

## MAPPING GRADE 6 SCIENCE INSTRUCTION

**Concept:** Organization of the Solar System

**PWC Objective: 6.8(a)**

The student will investigate and understand the organization of the solar system. Key concepts include:

- the sun, moon, Earth, other planets and their moons, meteors, asteroids, and comets **(SOL 6.8a)**
- relative size of and distance between planets **(SOL 6.8b)**
- the unique properties of the Earth as a planet **(SOL 6.8f)**
- the role of gravity **(SOL 6.8c)**
- the history and technology of space exploration **(SOL 6.8i)**

<b>What Students Should Know</b> (Critical Attributes)	<b>What Students Should Be Able To Do</b> (Essential Skills)
<p><b><u>Essential Questions:</u></b></p> <ul style="list-style-type: none"> <li>• What are the components of the solar system?</li> <li>• What are meteors, asteroids, and comets?</li> <li>• How do we distinguish between planets with very different physical properties?</li> <li>• What are some distinguishing characteristics of Earth as a planet?</li> <li>• How do we explore the solar system?</li> </ul> <p><b><u>Critical Attributes:</u></b></p> <p>6.8a The solar system consists of the sun, moon, satellites, nine planets, and their moons, meteors, asteroids, and comets.</p> <p>6.8a A <i>meteor</i> is a piece of stony or metallic material that enters the Earth’s atmosphere, burns up and falls as dust. These meteors become visible as streaks of light in the sky. An <i>asteroid</i> is a round or irregularly shaped rocky object in space. <i>Comets</i> are icy bodies that normally travel around the sun in a long oval orbit.</p> <p>6.8a The nine planets have very different size, composition, and surface features. Some planets have a great variety of moons and even flat rings of rock and ice particles orbiting around them. Some of these planets show evidence of geological activity.</p>	<ul style="list-style-type: none"> <li>• Design and interpret a scale model of the solar system. (A scale model may be a physical representation of an object or a concept. It can also be mathematical representation that uses such factors as ratios, proportions, and percentages.)</li> <li>• Differentiate among comets, asteroids, and meteors.</li> </ul>

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<b>What Students Should Know (Critical Attributes)</b>	<b>What Students Should Be Able To Do (Essential Skills)</b>
6.8b The distance between planets and sizes of planets varies greatly. The Earth-like “terrestrial” planets—Mercury, Venus, Earth, and Mars—are small, dense rocky worlds. They have solid surfaces and are located in the inner part of the solar system. Unlike the terrestrial planets, the Jovian or “gas” planets in the outer solar system have no solid surface.	<ul style="list-style-type: none"><li>• Differentiate between terrestrial and gas planets.</li></ul>
6.8b Our everyday experiences with distance do not prepare us to think about the distances and sizes of planets and the solar system as a whole. Astronomers use shorthand involving the speed of light to describe the enormous distances between objects in the universe	
6.8f The Earth is one of the terrestrial planets. It is rocky and extensively covered with large oceans of liquid water, having frozen ice caps in its polar regions. The Earth has a protective atmosphere consisting predominantly of nitrogen and oxygen and has a magnetic field. The atmosphere and the magnetic field help shield the Earth’s surface from harmful solar radiation. Scientific evidence indicates the Earth is about 4.5 billion years old.	<ul style="list-style-type: none"><li>• Describe the unique characteristics of planet Earth.</li></ul>
6.8c Gravity is a force that keeps the planets and all objects within the solar system orbiting around the sun. Gravity acts everywhere in the universe.	<ul style="list-style-type: none"><li>• Explain the role of gravity in the solar system.</li></ul>
6.8i The ideas of Ptolemy, Aristotle, Copernicus, and Galileo contributed to the development of our understanding of the solar system.	<ul style="list-style-type: none"><li>• Compare and contrast the ideas of Ptolemy, Aristotle, Copernicus, and Galileo related to the solar system.</li></ul>
6.8i Space technology is continuously advancing and changing to meet the human desire to explore the universe. The invention of the telescope allowed us to observe objects in space. The invention of manned and unmanned space travel vehicles (rockets, space probes, the space shuttle, space stations) have allowed us to conduct space missions to add to our knowledge of space.	<ul style="list-style-type: none"><li>• Create and interpret a timeline highlighting the advancements in solar system exploration over the past half century. This should include information on the first modern rockets, artificial satellites, orbital missions to the moon, Mars robotic explorers, and explorations of outer planets.</li></ul>
6.8i Space technology also helps improve our everyday lives through the development of satellites for weather forecasting, communications, and prospecting for energy resources.	

## MAPPING GRADE 6 SCIENCE INSTRUCTION

**Concept:** The Solar System: Earth-Moon-Sun Relationships

**PWC Objective: 6.8(b)**

The student will investigate and understand relationships among the Earth, moon, and sun. Key concepts include:

- revolution and rotation **(SOL 6.8d)**
- mechanics of day and night and the phases of the moon **(SOL 6.8e)**
- the relationship of the Earth's tilt and seasons **(SOL 6.8g)**
- the causes of tides **(SOL 6.8h)**

<b>What Students Should Know</b> (Critical Attributes)	<b>What Students Should Be Able To Do</b> (Essential Skills)
<p><b><u>Essential Questions:</u></b></p> <ul style="list-style-type: none"> <li>• How do planets move on their axes?</li> <li>• How do planets move around the sun?</li> <li>• Why are there seasons on Earth?</li> <li>• Why do we see phases of the moon?</li> <li>• What is the relationship between the Earth's tilt and the seasons?</li> <li>• How does the relationship between Earth and the moon's movements create tides?</li> </ul> <p><b><u>Critical Attributes:</u></b></p> <p>6.8d Gravity keeps the planets in orbit around the sun. The movement of planets around the sun is called <i>revolution</i>. The orbits of the planets and other bodies revolving around the sun are not perfect circles but are elongated circles called <i>ellipses</i>.</p> <p>6.8d Planets, including Earth, also rotate, or spin on an axis. An axis is an imaginary line through the planet's center.</p>	<ul style="list-style-type: none"> <li>• Compare and contrast revolution and rotation and apply these terms to the relative movements of the planets and moons.</li> </ul>

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<b>What Students Should Know (Critical Attributes)</b>	<b>What Students Should Be Able To Do (Essential Skills)</b>
<p>6.8e Earth has a day that lasts about 24 hours because it takes about 24 hours for the Earth to completely rotate on its axis. Because the Earth rotates, locations on its surface move from daylight to darkness and back to daylight again. The half of Earth facing the sun is in sunlight and has day. The half of Earth facing away from the sun is in darkness and has night.</p> <p>6.8e Planets revolve around the sun, and moons revolve around planets. The Earth has its own gravitational field that keeps the moon orbiting around it as well as around the sun. It takes about 28 days, or one month, for the moon to complete one revolution around Earth. The phases, or changing appearance, of the moon, are due to the reflected light from the moon during its monthly revolution. Over the course of a month the amount of light reflected from the moon increases (waxes) until one complete half of the moon (the “full moon”) can be seen, then decreases (waning) until no part of half can be seen (the “new moon”).</p> <p>6.8g Seasons are caused by the tilt of the Earth on its axis and thus, the angle at which the sunlight strikes the surface of the Earth during its annual revolution around the sun. The tilt of Earth causes some parts of Earth to get more direct light rays from the sun. During half of the year the Northern Hemisphere has longer days and receives more of the sun’s direct light because of its tilt toward the sun. As the Earth revolves around the sun, the orientation of the axis remains the same, and the Southern Hemisphere gets more direct sunlight and experiences summer.</p> <p>6.8h Tides, the rise and the fall of the ocean waters, are caused by the gravitational pull of the moon and, to a lesser extent, the sun by the Earth. This pull causes the water to draw up (high tide) on the side of the Earth facing the moon and on the opposite side. As the Earth rotates, locations of the Earth experience different tides.</p>	<ul style="list-style-type: none"><li>• Model and describe how day and night occur.</li><li>• Model and describe how the phases of the moon occur.</li><li>• Model and describe how the Earth’s axial tilt and its annual orbit around the sun cause the seasons.</li><li>• Discuss the relationship between the gravitational pull of the moon and cycles of tides.</li></ul>