

**TEACHING KATE
TEACHING KIDS ABOUT THE ENVIRONMENT**

MINERALS OF SOUTH CAROLINA

Grade Level: 5

Time Required: 3 class periods of 50 minutes each.

SC Science Standards

This lesson plan was correlated with only the grade level specified unless otherwise noted.

- I. A. 1. a
- I. A. 4. a
- I. B. 1. d
- I. C. 2. b
- III. A. 1. c

Purpose

Students will by adopting a rock increase their awareness of South Carolina's geological environment. They will become familiar with the formation of rocks by observing laboratory representation of the origin of extrusive, intrusive, metamorphic and sedimentary rocks. Students will learn the geological nature of the major physiographic provinces of South Carolina. Students will become familiar with minerals of economic value in South Carolina and locations where they are mined. They will learn to identify minerals common to South Carolina, the rocks of which these minerals are constituent parts and classify them into four major types: intrusive, extrusive, metamorphic or sedimentary.

Skills

Classifying, comparing and contrasting, discussing, observing, organizing information, predicting, problem solving, small group interacting, verifying, writing a description.

Concepts

Geological processes, economic importance of South Carolina minerals, mineral identification and classification, physiographic regions of South Carolina.

Materials Needed

Paper	Pencils	Worksheets	Crayons
Clay (3 colors)	Gelatin Mix (3 colors)	Mixing Bowl	Spoon
Measuring Cup	Hot Water	Rock Samples	Hole Punch
Heavy Book	Wax Paper or Paper Plates	Overhead Pens (3 colors)	Refrigerator
3 oz. Paper Cup (7 per group)		Large Laminated Map of SC (opt.)	
Class Copies of Maps Showing SC Mineral and Rock Occurrence			
Class Copies of Geological Provinces of SC			

Definition of Terms

<u>Extrusive</u>	Rock that cools on the earth's surface.
<u>Geographic Provinces</u>	Geological landforms in which all rock types within it are alike.
<u>Igneous</u>	Molten rock that cools within the earth or on the earth's surface.
<u>Intrusive</u>	Rock that cools below the earth's surface.
<u>Metamorphic</u>	Preexisting rock that changes under high pressure, high temperature or chemically active fluids.
<u>Mineral</u>	Naturally occurring inorganic substance in crystal form.
<u>Mining</u>	The extracting and selling of material from the earth.
<u>Rock</u>	An aggregate of one or more minerals.
<u>Sedimentary</u>	Rock formed from deposited rock or mineral fragments then compacted or cemented together.

Before the Session

Before beginning the lesson obtain enough gelatin, clay, and cups for each group. In addition, have hot water, measuring implements and a bowl to mix the gelatin. You need to be sure you have access to a refrigerator or an ice chest with ice to chill the gelatin. Maps and worksheets need to be duplicated for the students to record their information. In order to save time, punch three holes in at least one cup for each group.

Background Information

In South Carolina there are three geographical provinces: Coastal Plain, Piedmont and the Blue Ridge. The Coastal Plain extends from the Fall Line near Columbia to beyond the coast line onto the ocean floor of the Atlantic. The Fall Line therefore marks the upper boundary of the Coastal Plain and the lower boundary of the Piedmont, the second province. The Brevard Fault Zone marks the upper boundary between the Piedmont and the third province, the Blue Ridge.

The Coastal Plain contains sedimentary and unconsolidated rocks. Igneous rocks are found in the Piedmont. The Blue Ridge province is composed of metamorphic rocks.

When identifying rocks the factors that are considered for this lesson are the rock types: mineral, extrusive, intrusive, metamorphic or sedimentary.

Sedimentary rock forms when rocks are weathered or broken. These rock and mineral fragments are carried and deposited by ice, wind, gravity or water. Compaction or cementation then changes this material back into rock. Ground water minerals cause the cementation and compaction is caused by the pressure of the rock material that continually builds up on top. This type of rock looks loosely cemented together. It ranges in age from 225 million years old to the present.

Metamorphic rocks form when igneous sedimentary or metamorphic rocks change due to the addition and/or deletion of minerals under high pressure, high temperature or chemically active fluids. These can be identified by tightly compacted layers viewed in cross-section.

Igneous rocks form when molten rock cools. There are two ways igneous rocks form. They can either cool inside or outside the earth. The igneous rocks that cool within the earth are intrusive. Extrusive igneous rocks are those rocks that cool outside the earth's crust. Igneous, as well as, metamorphic rocks range in age from 1.2-2 billion years.

The last category of classification is mineral. Minerals are naturally occurring inorganic substances in crystal form.

There are 21 minerals in South Carolina that are of economic value and are actively being mined. The chart that follows lists these minerals and their products.

Suggested Lesson Plan

1. Have students select a rock to use in their Adopt-A-Rock activity.
2. Handout the worksheet for Adopt-A-Rock. Students should use this as a guide to write about their rock.

3. Give out 2 sheets of wax paper or paper plates, and a heavy book. Give out 3 colors of clay - red, blue and yellow - and 7 (3 oz.) cups. One of these cups has 3 holes punched near the bottom.
4. Break each piece of clay into 4 portions and shape into balls (4 red, 4 blue, 4 yellow).
5. Using one of each color, place them close together on wax paper or paper plate. Cover with the other sheet of wax paper or paper plate. Place the book on top and press down firmly.
6. Lift off the book and wax paper or paper plate. Observe the clay. Identify. This example is a metamorphic rock. Note the layering and compactness of the clay.
7. Using 3 more pieces of clay (1 of each). Shape the clay into cubes. Stack the cubes on top of each other on wax paper or paper plate. Place wax paper or plate and book on top for approximate 30 seconds.
8. Lift off the book and paper. Identify. This is an example of sedimentary rock. The layers are not tightly compacted.
9. Place a red, yellow and blue ball into a cup. Mash it only enough to fill all the empty spaces in the bottom. Take the sample out of the cup. Note that this is an example of intrusive rock. The outer part of the cup is the earth's crust.
10. Do the same with the cup that has the holes in the side. Using your fingers mash the clay until it oozes out the holes. This is an example of extrusive rock cooling on the outside of the earth.
11. Have the students draw and label representations of each type of rock.
12. Mix gelatin one color at a time. Pour small portions into each cup (1 color per cup). Chill in refrigerator or ice chest on a slanting surface.
13. After gelatin has hardened, remove it from the cup and place it on wax paper or plate, stacking each color on top and slightly forward of the other. Thick areas should be on the same side and thin on the same side. Note that these represent the geographical provinces of South Carolina - Blue Ridge, Piedmont and Coastal Plain and their positions.
14. Have the students color and label the provinces on maps issued to them.

15. “Maps Showing Mineral and Rock Occurrence” 1, 2, 3 and 4 are issued. Beginning with Map 1, discuss each mineral: kyanite, phyllite, biotite/vermiculite, barite, granite, quartz sand and chert. Noting its location and products as you proceed. Students are to color each location a different color. Continue this procedure with each map.
16. Pass out one sample of each rock and/or mineral that is available to each group. Have students examine the rocks and classify them into the 4 categories.
17. Students will then note their predictions and when finished will verify their answers with the teacher.
18. Return materials to designated storage areas and dispose of waste properly.

Application

Minerals are a valuable resource in South Carolina. There are many jobs associated with mining and mineral products in South Carolina.

Resources Available

South Carolina Minerals and Rocks. 1993. South Carolina Geographical Survey.

South Carolina Mining Product Samples. Broad River Road, Columbia, S. C.

Prepared by: Brenda C. Hardwick

TEACHING KATE
TEACHING KIDS ABOUT THE ENVIRONMENT

MINERALS OF SOUTH CAROLINA

Mineral Locations

<u>Material</u>	<u>Province</u> (Type)	<u>Location</u> (County)	<u>Economic Value</u>
Quartz (sand)	Coastal (mineral)	Aiken to Chesterfield	filter sand, masonry sand, glass, fiberglass, sand blasting
Quartz (crystals)	Coastal (mineral)	Lancaster, Cherokee, Anderson, Abbeville, Union	jewelry
Muscovite	Piedmont, Blue Ridge (mineral)	Oconee, Greenville, Anderson	filler in rubber tires, sheetrock, paint, wallpaper, insulating material, lubricant
Biotite	Piedmont (mineral)	Laurens, Spartanburg, Union	no commercial value but will weather to make vermiculite
Vermiculite	Piedmont (mineral)	Laurens, Spartanburg, Union	thermal and acoustic insulation, concrete aggregate, potting soil
Barite ics	Piedmont (mineral)	Cherokee, McCormick	Well casings in oil and gas wells, filler in cloth and paper, cosmet-
Hematite	Piedmont (mineral)	Cherokee, York, Spartanburg	part of iron production
Pyrite	Piedmont (mineral)	Lancaster, York	sulfuric acid, colorant for grey glass
Limonite	Piedmont (mineral)	Cherokee, Saluda, Greenville, McCormick	masonry products, roofing granules, linoleum, fertilizer

<u>Material</u>	<u>Province</u> (Type)	<u>Location</u> (County)	<u>Economic Value</u>
Kyanite	Piedmont (mineral)	York	gemstone, heat resistant ceramic
Granite	Piedmont (intrusive)	Kershaw, Fairfield	aggregate in construction
Gabbro	Piedmont (intrusive)	York, Greenwood, Fairfield, Abbeville McCormick	crushed stone aggregate
Limestone	Coastal (sedimentary)	Charleston, Georgetown Colleton, Hampton, Allendale, Jasper, Dorchester, Bamberg, Berkeley, Orangeburg	crushed stone aggregate agriculture lime, mortar, sand, brick
Diabase	Piedmont (intrusive)	Kershaw	roofing granules, black granite
Chert	Coastal (sedimentary) Americans	Allendale	flint for starting fires, stone weapons used by Native
Kaolin	Coastal (sedimentary)	Aiken, Lexington, Kershaw, Richland, Chesterfield	china porcelain, crayons
Fuller's Earth	Coastal (sedimentary)	Aiken, Lexington, Calhoun, Richland, Sumter, Clarendon, Williamsburg, Georgetown	kitty litter
Gneiss	Piedmont (metamorphic)	Oconee	crushed stone aggregate

<u>Material</u>	<u>Province</u> (Type)	<u>Location</u> (County)	<u>Economic Value</u>
Schist	Piedmont, Blue Ridge (metamorphic)	All Piedmont and Blue Ridge Counties	none
Amphibolite	Piedmont, Blue Ridge (metamorphic)	All Piedmont and Blue Ridge Counties	none
Argillite	Piedmont (metamorphic)	Greenwood, Saluda Kershaw, McCormick, Edgefield, Fairfield, Newberry, Lexington, Chesterfield, Lancaster, Richland	brick and tile
Marble	Piedmont, Blue Ridge (metamorphic)	Cherokee	monuments, statuary, crushed stone, flux in smelting, decorative stone
Phyllite	Blue Ridge, Piedmont (metamorphic)	Oconee, Pickens	none
Soapstone	Piedmont, Blue Ridge (metamorphic)	Oconee, Pickens, Cherokee, Laurens, Spartanburg	hearth stones, bedwarmers, stove linings, ceramics, talc

**TEACHING KATE
TEACHING KIDS ABOUT THE ENVIRONMENT**

MINERALS OF SOUTH CAROLINA

WORKSHEET

Name:

Date:

- I. Name your rock.
- II. Identify your rock as extrusive, intrusive, metamorphic or sedimentary.
- III. Write a description of your rock.
- IV. Draw your rock.
- V. Write a poem or song about your rock.
- VI. What is the economical value of your rock?
- VII. Predict the age of your rock.
- VIII. What special things do you do for your rock?
- IX. Consider the products that are produced from your rock. What industry and/or careers could be related to these products?