side at a 90° tilt, on its axis. Can you tilt to your side and spin like Uranus? Not as easy as it looks!
- **Neptune:** This large blue planet also gets its color from the methane in its atmosphere. The fastest winds in the entire solar system blow on Neptune at its poles, at around 790 miles per hour!
- Other things to explore on the viewer: Dwarf planets, moons, comets, meteoroids, asteroids, satellites, etc.!

Part 2: Create a Model of the Solar System



Materials needed:

- 1 paper plate
- Scissors
- Markers
- Crayola Model Magic (various colors preferred, or white that can be colored with markers)
- Hot Glue Gun and Hot Glue Sticks (Requires adult supervision at all times)
- String

Directions:

1. Draw a spiral on the back of your paper plate and cut it out. Optional: use a black/navy paper plate to mimic the color of space, or you can color your plate with markers.
2. Form 1 Sun out of Model Magic clay.
3. Form 8 planets out of Model Magic clay (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune).
Note: All planets should be smaller than the Sun! Try to size them appropriately based on the image above. Add rings to the planets that contain them.
4. When you are done, line up your planets up in a row and ask an adult to help hot glue them onto your plate. Start with the Sun in the center spiral and space out the remaining planets on your plate.
5. Add a string so you can hang up your spiral solar system model.
6. Label the Sun and each planet with markers.
7. Decorate your solar system with asteroids, meteoroids, stars, and dwarf planets if you would like.



Examples of solar system models made by EIS students.

EXPLAIN:

- How did our solar system form?
 - Scientists theorize that the solar system formed about 4.6 billion years ago from a cloud of gas and dust that began to collapse after a shockwave from a nearby supernova hit the dust cloud in our arm of the Milky Way

Galaxy. 99.8% of that material formed our Sun. The early Sun grew hot enough to begin a chain reaction through nuclear fusion. This reaction generated enough energy to fuel the solar wind, magnetic field, and the light energy that powers life on Earth. The Sun also grew big enough to create a large gravitational field that keeps all planets in orbit around it. Shortly after the Sun formed, the remaining material formed Jupiter, the rest of the planets, comets, asteroids, and meteoroids.

- How does the solar system work?
 - The solar system is made up of the Sun at the center, four terrestrial planets, four Jovian planets, an asteroid belt, and many other objects! The solar system works like a clock: the bodies orbit around the Sun at regular intervals, and positions can be determined through mathematics. This is a very exciting time in space travel because humans live in outer space on the International Space Station and we are making new discoveries about our solar system and the universe every day!

Review STEAM Vocabulary:

- **Dwarf Planet:** Small bodies that orbit the sun, are spherical in shape but have not cleared their gravitational orbit of all debris. Pluto is a dwarf planet.
- **Jovian Planet:** Larger gassy planets made up of mostly hydrogen and helium. The Jovian planets Jupiter, Saturn, Uranus, and Neptune all have rings.
- **Nebula:** a giant cloud of gas and dust in space where new stars are born.
- **Nuclear Fusion:** The process by which the Sun generates and releases energy in its core.
- **Orbit:** The path that an object takes in space when it goes around a star, a planet, or a moon.
- **Terrestrial Planet:** Smaller rocky planets made up of metals and silicates. Mercury, Venus, Earth, and Mars are terrestrial planets.

EVALUATE:

Ask your students the following questions to see what they learned:

- How old is the solar system and how did it form?
- How many planets are there in the Solar System?
- What planet is closest to the Sun? Which is farthest from the Sun?
- Are all planets alike? How is Earth similar to or different from other planets in our Solar System?
- Have students do independent research about a planet in the solar system using the NASA interactive viewer as a starting point.
- Have students write a short essay about the planet detailing its main features and some of its most interesting characteristics.

ELABORATE:

- Check out more activities from NASA: <https://solarsystem.nasa.gov/kids/do-it-yourself/>
- Watch these videos about the planets in our solar system:
 - Mercury: <https://youtu.be/OKBjnNuhRHs>
 - Venus: <https://youtu.be/BvXa1n9fjow>
 - Earth: <https://youtu.be/HCDVN7DCzYE>
 - Mars: <https://youtu.be/E-PuUs25rJA>
 - Jupiter: <https://youtu.be/PtkqwsIbLY8>
 - Saturn: <https://youtu.be/epZdZaEQhS0>
 - Uranus: <https://youtu.be/m4NXbFOiOGk>
 - Neptune: <https://youtu.be/NStn7zZKXfE>

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