Earth Systems Standards

Earth Systems Teaching & Learning Framework							
Unit 1 1 wk BL/2 wks YR	**Unit 2 2 wks BL/4 wks YR**	**Unit 3 4 wks BL/8 wks YR**	**Unit 4 2 wks BL/4 wks YR**	**Unit 5: 1.5 wks BL/3 wks YR**	**Unit 6: 3 wks BL/6 wks YR**	**Unit 7: 3 wks BL/6wks YR**	**Unit 8: 1.5 wks BL/3 wks YR**
Intro to Systems and Maps SES1	**Introduction to Earth's Beginnings SE1**	**Atmosphere and Meteorology SES5**	**Landscape Changes SES3**	**Minerals, Rocks, and the Rock Cycle SES2, SES3**	**Plate Tectonics, Earthquakes, and Landforms SES2, SES3**	**Geologic Time SES4**	**How Life Shapes the Earth SES6**
SES1 Obtain, evaluate, and communicate information to investigate the composition and formation of Earth systems, including the Earth's place in the solar system. b. Ask questions to evaluate evidence for the development and composition of Earth's early systems, including the geosphere (crust, mantle and core), hydrosphere and atmosphere. (Clarification statement: The differentiation by density of Earth into crust, mantle and core should be included in this element.)	**SES1. Obtain, evaluate, and communicate information to investigate the composition and formation of Earth systems, including the Earth's place in the solar system.** a. Construct an explanation of the origins of the solar system from scientific evidence including the composition, distribution and motion of solar system objects. (Clarification statement: The nebular hypothesis should be included in this element.) b. Ask questions to evaluate evidence for the development and composition of Earth's early systems, including the geosphere (crust, mantle and core), hydrosphere and atmosphere. (Clarification statement: The differentiation by density of Earth into crust, mantle and core should be included in this element.) c. Develop a model of the physical composition of Earth's layers using multiple types of evidence (e.g., Earth's magnetic field, composition of meteorites and seismic waves). (Clarification statement: Earth's layers should include crust, mantle, inner core and outer core.)	**SES5. Obtain, evaluate, and communicate information to investigate the interaction of solar energy and Earth's systems to produce weather and climate.** a. Develop and use models to explain how latitudinal variations in solar heating create differences in air pressure, global wind patterns, and ocean currents that redistribute heat globally. b. Analyze and interpret data (e.g., maps, meteograms, and weather apps) that demonstrate how the interaction and movement of air masses creates weather. c. Construct an argument that predicts weather patterns based on interactions among ocean currents, air masses, and topography. d. Analyze and interpret data to show how temperature and precipitation produce the pattern of climate regions (zones) on Earth. e. Construct an explanation that describes the conditions that generate extreme weather events (e.g., hurricanes, tornadoes, and thunderstorms) and the hazards associated with these events. f. Construct an argument relating changes in global climate to variation to Earth/sun relationships and atmospheric composition.	**SES3. Obtain, evaluate, and communicate information to explore the actions of water, wind, ice, and gravity as they relate to landscape change.** a. Plan and carry out an investigation that demonstrates how surface water and groundwater act as the major agents of physical and chemical weathering. c. Construct an explanation that relates the past and present actions of ice, wind, and water to landform distribution and landscape change. d. Construct an argument based on evidence that relates the characteristics of the sedimentary materials to the energy by which they were transported and deposited.	**SES2. Obtain, evaluate, and communicate information to understand how plate tectonics creates certain geologic features, landforms, Earth materials, and geologic hazards.** d. Ask questions to compare and contrast the relationship between transformation processes of all rock types (sedimentary, igneous, and metamorphic) and specific plate tectonic settings. **SES3. Obtain, evaluate, and communicate information to explore the actions of water, wind, ice, and gravity as they relate to landscape change.** d. Construct an argument based on evidence that relates the characteristics of the sedimentary materials to the energy by which they were transported and deposited.	**SES2. Obtain, evaluate, and communicate information to understand how plate tectonics creates certain geologic features, landforms, Earth materials, and geologic hazards**. a. Construct an explanation based on evidence that describes the mechanisms causing plate tectonic motion. b. Develop and use models for the different types of plate tectonic settings (convergent, divergent and transform boundaries). c. Construct an explanation that communicates the relationship of geologic features, landforms, Earth materials and geologic hazards to each plate tectonic setting. d. Ask questions to compare and contrast the relationship between transformation processes of all rock types (sedimentary, igneous, and metamorphic) and specific plate tectonic settings e. Construct an argument using multiple forms of evidence that supports the theory of plate tectonics (e.g., fossils, paleomagnetism, seafloor age, etc.). **SES3. Obtain, evaluate, and communicate information to explore the actions of water, wind, ice, and gravity as they relate to landscape change.** b. Develop a model of the processes and geologic hazards that result from both sudden and gradual mass wasting.	**SES4. Obtain, evaluate, and communicate information to understand how rock relationships and fossils are used to reconstruct the Earth's past.** a. Use mathematics and computational thinking to calculate the absolute age of rocks using a variety of methods (e.g., radiometric dating, rates of erosion, rates of deposition, and varve count). b. Construct an argument applying principles of relative age (superposition, original horizontality, cross-cutting relations, and original lateral continuity) to interpret a geologic cross-section and describe how unconformities form. c. Analyze and interpret data from rock and fossil succession in a rock sequence to interpret major events in Earth's history such as mass extinction, major climatic change, and tectonic events. d. Construct an explanation applying the principle of uniformitarianism to show the relationship between sedimentary rocks and their fossils to the environments in which they were formed. e. Construct an argument using spatial representations of Earth data that interprets major transitions in Earth's history from the fossil and rock record of geologically defined areas. (Clarification statement: Students should use maps and crosssections with a focus on Georgia.)	**SES6. Obtain, evaluate, and communicate information about how life on Earth responds to and shapes Earth's systems.** a. Construct an argument from evidence that describes how life has responded to major events in Earth's history (e.g., major climatic change, tectonic events) through extinction, migration, and/or adaptation. b. Construct an explanation that describes how biological processes have caused major changes in Earth's systems through geologic time (e.g., nutrient cycling, atmospheric composition, and soil formation). c. Ask questions to investigate and communicate how humans depend on Earth's land and water resources, which are distributed unevenly around the planet as a result of past geological and environmental processes. d. Analyze and interpret data that relates changes in global climate to natural and anthropogenic