Students will learn about the rocks, soils, and fossils in the regions of Georgia.	
Grade or course: Third Grade	**Title** Rocks, Soils, and Fossils in Georgia
Topic: History of Earth	

Performance Expectation for GSE:

S3E1. Obtain, evaluate, and communicate information about the physical attributes of rocks and soils.

a. Ask questions and analyze data to classify rocks by their physical attributes (color, texture, luster, and hardness) using simple tests. (*Clarification statement: Mohs scale should be studied at this level. Cleavage, streak and the classification of rocks as sedimentary, igneous, and metamorphic are studied in sixth grade.*)

** The modern understanding of this core idea is that all minerals are rocks but not all rocks are minerals.*

b. Plan and carry out investigations to describe properties (color, texture, capacity to retain water, and ability to support growth of plants) of soils and soil types (sand, clay, loam).

c. Make observations of the local environment to construct an explanation of how water and/or wind have made changes to soil and/or rocks over time. *(Clarification statement: Examples could include ripples in dirt on a playground and a hole formed under gutters.*)

S3E2. Obtain, evaluate, and communicate information on how fossils provide evidence of past organisms.

a. Construct an argument from observations of fossils (authentic or reproductions) to communicate how they serve as evidence of past organisms and the environments in which they lived.

b. Develop a model to describe the sequence and conditions required for an organism to become fossilized. (*Clarification statement: Types of fossils (cast, mold, trace, and true) are not addressed in this standard.)*

S3L1. Obtain, evaluate, and communicate information about the similarities and differences between plants, animals, and habitats found within geographic regions (Blue Ridge Mountains, Piedmont, Coastal Plains, Valley and Ridge, and Appalachian Plateau) of Georgia.

c. Use evidence to construct an explanation of why some organisms can thrive in one habitat and not in another.

Performance Expectations for Instruction:

After a study of rock and soil types and their characteristics, students will

- grow various plants in different soils to see the differences soil type makes in plant growth.
- perform experiments to explain how wind and water shape the land by breaking rocks, soils, and sediments into smaller particles and moving them around.
- use questions to design tests on rocks and soils and describe the different physical properties of rocks and soils.
- observe rocks and conclude that rocks found in different settings have different physical attributes (color, texture, luster and hardness).
- observe soil and conclude that soils found in different settings have different compositions (sand, clay, loam) and physical properties (color, texture, capacity to retain water, and ability to support growth of plants).
- grow plants in sand, clay and loam, record the results, and come to a conclusion about which type of soil is best for plant growth and why.
- explain how fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.
- examine fossils and compare them to living organisms according to their similarities and differences.
- recognize that some organisms that lived long ago are similar to organisms living today, but some are quite different.
- explain that fossils can form when an organism is preserved in some form, usually as sediments are deposited over the body parts or other evidence of the organism.
- explain how the characteristics of each geographic region of Georgia are different due to their geologic history and climate.
- explain how the rocks, soils, landforms, and climate of each region influence the types of plants and

animals that can live there.

- understand that in any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.
- understand that organisms that survive well in a particular environment have external features (camouflage, mimicry) and/or behaviors (hibernation, migration) that have allowed them to adapt to the condition in that environment.

Materials:
Rocks and Soils: A science journal to record observations, rock samples, soil samples (sand, clay, loam), seeds or seedlings for growing plants,
Fossil lab (per student): fossils, styrofoam bowl, modeling clay, assorted sea shells, petroleum jelly, tweezers, plaster of Paris, toothpick, and watercolor paints.
Fossil dig: string, tape, index cards, a large, shallow plastic container, and a small paint brush.
Soil Lab: soil samples (sand, clay, loam), soda bottle (cut in two parts), coffee filters (3 per group), paper towels, water, graduated cylinder or other tool for measuring water, My Soil Record.
Plant Lab: soil samples (sand, clay, loam), seeds or seedlings for growing plants, containers for planting (examples: egg carton or student milk carton) Recording sheet to chart growth My Plant Record.

Students will continuously obtain, evaluate, and communicate information. This is not a linear process. Students will communicate through writing and discussions to allow for formative assessment. This benefits the teacher, student, and whole group to guide instruction to clarify misconceptions or extend content.

Engaging Learners

Phenomenon
View items found in or growing in rocks: What's in a Rock? Encourage students to generate questions about how the items are in the rocks and how the items might affect the rocks. (Teacher note: Items growing in rocks, water frozen in rocks, water flowing over rocks, and wind blowing against rocks cause the rocks to break down and become different types of soil.)

Obtaining
'Pet Rock' Activity
Gather a set of rocks (at least one per student) and allow each student to pick out their own rock. Have the students examine the rock and make careful notes about the color, shape, size, texture, and any details that might help them identify their rock in their Science Journal. Place all of the rocks back into box. Have students take turns reading about their rock, and let the class try to identify each person's rock from the description.

Evaluating
Students will work in groups to classify the rocks based on characteristics such as color, texture, luster, and hardness.

1. Provide each group of students with several rocks (4-7).
2. Students will develop questions to determine how to sort their rocks. Give students a few minutes to brainstorm these questions. Questions may lead groups to sort rocks in multiple ways.
3. Provide each group of students with common items to use to try to scratch their rocks. (fingernail, penny, paper clip or steel nail)
4. Students will use Moh's Scale to compare the hardness of their rocks to the hardness of minerals and other common objects indicated on the provided resource. Moh's Hardness Scale
5. As students are using rocks, which contain more than one mineral, they may make an observation that the rock is harder in some areas than in others.
6. Luster refers to how a mineral reflects light. Third graders use words like shiny, dull, or metallic to describe luster. Students will sort their rocks (made up of 2

	or more minerals) according to their luster and record it in their science journal. 7. Students will sort their rocks based on color and record it in their science journal. 8. Students will sort and describe their rocks based on texture (grainy, smooth, rough) and record it in their science journal.
	Communicating Students will record in their Science Journal an explanation of what questions they asked to place rocks into each category.
Exploring How what and *(Grow plants in sand, loam and clay), fossils*	*Obtaining and Communicating* Students will look at pictures and videos of rocks and processes that break rock down to soils. Rocks Become Soil and Water Flows over Rock Students will form an explanation about how rocks become soil. *Probe Students:* • *Are rocks the same in all parts of Georgia?* • *How are they the same?* • *How are they different?* • *Does the type of rocks found in a Georgia region help you figure out what type of soil is there?* • *Can you predict the types of plants in a region if you know the types of rocks found there? Why?* Students will research the types of rocks and soils found in each region of Georgia using the Research Guide. Rocks in Regions of Georgia is a PowerPoint depicting some of the different types of rock found in Georgia regions. Show the PowerPoint to students and allow them to discuss the appearance of soils in the different regions based on the rocks found there. Ask students how they think the type of soil will affect the types of plants found in the regions. Resource: Georgia Geological Society, https://www.westga.edu/~ggsweb/ Divide students into groups of 3-4. Pass out small samples of soil (sand, clay, loam). Students will observe the soil: 1. Students will roll the soil between their fingers and record the texture on the recording sheet. They can use words like gritty, smooth, grainy, etc. 2. Students will use a hand lens to look at the grains of soil. Students will write their findings on the recording sheet, My Soil Record. 3. Complete the water retention lab below: Water Retention Lab Provide student groups with a ½-1 cup of each soil (clay, sand, loam). Give each group a container and three coffee filters. Containers are made by cutting the top portion off of a soda bottle and turning upside down into the bottom portion. 1. Students will place a coffee filter into their container. 2. Students will pour ½-1 cup (amount determined by teacher) of clay into the filter.

	3. Students will pour 50mL of water into the soil and set a timer for 2 minutes. 4. After 2 minutes, students will measure the amount of water that clay allowed to pass through to the bottom of the soda container. Students will write data on their recording sheet [My Soil Record.](#) 5. Repeat the process with sand. 6. Repeat the process with loam. 7. Students will discuss the results with their group and how the amount of water a soil will hold could affect the types of plants that could grow in each type of soil. 8. Students write their ideas in their student journal [My Soil Record](#). Now that students have some knowledge of rocks and soils, it's time to plant some plants! Using seeds (such as lima bean, corn, pumpkin, radish) or seedlings, complete the following lab. Plant Lab 1. Each group of students will need 3 containers for growing plants (Styrofoam cups, egg cartons, washed student milk cartons), sand for one container, clay for one container, loam for another, and seeds or seedlings to plant. 2. *Teacher note: Put a few small holes in the bottom of the container and line the bottom with a piece of coffee filter or paper towel so the excess water can drain through into another container or plate.* 3. Label the first container as SAND. 4. Students will place sand in the first container and follow the directions for the seeds provided to plant them in the sand. 5. Label the second container as CLAY. 6. Students will place clay in the second container and follow the directions for the seeds provided to plant them in the clay. 7. Label the third container as LOAM. 8. Students will place loam in the third container and follow the directions for the seeds provided to plant them in the clay. 9. Students will write observations in their student journals and draw a picture or take a digital picture to show their "plants" on day 1. 10. Students should water each plant the same amount daily (careful not to overwater) and record growth every other day on their [My Plant Record.](#)
	Evaluating After the plants have had time to grow (2-4 weeks), student will make a claim about which soil is the best for growing plants and provide evidence to support their claim.
Elaborating Applying Model to Solve a Problem	*Obtaining* Divide the students into groups of 3 or 4. Explain to the class that they are science detectives. They are going to look for clues today. Tell them that fossils can act like a history book, giving clues about the past. Give each group of students a dozen fossils, and let them examine the fossils for clues about the organisms that became fossilized. Have them write questions and discuss ● what organism each fossil used to be, ● where that organism lived, and ● how long ago the organism lived.

	Scientist use clues from fossils to learn about animals that lived long ago. Discuss that if you find a fossil with a plant and a fish, that you might assume that the plant was an aquatic plant because of the fish. If you find a plant with a desert lizard fossil, where would you suppose it might have lived? If you find a plant fossil inside a dinosaur, what would that clue tell you? Fossils closer to the top of the soil usually mean that the animal was alive more recently than one found deeper in the earth, but sometimes the soil may have been moved. If an earthquake or some other event disturbs the soil, sometimes layers that used to be buried are shifted up to the top of the Earth. Do you think that all organisms become fossils? Stress that conditions have to be just right for a fossil to form. Most fossils are formed when a plant or animal dies in a wet environment and is buried in mud and silt. The soft tissues from the animal decompose quickly, leaving behind the hard bones or shells. The water flows through the bones or shells, leaving minerals from the water in the tiny holes in the bones or shells. Over time, the bones or shells actually turn into a rock. Watch the following 3-minute video: Fossils in Sedimentary Rock Making a Model of Fossils Tearing off small pieces of modeling clay, press the clay into the bottom of a styrofoam bowl until you have a layer about ½ inch thick. Make the top of the clay as flat as possible. Put a thin layer of petroleum jelly over the top of the clay. Coat three to four shells with the petroleum jelly, and then push them down into the clay until they are mostly submerged into the clay. Using tweezers, pull the shells back out of the clay, keeping them as straight as possible as you pull them out. Mix up about 1 ½ cups of plaster of Paris for each student. Pour the plaster of Paris over the clay in each bowl, and allow to harden overnight. Have the students write their name on the bowl for easy identification the next day. The next day, have the students peel the Styrofoam bowls off of the clay/plaster mixture. Discard the bowl. Place the mixture clay side up onto the student's desk. Using toothpicks, carefully remove the clay from the top of the plaster to reveal the fossil model.
	Evaluating Probe the student's thinking by asking the following questions: ● What do you see in the plaster? (shells) ● Is it the real shells? (No. The teacher can hold up the original shells to show that the plaster is a copy of the shells, but there is nothing of the original animal in the 'fossil'.) ● We made a model of a fossil. How is the model like a real fossil? (it has the same shape, it is the same size, etc.) ● How is the model different from a real fossil? (It formed quickly, it is not made of minerals from water, they are not the same color, etc.) ● Do all dead plants and animals become fossils? (No, most do not. Circumstances have to be just right for fossils to form.)
	Communicating Have the students write their name on the bottom of their fossil with a permanent

marker, watercolor their fossil model, and then allow the model to dry overnight.

Making an Archeological Dig
(Connections to Engineering, Technology, and Applications of Science)

Place the fossils into the plastic container and cover them with sand or rice before the students arrive for class. Be sure to keep a record of which fossil is in which section, so that you can grade the activity sheets later.
As class starts, explain that scientists that look for fossils are called ‘paleontologists’. Paleontologists keep a careful record of where they find their fossils. Explain to the students that they are going to make a grid and keep data about their fossil dig, too.
Tape four pieces of string across the width of the plastic container, at equal distances to form five rectangular sections. Tape four pieces of string across the length of the plastic container to form small squares. Label each square with an index card. The squares across the top will be A, B, C, D and E. The squares down the side will be 1, 2, 3, 4 and 5. (see illustration)

	A	B	C	D	E
1					
2					
3					
4					
5					

Pass out the Fossil Dig Data Sheet.

Allow one student at a time to explore one section of the ‘dig’ with a soft paint brush. When a student finds one fossil, the brush should be handed to another student to explore. All students should record what is found in each section of the dig, just like a real paleontologist. At the end of the fossil dig, the students can fold the data sheet and glue it into their Science Journal. Activity sheets can be graded based on the percentage of fossils recorded in the correct section of the recording sheet.

Evaluation	***Assessment of Student Learning***
	Student Journal and Recording Sheets
SEP, CCC, DCI	**Science Essentials**
Science and Engineering Practices	• Asking questions and defining problems • Developing and using models • Planning and carrying out investigations • Constructing explanations and designing solutions • Engaging in argument from evidence
Crosscutting Concepts	• Patterns • Cause and Effect • Structure and Function • Stability and Change

Disciplinary Core Ideas	• ESS1.C: The History of Planet Earth • ESS2.A:Earth Materials and Systems • ESS2.C: The Roles of Water in Earth's Surface Processes • ESS2.E: Biogeology • LS4.A: Evidence of Common Ancestry and Diversity • LS4.C: Adaptations