

# Phoenixville Area School District Understanding by Design (UbD) Science Template

**Grade Level: 6**

**Unit Name: Earth's Place in the Universe**

**Author: L. Freeman**

## Stage 1 Desired Results

<p><b>Overarching NGSS &amp; PA Standards:</b></p> <p><b>3.3.6-8.A</b> 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.</p> <p><b>3.3.6-8.B</b> Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.</p> <p><b>3.3.6-8.C</b> Analyze and interpret data to determine scale properties of objects in the solar system.</p>	<i>Transfer</i>	
	<p><i>Students will be able to independently use their learning to...</i></p> <ol style="list-style-type: none"> <li>1. Ask questions and/or define problems</li> <li>2. Develop and/or use models</li> <li>3. Plan and/or carry out investigations</li> <li>4. Analyze and interpret data using computational thinking</li> <li>5. Obtain, evaluate, and communicate information (supported by evidence)</li> <li>6. Construct explanations and design solutions</li> </ol>	
	<i>Meaning-Making</i>	
	<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• Earth and its solar system are part of the Milky Way galaxy, which is one of the many galaxies in the universe.</li> <li>• The solar system consists of the sun and many other objects including planets, their moons, asteroids, and stars.</li> <li>• The planets, moons, asteroids, and stars in our universe are held in orbit around the sun by its gravitation pull on them.</li> <li>• There are predictable patterns of motion of the sun, the moon, the stars.</li> <li>• There are relationships between the Earth-moon systems and the sun which cause predictable patterns.</li> </ul>	<p><b>ESSENTIAL QUESTIONS</b> <i>Students will keep considering...</i></p> <ol style="list-style-type: none"> <li>1. What is the universe and what is Earth's place in it?</li> <li>2. What are the predictable patterns caused by Earth's movement in the solar system?</li> <li>3. What impact do forces have on the movement of Earth and other planets?</li> </ol>
<i>Knowledge and Skills Acquisition</i>		
<p><i>Students will know...</i></p> <ul style="list-style-type: none"> <li>• Earth is part of the Milky Way Galaxy and other galaxies exist in our universe.</li> <li>• The relative spatial scales of solar systems and galaxies.</li> <li>• Gravity as an attractive force between solar system and galaxy objects and is dependent on the mass of an object.</li> </ul>	<p><i>Students will be skilled at...</i></p> <ul style="list-style-type: none"> <li>• Comparing Earth to the other collection of bodies within our universe (universe-galaxy-solar</li> </ul>	

<p><b>3.2.6-8.J</b> Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.</p>	<ul style="list-style-type: none"> <li>• Gravitational forces from planets cause smaller objects (e.g., moons) to orbit around planets</li> <li>• Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.</li> <li>• The orbital motion of objects in our solar system (ex. moons orbit around planets, all objects orbit the sun).</li> <li>• Earth rotates on its tilted axis once an Earth Day – 24 hours.</li> <li>• The Earth-moon system orbits the sun once an Earth year – 365.25 days.</li> <li>• The distance between Earth and the sun stays relatively constant throughout the Earth’s orbit.</li> <li>• Earth’s spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun.</li> <li>• The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.</li> <li>• Earth maintains the same relative orientation in space, with its North Pole pointed toward the North Star throughout its orbit.</li> <li>• The moon rotates on its axis at the same rate at which it orbits Earth in approximately one month.</li> <li>• The visible proportion of the illuminated part of the moon (as viewed from Earth) changes over the course of a month as the location of the moon relative to Earth and the sun changes.</li> <li>• Solar energy reflects off the side of the moon that faces the sun causing different phases of the moon.</li> <li>• Relative positions of the sun-moon-Earth during eclipses.</li> <li>• The effect of the Earth’s tides due to the location of the moon.</li> </ul>	<p>system-stars-planets-asteroids)</p> <ul style="list-style-type: none"> <li>• Use models to explain that gravity is the inward-pulling force that keeps smaller objects in orbit around larger objects which holds the solar system together.</li> <li>• Use models to illustrate the direction gravity acts at different points on Earth.</li> <li>• Students use quantitative analyses to describe* similarities and differences among solar system objects by describing* patterns of features of those objects at different scales: distance from the sun, composition, and size.</li> <li>• Creating and using models to explain the reason for day/night on Earth.</li> <li>• Creating and using models to explain the reason for seasons on Earth.</li> <li>• Creating and using models to identify the phase of the moon when given relative locations of the Earth-sun-moon systems.</li> <li>• Describe the patterns shown in moon phases, tides, lunar, and solar eclipses.</li> <li>• Differentiate between high and low tide and its connection to the moon.</li> </ul>
<p><b>3.2.6-8.K</b> Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.</p> <p><b>Which branch(es) of science apply:</b></p> <p><b>E&amp;SS</b></p> <p><b>PS</b></p>	<p style="text-align: center;"><b>KEY VOCABULARY</b></p> <ul style="list-style-type: none"> <li>• Universe</li> <li>• Galaxy</li> <li>• Solar System</li> <li>• Rotation (Revolution)</li> <li>• Revolution (Revolve)</li> <li>• Gravity</li> <li>• Inertia</li> <li>• Waxing</li> <li>• Waning</li> <li>• Crescent</li> <li>• Gibbous</li> </ul>	

- New Moon
- Full Moon
- First Quarter/Last Quarter
- Solar Eclipse
- Lunar Eclipse
- Low Tide
- High Tide
- Spring and Neap Tides

**Stage 2 – Evidence**

**Evaluative  
Criteria**

*Assessment Evidence*

**PERFORMANCE TASK(S):**

**Differentiation Considerations:**

Rubric

Students will create a video response with pictures answering “Stark Alien’s” questions about life on Earth using Adobe Creative Cloud Express. Students must include:

1. Reasons for day and night on Earth
2. Reasons for the changing seasons on Earth
3. Reasons for the moon changes on Earth and 8 phases
4. Defining the important terms: waxing, waning, crescent, and gibbous
5. Explaining the reasons for changing tides
6. Linking the phases of the moon to the tides (Spring and Neap Tides)
7. Diagrams, models, graphs and/or illustrations
8. Any other information that you think would be helpful to Stark, our alien visitor

Pictures

Spoken audio in English/Spanish

Access to information to include

Chunked- Day by Day plan

Common Summative Performance Task - Sun, Moon, and Stars

	OTHER EVIDENCE:	Differentiation Considerations:
Content Criteria	1. Investigate our Solar System <ul style="list-style-type: none"> <li>Discover the inner planets and learn commonalities</li> <li>Make a model of the planets and their distance from the sun</li> <li>Discover the outer planets and learn commonalities</li> <li>Make a model of the planets to size with Play-doh</li> </ul>	Modified Quizzes
Graded Lab Sheet	2. Phet Simulation – Gravity and Orbits - <a href="https://phet.colorado.edu/sims/html/gravity-and-orbits/latest/gravity-and-orbits_en.html">https://phet.colorado.edu/sims/html/gravity-and-orbits/latest/gravity-and-orbits_en.html</a> <ul style="list-style-type: none"> <li>Students investigate the movement of satellites and experiment with gravitational pull and mass</li> <li>Gravity and Orbits Lab Sheet</li> </ul>	Flexible grouping Homogeneously grouped labs to allow for teacher support
Graded Quizzes	7. Where is Earth? <ul style="list-style-type: none"> <li>Create conceptual understanding of Earth and its placement in our universe</li> </ul>	Guided/Cloze Notes
Content Criteria	Universe - Largest to Smallest Universe Largest to Smallest (Ticket Out)	Pictures and videos to support vocabulary
Observation/ Answer Check	8. Stars Stars in our universe Information Student Notes	Sentence Starters
Content Criteria	9. Rotation and Revolution – model in classroom Rotation and Revolution Learning Rotation and Revolution Foldable	Product modification in place of writing: -Drawing -Verbal explanation
Graded Quizzes	10. Moon Before/After Learning Questions	
Content Criteria	11. Moon Phase Lab <ul style="list-style-type: none"> <li>Students investigate the changes of the moon with this hands-on lab</li> <li>A light source is set up in the middle of the room, students hold a stick with a Styrofoam ball attached. Students begin looking at the light source with the Styrofoam ball in front and above their face. Rotating counterclockwise, students investigate the changes of the moon based upon movement.</li> <li>Students draw observations here (linked)</li> <li>Moon Phase Notes</li> </ul>	
Observation		
	7. Solar and Lunar Eclipses – Sun, Moon, and Earth Interactions	

8. Sun-Earth-Moon Review Task Cards

- Students check understanding of the Sun-Earth-Moon Systems (linked above)

9. Movement in Space Study Guide

Movement In Space CS

10. Moon Effect on Ocean Tides Flipbook

- Students create a Flipbook of the moon phase and its effect on ocean tides (linked above)

11. Spring and Neap Tides

Tide Project (TS)

12. Moon and Tides Study Guide

13. Science Notebook Entries

- Concept maps
- Vocabulary/Glossary entries
- Guided Research

14. Class Participation

- Volunteering
- Note-taking
- Participation in Labs