S4E1-2: Stars and Solar System

Dates: 1/19 – 2/25

Key Terms

Solar System[2]
Inner Planets[2]
Outer Planets[2]
Stars[1]
Planets[2]
Orbit[3]
Rotation[2]
Revolution[2]
Galaxies[2]
Universe[2]
Phases[3]
Waxing[3]
Waning[3]
Satellite[2]
Moon[1]
Constellation[2]
Telescope[2]
Relative size[3]
Order[1]
Axis[2]
Day and Night Cycle[2]
Tilt of Earth's Axis[3]

Framework for Teaching:

Students Will Be Able To:

1. Use a model to explain the relationship between the Earth's rotation on its axis and the day and night cycle.
2. Explain the relationship between seasonal changes and the revolution of the Earth around the sun and the tilt of the Earth on its own axis.
3. Differentiate between a day and year based on the rotation of Earth on its axis and the revolution of the Earth around the sun.
4. Explain and describe the phases of the moon.
5. Relate the phases of the moon to the revolution of the moon around the earth and the resulting reflected light from the sun.
6. Compare and contrast waxing and waning in regards to the phases of the moon.
7. Identify our solar system as composed of planets, moons, and asteroids. Differentiate between these three components.
8. Understand that stars are not necessarily part of our solar system; however the sun is a star in our solar system.
9. Compare and contrast characteristics of the inner and outer planets.

10. Understand that the universe is everything that exists in space.
11. Explain why stars appear stationary but planets are in different locations at different times.
12. Provide examples of technology that is used to observe objects in the night sky.
13. Identify examples of constellations.
14. Compare and contrast stars based on size, color, number, and patterns (e.g. constellations)

For the teacher to know for their own understanding and to avoid misconceptions:

1. The Earth rotates on its axis, which is tilted. This not only affects the shift from night to day but it also provides an explanation for the periods of permanent day and night in certain locations (e.g. Alaska)
2. The revolution of the moon around the Earth and the planets around the sun can be explained by the gravitational force between the Earth/Moon and Sun/Planets. The revolving bodies fall toward the larger mass (i.e. Sun) in a circular path. (the revolution is not a perfect circle)
3. The phases of the moon are a result of the positions of the sun, moon, and Earth.
4. The phases of the moon are *new moon, waxing crescent, half moon (waxing), waxing gibbous, full moon, waning gibbous, half moon (waning), waning crescent* → **starts back at New Moon**
5. The sun is star, not a planet. It is a hot ball of gas.
6. The AU is the average distance between the Earth and the Sun. (93 million miles)
7. The issue with Pluto as a planet is a good discussion point. As of today Pluto is classified as a dwarf planet.
8. A year varies from planet to planet. A year is the time measurement for a planet to revolve around the sun. The "Earth Year" is 365.25 days. A month is the approximate time it takes for the moon to go through all phases. A "Mars Year" is about twice as long as an "Earth Year".
9. There are different types of telescopes; however the data collected by astronomers is recorded electronically.

Activities (Suggestions)

- ✓ The Night Sky (Picture Perfect)
- ✓ Earth Rotation lab: Using a globe and lamp, students will model the rotation of the earth in order to see day and night cycles.
- ✓ Seasons and Sunlight (page 58)
- ✓ Distances Between Planets (page 70)
- ✓ Make a Telescope (page 84)

Notes:

This unit lends itself to writing and journaling. Additionally, while comparing planets you can use math to quantify size differences, "years", and temperatures of planets. Math can be incorporated due to the nature of the cycles (length of time, fractions of the moon phases). The discussion around the distances between planets can give students a deeper understanding of magnitude and scale. For example, the Earth is 746 million miles from Saturn which is 8 times the distance from the Earth to the sun. Learners tend to relate distances and times to their everyday lives. Another example would be that a Saturn year is approximately 29 Earth years which means we might be lucky enough to live to be 3 years old on Saturn. Lastly pay attention to the use of units. Try to have students talk about distance using lengths (feet, miles, meters, kilometers) as opposed to time. Have them make these connections *"It is 30 minutes to my house"* is not a distance.