EARTH SCIENCE

SCOPE AND SEQUENCE CHART

Unit Name	Unit Description	Georgia Standards of Excellence	Unit Duration

1 **Astronomy** **<u>Core Ideas</u>** ● Scientific Theories of the Universe ● Objects in the Solar System ● Gravity and Orbits ● Moon Phases & Tides ● Eclipses and Seasons	In this unit students will examine how scientific theories of the solar system and universe have changed and how gravity shapes and drives the universe. In this unit students will explore how the Earth, Moon, and Sun are in regular and predictable motion and those motions explain phenomena such as seasons, moon phases, tides, and eclipses.	**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.(*<u>Clarification statement: Students should consider Earth's position in geocentric and heliocentric models and the Big Bang as it describes</u> <u>the formation of the universe.)</u>* ***b.*** Develop a model to represent the position of the solar system in the Milky Way galaxy and in the known universe. ***(This is a low priority standard as this can be integrated into element S6E1.c)*** c. Analyze and interpret data to compare and contrast the planets in our solar system in terms of: ● size relative to Earth, ● surface and atmospheric features, ● relative distance from the sun, and ● ability to support life. ***d.*** Develop and use a model to explain the interaction of gravity and inertia that governs the motion of objects in the solar system. ***(This is a low priority standard as students will study gravity in the 8th grade and in secondary grades)*** ***e.*** Ask questions to compare and contrast the characteristics, composition, and location of comets, asteroids, and meteoroids. ***(This is a low priority standard, this can be integrated into the S6E1.c as part of the solar system)***	**9 Weeks**

		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. ***b.*** Construct an explanation of the cause of solar and lunar eclipses. ***(This is a low priority standard, you can include this in the Sun-Moon-Earth Arrangement of teaching moon phases S6E2.a)*** 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.	

Core Idea	Crosscutting Concept	Science & Engineering Practices
Theories and Origins of the Universe ● Students will develop a geocentric model represent the position of the Earth and Sun. **Objects in Our Solar System** ● Students will compare and contrast the different objects in our solar system in terms of relative size, distance from the sun, and characteristics. **Motion of Our Universe** ● Students will explain the interaction of gravity and inertia and will describe the motion of objects in our solar system. **Earth, Sun, and Moon System** ● Students will create an Earth, Moon, and Sun diagram to identify and label the moon phases, tides, and eclipses, at various points in the moon's orbit around the Earth. **Earth's Tilt** ● Students will explain how the tilt of the Earth impacts the distributing of sunlight throughout the year and	**Stability and Change** ● Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales. **Systems and System Models** ● Systems may interact with other systems; they may have subsystems and be a part of larger complex systems. **Cause and Effect** ● Cause-and-effect relationships may be used to predict phenomena in natural or designed systems. **Structure and Function** ● Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be	**Asking Questions and Defining Problems** ● Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information. **Developing and Using Models** ● Develop and/or use a model to predict and/or describe phenomena. **Analyzing and Interpreting Data** ● Analyze and interpret data to provide evidence for phenomena. **Constructing Explanations and Designing Solutions** ● Construct an explanation using models or representations.

differentiate between seasons as a result of this tilt.		

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2 **Hydrology** **Core Ideas** ● Water Sources ● Water Cycle ● Topography of the World's Oceans ● Waves, Currents, Tides	In this unit students will study the movement of water through the crust, ocean, and atmosphere.	**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. ***(This is a low priority standard and can be integrated into S6E3.c)*** **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.)* ***Re-teach S5P1.a as students must understand phase change to understand the water cycle – S5P1.a: Construct an argument based on observations to support a claim that the physical changes in the state of water are due to temperature changes, which cause small particles that cannot be seen to move differently.*** **c.** Ask questions to identify and communicate, using graphs and maps, the composition, location, and subsurface topography of the world's oceans. **d.** Analyze and interpret data to create graphic representations of the causes and effects of waves, currents, and tides in Earth's systems. ***(This is a low priority standard, tides can be referenced as cause by the moon S6E2.a and currents can be taught with Meteorology using convection currents S6E4.b-c)***	**6 Weeks**

Core Ideas	Crosscutting Concept	Science & Engineering Practices
Water ● Students will evaluate different types of water and analyze the impact of salinity and temperature on density. **Water Cycle** ● Students will identify the sources of water on the planet and will explain how water moves through the atmosphere and land driven by the sun's energy. **Topography**	**Scale/ Proportion/ Quantity** ● Phenomena that can be observed at one scale may not be observable at another scale. **Patterns** ● Graphs, charts, and images can be used to identify patterns in data. **Stability and Change** ● Stability might be disturbed by either	**Asking Questions and Defining Problems** ● Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information. **Planning and Carrying Out Investigations** ● Collect data about the performance of a proposed object, tool, process, or system under a range of conditions. **Analyzing and Interpreting Data**

	sudden events or gradual changes that accumulate over time.	

• Students will describe the topography of the world's oceans utilizing graphs and maps. Students will evaluate **Waves, Currents, Tides** • Students will explain the causes of movement of water in waves, currents, and tides using graphic representations.		• Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships.

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3 **Meteorology** **Core Ideas** • Layers of the atmosphere • Heat Transfers: Conduction, Convection, Radiation • Land vs. Water • Wind Systems • Air Pressure • Air Masses • Weather Fronts • Severe Weather	Students will investigate the interaction of atmospheric conditions and the effects of these on 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.)* ***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.)* ***(This is a low priority standard and can be integrated into the second half of S6E4.c See underline portion)*** c. Develop a model demonstrating the interaction between unequal heating and the rotation of the Earth that causes local and global wind systems. d. Construct an explanation of the relationship between air pressure, weather fronts, and air masses and meteorological events such as tornados and thunderstorms. 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. ***(Teacher Weather by integrating S6E4.d and S6E4.e – See Below)***	**7 Weeks**

Weather Event	*Air Pressure*	*Fronts*	*Moisture/Precipitation*	*Description*
Tornado				

Core Ideas	Crosscutting Concepts	Science & Engineering Practices
Layers of the Atmosphere ● Students will gather and analyze data to compare and contrast the layers of Earth's atmospheres. **Land vs. Water** ● Students will conduct an investigation to contrast the rate at which land and water transfer heat, students will then use data gathered to relate the unequal heating of Earth's surface to wind systems. **Heat Transfer** ● Students will explain the relationship between air pressure, fronts, air masses, and the water cycle to weather events such as thunderstorms, tornadoes, and hurricanes.	**Energy and Matter** ● The transfer of energy can be tracked as energy flows through a designed or natural system. **Cause and Effect** ● Cause-and-effect relationships may be used to predict phenomena in natural or designed systems. **Patterns** ● Graphs, charts, and images can be used to identify patterns in data.	**Analyzing and Interpreting Data** ● Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships. **Planning and Carrying Out Investigations** ● Plan an investigation individually and collaboratively, and in the design identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. **Developing and Using Models** ● Develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena.

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4 **Geology: History of Earth** **<u>Core Ideas</u>** • Earth's Layers • Minerals • The Rock Cycle • Weathering, Erosion, and Deposition • Theory of Plate Tectonics • Soil Composition • Fossils as evidence to a changing Earth	In this unit students will examine surface and subsurface processes that are involved in the formation and destruction of earth materials including the three types of rocks found in the rock cycle — igneous, sedimentary, and metamorphic — and compare and contrast their origins and processes of formation. Additionally, students will study how fossils provide evidence of constant environmental change.	***Prior Grade: 5th*** ***Standards:*** ***S5E1. Obtain, evaluate, and communicate information to identify surface features on the Earth caused by constructive and/or destructive processes.*** ***a. Construct an argument supported by scientific evidence to identify surface features (examples could include deltas, sand dunes, mountains, volcanoes) as being caused by constructive and/or destructive processes (examples could include deposition, weathering, erosion, and impact of organisms).*** ***b. Develop simple interactive models to collect data that illustrate how changes in surface features are/were caused by constructive and/or destructive processes.*** ***Explanation: <u>Students will need to be able to identify surface features and analyze constructive/destructive forces to understand the relationship between plate tectonic movement (S6E5.f), weathering/erosion/ deposition (S6E5.d-e), constructive/destructive forces , and surface features.</u>*** **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. b. Plan and carry out an investigation of the characteristics of minerals and how minerals contribute to rock composition. ***c.*** Construct an explanation of how to classify rocks by their formation and how rocks change through geologic processes in the rock cycle. ***Integrate <u>S6E5.b</u> and <u>S6E5.c</u> to study the structure of rocks and the rock cycle.***	**8 Weeks**

		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.)* **e.** Develop a model to demonstrate how natural processes (weathering, erosion, and deposition) and human activity change rocks and the surface of the Earth. ***Integrate S6E5.d and S6E5.e to teach erosion, deposition, weathering, and other natural Earth processes.*** **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.)* **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. ***(Low priority standard as this can be integrated into S6E5.c, S6E5.e, and S6E5.h as fossils are formed by the layering of soil and the resulting pressure of the rock cycle)*** **h.** Plan and carry out an investigation to provide evidence that soil is composed of layers of weathered rocks and decomposed organic material.	

Core Ideas	Crosscutting Concepts	Science & Engineering Practices
Earth's Layers ● Students will compare characteristics of Earth's layers including temperature, density, thickness, and composition. **Weathering, Erosion, and Deposition** ● Students will explain how weathering, erosion, and deposition tear down and build up the Earth's surface. **Minerals, Soil, and Rocks** ● Students will describe the rock cycle and explain the process that leads to	**Scale/Proportion/Quantity** ● Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. **Patterns** ● Graphs, charts, and images can be used to identify patterns in data. **Stability and Change** ● Stability might be disturbed by either sudden events or gradual changes that accumulate over time. **Structure and Function**	**Asking Questions and Defining Problems** ● Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information. **Planning and Carrying Out Investigations** ● Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation. **Constructing Explanations and Designing Solutions** ● Construct an explanation using models or representations.

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formation of igneous, sedimentary, and metamorphic rocks. **Theory of Plate Tectonics** ● Students will describe the scientific theory of plate tectonics and/or how the movement of Earth's crustal plates and the flow of heat and material cause various geologic events to occur. **Changing Earth** ● Students will identify examples of and/or explain physical evidence that supports scientific theories that Earth has evolved over geologic time due to natural and human processes.	● Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.	● Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws describe the natural world operate today as they did in the past and will continue to do so in the future. **Developing and Using Models** ● Develop and/or use a model to predict and/or describe phenomena.

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5 **Human Impact** **<u>Core Ideas</u>** • Renewable & Nonrenewable Resources • Sustaining Natural Resources • Global Climate Change	In this unit students will explore how human activities impact the availability of renewable and nonrenewable resources and ways to conserve natural resources.	***Prior Grade: 5th*** ***Standards:*** ***S5E1. Obtain, evaluate, and communicate information to identify surface features on the Earth caused by constructive and/or destructive processes.*** ***c. Ask questions to obtain information on how technology is used to limit and/or predict the impact of constructive and destructive processes.*** ***(<u>Clarification statement:</u> Examples could include seismological studies, flood forecasting (GIS maps), engineering/construction methods and materials, and infrared/satellite imagery.)*** ***Explanation: <u>Students will apply their knowledge of technology to potentially design and evaluate solutions for sustainability (S6E6.b).</u>*** **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. ***b.*** Design and evaluate solutions for sustaining the quality and supply of natural resources such as water, soil, and air. ***Integrate the 5th grade standard S5E1.c to evaluate solutions from the 5th grade standard (e.g beach reclamation)*** *c.* Construct an argument evaluating contributions to the rise in global temperatures over the past century. (*<u>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.)</u>*	**5 Weeks**

Core Ideas	Crosscutting Concept	Science & Engineering Practices
Renewable & Nonrenewable Resources ● Students will differentiate between renewable and nonrenewable resources and will describe the benefits and/or limitations of each type of energy resource. **Sustainable Living** ● Students will research and design solutions to maintain the quality and supply of natural resources. **Global Climate Change** ● Students will gather and analyze data to evaluate the rise in global temperatures over the past century and the impact it is having on life on Earth.	**Energy and Matter** ● Energy may take different forms (e.g. energy in fields, thermal energy, and energy of motion). **Stability and Change** ● Stability might be disturbed by either sudden events or gradual changes that accumulate over time. **Cause and Effect** ● Cause-and-effect relationships may be used to predict phenomena in natural or designed systems.	**Asking Questions and Defining Problems** ● Ask questions to clarify and/or refine a model, an explanation, or an engineering problem. **Constructing Explanations and Designing Solutions** ● Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. **Engaging in Argument From Evidence** ● Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts. ● Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.