



# Teaching & Learning Standards

## Science Learning Targets

**6<sup>th</sup> Grade**

## Unit 1 – Universe and Solar System

**S6E1. Obtain, evaluate, and communicate information about current scientific views of the universe and how those views evolved.**

- a. Ask questions to determine changes in models of Earth’s position in the solar system, and origins of the universe as evidence that scientific theories change with the addition of new information. (Clarification statement: Students should consider Earth’s position in geocentric and heliocentric models and the Big Bang as it describes the formation of the universe.) (Reasoning)**
- I can describe the historical views of the geocentric model and heliocentric model of the solar system. (Knowledge)
  - I can explain how the Big Bang Theory describes the formation of the universe. (Knowledge)
  - I can identify evidence that supports the Big Bang Theory (composition of matter in the universe, motion of distant galaxies, and background radiation). (Knowledge)
  - I can evaluate the geocentric and heliocentric views of our solar system and explain why views and knowledge have changed over the years. (Reasoning)
  - I can evaluate how evidence in support of the Big Bang Theory works together to explain the formation of the universe and how it continues to expand. (Reasoning)
  - I can explain historical models of Earth’s position in the solar system and why they changed over time. (Reasoning)
  - I can explain theories of the origins of the universe and how they could change over time based on new evidence. (Reasoning)
  - I can ask questions to determine changes in models of Earth’s position in the solar system, and origins of the universe as evidence that scientific theories change with the addition of new information. (Reasoning)
- b. Develop a model to represent the position of the solar system in the Milky Way galaxy and in the known universe. (Product)**
- I can identify features of the solar system. (Knowledge)
  - I can identify the solar system’s place in the Milky Way galaxy. (Knowledge)
  - I can explain that the Earth and the Milky Way are very tiny compared to the universe. (Knowledge)
  - I can explain and model the location of our solar system in the Milky Way galaxy. (Reasoning)
  - I can develop a model to represent the position of the solar system in the Milky Way galaxy and in the known universe. (Product)

## Unit 1 – Universe and Solar System (cont.)

**c. Analyze and interpret data to compare and contrast the planets in our solar system in terms of: (Reasoning)**

- size relative to Earth
  - surface and atmospheric features
  - relative distance from the sun, and
  - ability to support life.
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- I can identify the planets in our solar system. (Knowledge)
  - I can identify Earth as the only planet in the solar system that appears to be able to support life. (Knowledge)
  - I can compare and contrast the planets in our solar system. (Reasoning)
  - I can explain how Earth compares to other planets in terms of size, composition, and distance from the Sun. (Reasoning)
  - I can distinguish between the inner and outer planets based on composition, size, and location. (Reasoning)
  - I can gather, analyze and interpret data collected from credible sources about the planets in the solar system. (Reasoning)
  - I can analyze and interpret data to compare and contrast the planets of our solar system in terms of size, atmosphere, composition, distance from the sun, and ability to support life. (Reasoning)

**d. Develop and use a model to explain the interaction of gravity and inertia that governs the motion of objects in the solar system. (Product)**

- I can define the terms gravity, inertia and orbit. (Knowledge)
- I can explain the relationship between mass and gravity. (Knowledge)
- I can explain how basic changes in mass and distance affect gravity. (Knowledge)
- I can relate mass and distance of objects to the effect of gravitational pull on objects in the solar system. (Reasoning)
- I can explain the role of gravity and inertia in relation to the motion of objects in the solar system. (Reasoning)
- I can use a computer model to investigate the effects of gravity and inertia on the orbital motion of objects in the solar system. (Reasoning)
- I can use a model to explain the interaction of gravity and inertia that governs the motion of objects in the solar system. (Reasoning)
- I can develop a model to explain the interaction of gravity and inertia that governs the motion of objects in the solar system. (Product)

## Unit 1 – Universe and Solar System (cont.)

## e. Ask questions to compare and contrast the characteristics, composition, and location of comets, asteroids, and meteoroids.

**(Reasoning)**

- I can identify and describe characteristics, composition and location of asteroids. (Knowledge)
- I can identify and describe characteristics, composition and location of comets. (Knowledge)
- I can identify and describe characteristics, composition and location of meteoroids. (Knowledge)
- I can summarize the difference between comets, asteroids, and meteoroids. (Reasoning)
- I can ask questions to compare and contrast the characteristics, composition, and location of comets, asteroids, and meteoroids. (Reasoning)

## Unit 2 – Sun, Earth and Moon

**S6E2. Obtain, evaluate, and communicate information about the effects of the relative positions of the sun, Earth, and moon.****a. Develop and use a model to demonstrate the phases of the moon by showing the relative positions of the sun, Earth, and moon. (Product)**

- I can define rotation and revolution. (Knowledge)
- I can explain why we see Moon phases. (Knowledge)
- I can relate Moon phases to the Moon's position. (Knowledge)
- I can recognize and name the phases of the Moon and list them in order. (Knowledge)
- I can distinguish between waxing and waning. (Knowledge)
- I can describe the moon's orbit and how it affects the view of the moon from Earth. (Reasoning)
- I can explain how the phases of the moon are related to the relative positions of the Earth, Sun and Moon. (Reasoning)
- I can describe the moon's orbit and how it affects the view of the moon from Earth. (Reasoning)
- I can identify patterns of the Moon's appearance and make predictions about its future appearance based observational data. (Reasoning)
- I can compare and contrast the patterns of the moon's position and phases with its visual appearance. (Reasoning)
- I can develop and use a model to demonstrate the phases of the moon by showing the relative positions of the sun, Earth and moon. (Product)

**b. Construct an explanation of the cause of solar and lunar eclipses. (Reasoning)**

- I can differentiate between a solar and lunar eclipse. (Knowledge)
- I can explain the causes for lunar and solar eclipses. (Knowledge)
- I can define and explain how the moon's change in position around earth leads to changes in its appearance as well as solar and lunar eclipses. (Reasoning)
- I can diagram and describe solar and lunar eclipses and explain how the cause of an eclipse of the Moon is different from the cause of the Moon's phases. (Reasoning)
- I can explain why a solar eclipse does not occur every new moon. (Reasoning)
- I can construct an explanation of the cause of solar and lunar eclipses. (Reasoning)

## Unit 2 – Sun, Earth and Moon (cont.)

- c. Analyze and interpret data to relate the tilt of the Earth to the distribution of sunlight throughout the year and its effect on seasons. (Reasoning)
- I can identify the four seasons. (Knowledge)
  - I can explain why Earth has seasons. (Knowledge)
  - I can explain how the tilt of Earth's axis and the revolution around the Sun causes seasons. (Reasoning)
  - I can interpret satellite maps and explore an example of long-term climate change to learn about the seasons and the role of Earth's tilted axis. (Reasoning)
  - I can analyze and interpret data to relate the tilt of the Earth to the distribution of sunlight throughout the year and its effect on seasons. (Reasoning)

## Unit 3 – Role of Water

**S6E3. Obtain, evaluate, and communicate information to recognize the significant role of water in Earth processes.**

- a. **Ask questions to determine where water is located on Earth’s surface (oceans, rivers, lakes, swamps, groundwater, aquifers, and ice) and communicate the relative proportion of water at each location. (Reasoning)**
- I can identify examples of water sources on Earth’s surface. (Knowledge)
  - I can recognize the differences in the proportion of water on Earth’s surface. (Knowledge)
  - I can ask questions to determine where water is located on Earth’s surface. (Reasoning)
  - I can gather data to determine the relative proportion of water at various locations on Earth’s surface. (Reasoning)
  - I can communicate the relative proportion of water on Earth’s surface at various locations. (Reasoning)
- b. **Plan and carry out an investigation to illustrate the role of the sun’s energy in atmospheric conditions that lead to the cycling of water. (Clarification statement: The water cycle should include evaporation, condensation, precipitation, transpiration, infiltration, groundwater, and runoff.) (Skill)**
- I can identify the pathways of the water cycle (evaporation, condensation, precipitation, transpiration, infiltration, groundwater, and runoff). (Knowledge)
  - I can recognize the flow of energy in water as it changes states. (Knowledge)
  - I can recognize changes in atmospheric conditions. (Knowledge)
  - I can explain the role of the sun’s energy in atmospheric conditions that lead to the cycling of water. (Reasoning)
  - I can plan and carry out an investigation to illustrate the role of the sun’s energy in atmospheric conditions that lead to the cycling of water. (Skill)
- c. **Ask questions to identify and communicate, using graphs and maps, the composition, location, and subsurface topography of the world’s oceans.**
- I can use graphs and maps to identify the world’s oceans. (Knowledge)
  - I can recognize characteristics of ocean water composition. (Knowledge)
  - I can recognize characteristics of subsurface topography of the world’s oceans. (Knowledge)
  - I can ask questions about the composition location, and subsurface topography of the world’s oceans. (Reasoning)
  - I can ask questions to communicate information about the world’s oceans. (Reasoning)

## Unit 3 – Role of Water (cont.)

- d. Analyze and interpret data to create graphic representations of the causes and effects of waves, currents, and tides in Earth's system.
- I can identify characteristics of waves in Earth's systems. (Knowledge)
  - I can identify characteristics of currents in Earth's systems. (Knowledge)
  - I can identify characteristics of tides in Earth's systems. (Knowledge)
  - I can analyze data to explain causes and effects of waves in Earth's systems. (Reasoning)
  - I can analyze data to explain causes and effects of currents in Earth's systems. (Reasoning)
  - I can analyze data to explain causes and effects of tides in Earth's systems. (Reasoning)
  - I can develop graphic representations of the causes and effects of waves in Earth's systems. (Product)
  - I can develop graphic representations of the causes and effects of currents in Earth's systems. (Product)
  - I can develop graphic representations of the causes and effects of tides in Earth's systems. (Product)



## Unit 4 – Weather and Climate

**S6E4. Obtain, evaluate, and communicate information about how the sun, land, and water affect climate and weather.**

- a. **Analyze and interpret data to compare and contrast the composition of Earth’s atmospheric layers (including the ozone layer) and greenhouse gases. (Clarification statement: Earth’s atmospheric layers include the troposphere, stratosphere, mesosphere, and thermosphere.) (Reasoning)**
- I can identify Earth’s atmospheric layers. (Knowledge)
  - I can identify types of greenhouse gases. (Knowledge)
  - I can recognize characteristics of the composition of Earth’s atmospheric layers. (Knowledge)
  - I can analyze data to compare and contrast the composition of Earth’s atmospheric layers. (Reasoning)
  - I can analyze data compare and contrast Earth’s greenhouse gases. (Reasoning)
  - I can interpret data from my analysis to compare and contrast Earth’s composition and greenhouse gases. (Reasoning)
- b. **Plan and carry out an investigation to demonstrate how energy from the sun transfers heat to air, land, and water at different rates. (Clarification statement: Heat transfer should include the processes of conduction, convection, and radiation.) (Skill)**
- I can recognize evidence of the sun’s energy in the air, and on land and water. (Knowledge)
  - I can recognize the sun’s energy has a rate of transfer that varies between air, land, and water. (Knowledge)
  - I can explain the transfer of the sun’s energy to air, land, and water. (Reasoning)
  - I can differentiate the rate of the sun energy transfer between air, land, and water. (Reasoning)
  - I can plan and carry out an investigation to demonstrate how the sun’s energy transfers to air, land and water at different rates. (Skill)
  - I can communicate data from my investigation to demonstrate the different rates of the transfer of the sun’s energy. (Product)
- c. **Develop a model demonstrating the interaction between unequal heating and the rotation of the Earth that causes local and global wind systems. (Product)**
- I can recognize that the Earth experiences unequal heating because of its rotation. (Knowledge)
  - I can identify local and global wind systems. (Knowledge)
  - I can compare and contrast local and global wind systems. (Reasoning)
  - I can explain the cause of Earth's unequal heating. (Reasoning)
  - I can develop simple interactive models. (Skill)

**Unit 4 – Weather and Climate (cont.)**

- I can use interactive models to collect data to show the relationship between unequal heating of the Earth and local and global wind systems. (Skill)
- I can use interactive models to collect data to show the relationship between the rotation of the Earth and local and global wind systems. (Skill)
- I can develop a model to demonstrate the unequal heating and the rotation of the Earth. (Product)
- I can develop a model to demonstrate the relationship between the unequal heating and the rotation of the Earth and the local and global wind systems. (Product)

**d. Construct an explanation of the relationship between air pressure, weather fronts, and air masses and meteorological events such as tornadoes and thunderstorms. (Reasoning)**

- I can identify weather forecasting tools such as air pressure, weather fronts, and air masses. (Knowledge)
- I can identify characteristics of meteorological events such as tornadoes and thunderstorms. (Knowledge)
- I can explain the relationship between weather forecasting tools and weather events such as tornadoes and thunderstorms. (Reasoning)
- I can construct an explanation to explain the relationship between identify the flow of energy in an ecosystem. (Reasoning)

**e. Analyze and interpret weather data to explain the effects of moisture evaporating from the ocean on weather patterns and weather events such as hurricanes. (Reasoning)**

- I can identify the pathways of the water cycle (evaporation, condensation, precipitation, transpiration, infiltration, groundwater, and runoff). (Knowledge)
- I can identify characteristics of weather events caused by evaporating moisture such as hurricanes. (Knowledge)
- I can identify characteristics of weather by analyzing weather data. (Reasoning)
- I can analyze and interpret weather data to explain the effects of evaporation from the ocean on weather patterns. (Reasoning)
- I can analyze weather data to explain the effects of evaporation from the ocean on weather events. (Reasoning)
- I can interpret weather data to explain the effects of moisture evaporating from the ocean on weather patterns. (Reasoning)
- I can interpret weather data to explain the effects of moisture evaporating from the ocean on weather events. (Reasoning)

## Unit 5 – Formation of the Earth’s Surface

**S6E5. Obtain, evaluate, and communicate information to show how Earth’s surface is formed.**

- a. Ask questions to compare and contrast the Earth’s crust, mantle, inner and outer core, including temperature, density, thickness, and composition. (Reasoning)**
- I can identify the layers of the Earth including crust, mantle, inner and outer core. (Knowledge)
  - I can recognize characteristics of Earth’s crust such as temperature, density, thickness, and composition. (Knowledge)
  - I can compare and contrast the layers of the Earth with regards to temperature, density, thickness, and composition. (Reasoning)
  - I can ask questions to compare and contrast the Earth’s crust, mantle, inner and outer core, including temperature, density, thickness, and composition. (Reasoning)
- f. Construct an explanation of how the movement of lithospheric plates, called plate tectonics, can cause major geologic events such as earthquakes and volcanic eruptions. (Clarification statement: Include convergent, divergent, and transform boundaries.)**
- I can identify the theory known as plate tectonics. (Knowledge)
  - I can identify the types of tectonic plate movement (convergent, divergent, and transform). (Knowledge)
  - I can identify Earth’s lithospheric plates. (Knowledge)
  - I can identify characteristics of major geologic events such as earthquakes and volcanic eruptions. (Knowledge)
  - I can explain the movement of the Earth’s lithospheric plates. (Reasoning)
  - I can construct an explanation to explain how the movement of lithospheric plates can cause major geologic events. (Reasoning)
- g. Construct an argument using maps and data collected to support a claim of how fossils show evidence of the changing surface and climate of the Earth. (Product)**
- I can identify characteristics of fossils. (Knowledge)
  - I can explain how fossils show evidence of the changing surface of the Earth. (Reasoning)
  - I can explain how fossils show evidence of the changing climate of the Earth. (Reasoning)
  - I can use maps and data to collect information about fossils. (Skill)
  - I can construct an argument using evidence to support a claim that fossils show evidence of the changing surface and climate of the Earth. (Product)

## Unit 6 – Rocks and Minerals

**S6E5. Obtain, evaluate, and communicate information to show how Earth's surface is formed.****b. Plan and carry out an investigation of the characteristics of minerals and how minerals contribute to rock composition. (Skill)**

- I can recognize the characteristics of minerals. (Knowledge)
- I can describe how minerals contribute to rock composition. (Reasoning)
- I can plan and carry out an investigation to determine the characteristics of minerals and how minerals contribute to rock composition. (Skill)

**c. Construct an explanation of how to classify rocks by their formation and how rocks change through geologic processes in the rock cycle. (Reasoning)**

- I can identify the stages of the rock cycle. (Knowledge)
- I can recognize characteristics of rocks. (Knowledge)
- I can explain how rocks are formed. (Reasoning)
- I can explain how rocks change through the geologic process (rock cycle). (Reasoning)
- I can construct an explanation of how to classify rocks by their formation. (Reasoning)
- I can construct an explanation of how rocks change through geologic processes in the rock cycle. (Reasoning)

## Unit 7 – Weathering, Erosion, and Soil

**S6E5 Obtain, evaluate, and communicate information to show how Earth’s surface is formed.**

- d. Ask questions to identify types of weathering, agents of erosion and transportation, and environments of deposition. (*Clarification statement: Environments of deposition include deltas, barrier islands, beaches, marshes, and rivers.*) (Reasoning)**
- I can recognize characteristics of weathering on Earth’s surface. (Knowledge)
  - I can recognize characteristics of different agents of erosion and transportation on Earth’s surface. (Knowledge)
  - I can recognize characteristics of different environments of deposition such as deltas, barrier islands, beaches, marshes, and rivers. (Knowledge)
  - I can ask questions to identify types of weathering on Earth’s surface. (Reasoning)
  - I can ask questions to identify agents of erosion and transportation on Earth’s surface. (Reasoning)
  - I can ask question to identify environments of deposition such as deltas, barrier islands, beaches, marshes, and rivers. (Reasoning)
- e. Develop a model to demonstrate how natural processes (weathering, erosion, and deposition) and human activity change rocks and the surface of the Earth. (Product)**
- I can identify natural process on Earth’s surface such as weather, erosion, and deposition. (Knowledge)
  - I can explain how natural process change rocks on the surface of the Earth. (Reasoning)
  - I can explain how human activities have changed rock and the surface of the Earth. (Reasoning)
  - I can develop a model to show how natural processes and human activities change rocks and the surface of the Earth. (Product)
- h. Plan and carry out an investigation to provide evidence that soil is composed of layers of weathered rocks and decomposed organic material. (Skill)**
- I can identify the layers of soil. (Knowledge)
  - I can recognize characteristics of weather rocks. (Knowledge)
  - I can recognize characteristics of decomposed organic materials. (Knowledge)
  - I can explain that soil is composed of layers of weathered rocks and decomposed organic materials. (Reasoning)
  - I can plan and carry out an investigation about the composition of soil. (Skill)
  - I can communicate data from my investigations to provide evidence about the composition of soil. (Skill)

## Unit 8 – Conservation of Natural Resources

**S6E6 Obtain, evaluate, and communicate information about the uses and conservation of various natural resources and how they impact the Earth.**

- a. Ask questions to determine the differences between renewable/sustainable energy resources (examples: hydro, solar, wind, geothermal, tidal, biomass) and nonrenewable energy resources (examples: nuclear: uranium, fossil fuels: oil, coal, and natural gas), and how they are used in our everyday lives. (Reasoning)**
- I can identify examples of renewable/sustainable energy. (Knowledge)
  - I can identify example of nonrenewable energy resources. (Knowledge)
  - I can recognize the use of renewable and nonrenewable energy resources in our everyday lives. (Knowledge)
  - I can ask questions about renewable/sustainable energy resources. (Reasoning)
  - I can ask questions about nonrenewable energy resources. (Reasoning)
  - I can ask questions about how renewable and nonrenewable energy resources are used in our everyday lives. (Reasoning)
  - I can ask questions to determine the differences between renewable/sustainable and nonrenewable energy resources and how they are used in our everyday lives. (Reasoning)
- b. Design and evaluate solutions for sustaining the quality and supply of natural resources such as water, soil, and air. (Skill)**
- I can identify natural resources such as water, soil, and air. (Knowledge)
  - I can explain the need for sustaining the quality and supply of natural resources. (Reasoning)
  - I can design solutions for sustaining the quality of natural resources. (Skill)
  - I can design solutions for sustain the supply of natural resources. (Skill)
  - I can evaluate the design solutions for sustaining the quality and supply of natural resources. (Skill)
- c. Construct an argument evaluating contributions to the rise in global temperatures over the past century. (*Clarification statement: Tables, graphs, and maps of global and regional temperatures, and atmospheric levels of greenhouse gases such as carbon dioxide and methane, should be used as sources of evidence.*) (Product)**
- I can identify characteristics of rising global temperatures. (Knowledge)
  - I can identify greenhouse gases such as carbon dioxide and methane. (Knowledge)
  - I can interpret data about regional and global temperatures from tables, graphs, and maps over the past century. (Reasoning)
  - I can explain how greenhouse gases contribute to the rise in global temperatures. (Reasoning)
  - I can construct an argument evaluating contributions to the rise in global temperatures over the past century. (Product)