Planet Orbits and Gravity

WK 4: April 27- May 1

8th Grade Science Klinger & Sherman

Priority Standard(s):
DCI ESS1.B The solar system consists of the sun and a collection of objects, the planets, their moons, and asteroids that are held in orbit around the sun because of its gravitational pull on them. (MS-ESS1-2), (MS-ESS1-3)

What am I learning?
- What is an astronomical unit?
- How to describe the size and shape of planetary orbits.
- What is gravity?
- How does mass and distance influence the gravitational attraction between two objects?

How do I know I learned?
- Define astronomical unit.
- Describe the size and shape of planetary orbits.
- Define gravity.
- Explain how mass and distance influence the gravitational attraction between two objects.

Key Content/Modeling
Assignment 1: Frayer Model Vocabulary (see You Try)
Assignment 2: Using the APRIL packet, scroll down to page 109 which is the chapter outline of the SCIENCE section. This week you will be working on Lessons 1.5, 1.6, 1.7, and 1.8 pages 123-134.
Assignment 3: Extra Learning Opportunities Attached.

You Try
Create a Frayer model to define each vocab word (identify some of the characteristics/attributes, give examples, illustrate, use in a sentence).

- astronomical unit
- dwarf planet
- moon
- asteroid
- orbits
- gravity
- satellite
- terrestrial planets
- gas planets
- planetary rings

Show me what you know (Proof of learning)
Student emails their responses to the Review questions from each lessons to their teacher.

Self-Assessment
What is an astronomical unit and what is it used for?

Extra Learning Opportunities Attached - Activity 1: Read What’s Inside Our Solar System?, decide which objects you think are inside our solar system, and explain your thinking. Activity 2: Read the informational texts Solar System and The Planets and answer the questions on a separate piece of paper or print out the worksheet and answer on your copy.
ACTIVITY 1: Look at *What’s Inside Our Solar System?*, decide which objects you think are inside our solar system, and explain your thinking.

**What’s Inside Our Solar System?**

Many things are found inside our solar system. Put an X next to the things you think are found within our solar system.

- A the Sun
- B dwarf planets
- C galaxies
- D the North Star
- E Earth
- F Earth’s Moon
- G planets
- H pulsars
- I black holes
- J nebulae
- K comets
- L meteors
- M asteroids
- N constellations
- O satellites
- P space junk

Explain your thinking. How did you decide if an object was inside our solar system or not inside our solar system?

ACTIVITY 2: Read the informational texts *Solar System* and *The Planets* and answer the questions on a separate piece of paper or print out the worksheet and answer on your copy.

**SOLAR SYSTEM**

Solar means anything that has to do with the sun. System means a group of things that are organized to form a whole. Our solar system is the sun and the objects that are organized and travel around it. There are many parts of our solar system. Let’s take a quick look at the system as a whole and then we can learn about each part in much more detail.

Our solar system consists of the sun, eight planets, the moons around the planets, asteroids, meteoroids, and comets. The solar system also includes solar wind and dust; however, most of the solar system is mostly empty space. Each member of the solar system has its own characteristics.
All the parts of the solar system move around other objects. The moons move around their planets. The planets move around the sun. The sun also moves around the center of the Milky Way galaxy, along with billions of other stars, planets, moons and other celestial objects. At the center of our galaxy is a black hole.

The sun is said to be at the center of our solar system. The other members surround the sun and revolve around it, each in its own orbit. Astronomers believe that the sun is actually NOT in the center of the solar system, but is off to one side. Most of the members of the system orbit the sun in elliptical, or oval, paths—not round ones. Their paths are not as oval as a football or an egg, but nonetheless are not perfectly round.

How did our solar system form? Once again, scientists do not really have enough facts to answer this question completely and with full certainty. They are dealing with theories. We shall explore a couple variations of the most widely accepted current theories

One theory is called the Dust Cloud Theory. This idea suggests that the sun and planets formed at the same time from large clouds of dust and gas. One large cloud was revolving and began to collapse. The dust and gas particles began to form the planets and sun, which continued to revolve. The theory further explains that the extra gas and dust were pushed from the center of the solar system to the edge by the heat of the sun. There is evidence of dust and gas clouds in space which supports this theory in the minds of many astronomers.

A variation of the Dust Cloud Theory explains how a huge cloud of dust and gas in one arm of the Milky Way galaxy began to collapse. Gravity began to squeeze all of the particles together, and they rotated at faster and faster speeds. As the gases continued to be squeezed together, hydrogen atoms began to change to helium atoms in nuclear reactions. These compressed gases began to give off tremendous amounts of heat and our sun was born. Away from the center, the cloud was less dense and the temperatures were not as high. Dust and gas particles began to combine and formed large lumps. As the lumps collided, they combined and formed larger and larger bodies which finally became the planets we know today.

**DIRECTIONS:** Answer the questions below with complete sentences.

1. What do the words *solar* and *system* mean?

2. What are the six major parts of the solar system?

3. All of the parts of the solar system revolve around the sun. What does the sun revolve around?

4. Is the sun at the center of the solar system? Explain.

5. What is the shape of the orbits of most of the members of the solar system?

6. Why must astronomers consider only theories about the origin of our solar system?
7. What does the Dust Cloud Theory suggest our solar system formed from?

8. What was the cloud doing that most objects in the solar system continue to do today?

9. What happened to the extra gas and dust after the solar system was formed?

10. What evidence have astronomers found to support the Dust Cloud Theory?

11. What causes hydrogen atoms to fuse together and become helium atoms?

12. How did the planets form in one of the theories?

THE PLANETS

Long ago as they looked into the night sky, people noticed different celestial bodies. They noticed lights that twinkled and shimmered from afar. They also noticed that some of those twinkling lights changed position in the sky from week to week and season to season. However, they all seemed to stay in the same formation. Other lights seemed to move around the sky, wandering in and out among the others. They named these celestial bodies planetes, which meant ‘wandering stars’. From this word comes the term planet which means a large object orbiting the sun.

Today we know there are many differences between the planets and the stars. We understand the stars create light, but the planets simply reflect the light from our sun. Sometimes they even seem to twinkle, but that is the reflected light bending and shimmering as it passes through the Earth’s atmosphere.

As astronomers have studied the planets of our solar system, they have divided them into two groups: the inner planets and the outer planets. The inner planets are the four planets which are closest to our sun. They are relatively small in size and have solid surfaces. Mercury, Venus, Earth, and Mars make up this inner group of planets. They are often called the rocky planets. The outer planets are further from the sun, seem to have solid cores but gaseous surfaces, and are generally much larger in size than the inner planets. Jupiter, Saturn, Uranus, and Neptune make up this outer group of planets. These four planets are called the gas giants.

All eight of the planets orbit the sun. Each planet has its own unique and individual orbit. The orbits are all elliptical in shape and vary in length. The sun is slightly off center for all of the orbits. The smaller, inner planets complete their orbits in less time than the larger, outer planets do. The shape of the inner planets orbits tend to be more rounded than the shape of the outer planet orbits as well.

Due to each planets elliptical orbit, the planets are not always the same distance from the sun during their entire orbit around the sun. As the planets travel around the sun, the speed of the planet varies compared to the planets distance from the sun. When the planet is moving
closer to the sun the speed increases due to the greater gravitational pull from the sun. As they start the part of their orbit that moves away from the sun, the gravitational pull from the sun is weaker and the planet will start to decrease its speed around the sun.

What about Pluto? Pluto is a dwarf planet in the Kuiper belt, a ring of bodies beyond the last gas giant, Neptune. It was the first Kuiper belt object to be discovered. Pluto was discovered by Clyde Tombaugh in 1930 and was originally considered to be the ninth planet from the Sun. When more objects were discovered that were similar to Pluto, they were all classified as dwarf planets, sometimes called ‘plutoids’.

DIRECTIONS: Answer the questions below with complete sentences.

1. Why did early observers call some celestial bodies planetes?

2. What does the word planet mean?

3. What is one major difference between stars and planets?

4. How do the sizes of the inner and outer planets compare?

5. How does the distance from the sun of the inner and outer planets compare?

6. How do the shapes of the inner and outer planets orbits compare?

7. Why do they call the inner planets rocky planets?

8. Why do they call the outer planets gas giants?

9. Why do the speeds of the planets in orbit vary?

10. Why has Pluto been removed from the planet list?