

A Teacher's Guide to **Geology Really Rocks** Grades 3-6

Description: From the salt on our food to the gas in our car, we use geology in many ways. The fascinating world of rocks and minerals is revealed as you learn about the rock cycle and handle real geological specimens.

Outcomes: Students will be able to tell the difference between a rock and a mineral and will be able to understand the processes through which rocks are formed and destroyed. Students will also be able to name ways we use rocks and minerals in everyday life.

Suggested Activities Before Your Outreach:

<u>Vocabulary</u>		
geology	sedimentary	fossil
mineral	igneous	
rock cycle	metamorphic	

- Create a K-W-L chart about what the kids think of when they hear the word “geology” or “earth science”. Leave the “What We Learned...” column blank and have students fill in new information after the outreach lesson. Discuss the words rock, mineral, and fossil.
- Discuss what kind of jobs a geologist can do. Geologists study more than just rocks! Think about what the word “geology” means (the study of the earth) and have the students brainstorm some ideas on what kind of jobs a geologist might do. If you need something to help with the process, check out the *What is Geology- What Does a Geologist Do?* page in the Additional References for Teachers section.
- Fossils can be found in sedimentary rocks all over the world, including Antarctica! Ever wonder what fossils you could find in Australia? How about Madagascar? Start off with showing the kids a world map. Where do they think they could find some fossils (almost anywhere!). Now split the kids into 7 groups (one for each continent). Assign each group a continent and ask them to research what kind of fossils they could find if they visited. If you're stuck on where to begin looking, check out the *Fossil Museum-Fossil Sites* page in the Additional References for Teachers section.

Suggested Activities After Your Outreach:

Classroom Activities:

- Discuss the lesson with your students. What new ideas or information did they learn? Was anything confusing? What did they like best? Fill in the final column of the K-W-L chart.
- Learn what kind of geology can be found right in your school yard! Go for a geology hike around your school or in the playground and see what rocks or minerals you can

find. What are the buildings made of? What is the playground or swing set made of? You can use the rock and mineral identification charts in this packet to help you in your identification. For some ideas on how to construct your geology walk, see the United States Geological Survey (USGS) Schoolyard Geology- Find the Rocks on the USGS website provided in the Additional References for Teachers section.

- Make your own mineral crystals in class. Use the Candy Crystals experiment found in this packet to learn how some rocks and minerals are formed, while making a tasty treat to be enjoyed by all (and sneak in some chemistry knowledge as well). When you mix hot water and sugar you make what is called a “super saturated solution”. This means that the water can hold more sugar than usual because it is so hot. As the water cools the sugar “comes out” of the solution and forms crystals on your skewer. The skewer act as a “seed” or starting place for the sugar crystals to start to grow. This is how some minerals and rocks are formed (ex. calcite and limestone), as well as stalagmites.

Homework Assignments:

- Use the Geology Rocks word search as a good vocabulary review.
- Have the students find out about their birthstone. Birthstones are types of minerals that we call “gems”. Each month has a different stone that has been assigned to it. Have the students find their stone and write down what type of mineral it is and three fun facts about that mineral. After they have turned in the homework, you can make a chart showing which birth stone each student has (ex. Jane and John both have January birthdays-birthstone is Garnet). A good website is *Valley Jewelers* (see link in the Additional References for Teachers section). Although a jewelry website, it is a good resource on the different gems.

Interdisciplinary Activities:

- Mapping is an important part of geology. Geologist must take careful measurements of different types of rocks to construct maps for use in mining, oil research, and paleontology. However, some of these areas are huge! To help with figuring out distances, most geologists will figure out their stride length. This way they can measure distances by counting how many steps they took and multiply that by their stride length. What is your stride length? Measure the length of your classroom and record the length of the room. Have each student take a turn to walk (NORMAL) across the room and count how many strides it takes them. There are different definitions of what a “stride” is. For this activity, we define a stride as one step. Have the students divide the distance of the room by the amount of steps they took; this is their stride length. Use the worksheet provided to record all of your results. Now that they know their stride length, have them try to calculate distances. How long is the schoolyard? The hallway?

Writing/Drawing Prompts:

- Geologists often work with natural resources. A natural resource is a naturally occurring material (such as coal or wood), that can be used by people. Some of these resources are sustainable, which means they can be continually used with minimal long-term effect on the environment (such as wind), while others are unsustainable (oil or coal). When a resource is unsustainable, it takes care and good practice to conserve that resource for future generations. What is an example of a natural resource? Is it sustainable or

unsustainable? If it is unsustainable, how can we conserve that resource? For more information on resources, visit the USDA education website (See the Additional References for Teachers section).

- Geologists can help with predicting and preparing for natural disasters such as earthquakes. One example is the magnitude 7 earthquake that occurred in Haiti in January 2010. Geologists were able to tell what caused the earthquake, the magnitude (amount of energy released), and the possibility of aftershocks, which could cause more damage to the area. Why is it important to know about geology when worrying about natural disasters? For more on natural disasters, visit the National Geographic website (See Additional Resources for Teachers).

Class Project:

- Start your own museum! You can acquire specimens on your own, have the students collect them on their own, or have the students collect specimens on their geology walk around the school. Have the students work in groups to make a label for their specimen. A label should include the name of the mineral, the place it was found, the name of the person who collected it, and a specimen number (this can be made up by the students). Specimen numbers always start with the initial of the museum they are being kept, followed by a number. You can design the card on your own, or use the example label in this packet. Once the students have a good label for their specimen, have them make a pedestal for displaying the specimen using common arts and crafts material. Set up a table in the room that will act as your display case and have the students arrange their specimens for the opening of their new museum. Arrange for parents or other classrooms to tour your museum!

Additional Resources for Students

- Paleoportal is a great site for both students AND teachers. It features links to fossil galleries, geology careers, fossil collections, paleontologists, and geologic history for each state. <http://www.paleoportal.org/>
- The Mineral Information Institute has a wonderful list of common minerals and their uses at <http://www.mii.org/commonminerals.html>.
- The USGS Rocks and Minerals Site has great information on both rocks and minerals <http://geomaps.wr.usgs.gov/parks/rxmin/index.html>.
- Eyewitness: Rocks and Minerals- by Dr. R.F. Symes (general rock and mineral identification)
- Eyewitness: Earth- by Susanna Van Rose (general earth science information and geology careers index)
- Eyewitness: Fossil- by Dr. Paul Taylor (general fossil information)
- If You Find a Rock- by Peggy Christian (fun ways to describe geology)

Additional Resources for Teachers

- Teaching Earth Science- Good for locating general geology information and website links to the USGS and other geology sites geology.com.
- The USGS has a lot of teaching resources available for a variety of subjects. Go to <http://education.usgs.gov/schoolyard/> for information and fun activities for you to do with the students. There are a couple of the schoolyard geology walk ideas that you can use for your school yard geology project
- *What is Geology- What Does a Geologist Do?*- Website that highlights different geology careers. <http://geology.com/articles/what-is-geology.shtml>
- *Fossil Museum-Fossil Sites*- Great site for international fossils finds <http://www.fossilmuseum.net/FossilSites.htm>.
- Valley Jewelers- A good website for birthstone information www.valleyjewelers.com/tng070.htm
- USDA Education- A good resource on resources <http://www.nrcs.usda.gov/feature/education/>
- National Geographic- Covers a wide range of natural disasters <http://environment.nationalgeographic.com/environment/natural-disasters>.
- Geology Rocks!: 50 Hands-On Activities to Explore the Earth (Kaleidoscope Kids)- by Cindy Blobaum (fun earth science activities)
- Planet Earth, Grades 4-6+- by David Steward (another information and activities book geared towards older grades)
- Janice VanCleave's Earth Science for Every Kid: 101 Easy Experiments that Really Work (Science for Every Kid Series)- by Janice Van Cleave (fun and easy earth science experiments)

National Benchmarks

4B, 4C, 8B, 11A, 11C

PA State Standards

3.3A, 4.3, 1.6

Mineral Identification Chart

by Art Crossman

METALIC MINERALS

FRACTURE CLEAVAGE	STREAK	COLOR	HARDNESS	FRACTURE CLEAVAGE	LUSTER	OTHER PROPERTIES	SPECIFIC GRAVITY	MINERAL NAME
CLEAVAGE	colorless	dark green, dark brown, or black	2.5 - 3	perfect cleavage in one direction	submetallic	thin flakes, tough, flexible	2.8 - 3.2	BIOTITE
	black	black, silver, or gray	1 - 2	cleavage sometimes indistinct	metallic or submetallic	marks paper, soils fingers, slippery	2.23	GRAPHITE
FRACTURE	black	brassy yellow	6 - 6.5	conchoidal fracture	metallic	sometimes in crystal shapes	5.02	PYRITE
	reddish	red -brown, black, silver	5 - 6.5	fracture	metallic or submetallic	sometimes oolitic or magnetic	5.56	HEMATITE
	black	black or silver	6	fracture	metallic or submetallic	strongly magnetic	5.18	MAGNETITE

NONMETALIC MINERALS

FRACTURE CLEAVAGE	STREAK	COLOR	HARDNESS	FRACTURE CLEAVAGE	LUSTER	OTHER PROPERTIES	SPECIFIC GRAVITY	MINERAL NAME
CLEAVAGE	white or colorless	green to black	6 - 7	one direction indistinct	vitreous - dull	typically pistachio green	3.35 -3.4	EPIDOTE
	white or colorless	white, gray, pink, clear, green, yellow	6 - 6.5	two directions at 90 degrees	vitreous	few if any striations	2.5 - 2.6	ORTHOCLASE
	white or colorless	white, gray clear, blue green	6	two directions at 90 degrees	vitreous	striations on cleavage faces	2.6 -2.8	PLAGIOCLASE
	colorless	brown, dark green, black	5 - 6	two directions intersects at 56 & 124 degrees	vitreous	appears fibrous or silky	3.0 - 3.4	HORNBLLENDE
	white	any color clear, yellow purple, blue	4	perfect four directions	vitreous	sometimes fluorescent	3.18	FLUORITE
	white	white, gray green, yellow clear, etc.	3	perfect 3 directions, "rhombic"	vitreous/pearly	breaks rhombic HCl reaction 2x refraction	2.71	CALCITE
	colorless	dark green dark brown or black	2.5 - 3	perfect cleavage in one direction	nonmetallic	thin flakes, tough, flexible	2.8 - 3.2	BIOTITE
	gray to green	greenish, gray, black	2 - 2.5	perfect in one direction indistinct	vitreous dull pearly	foliated or scaly appearance	2.6 - 3.3	CHLORITE
	colorless	clear, white yellowish, silvery, etc.	2 - 2.5	perfect cleavage in one direction	vitreous to pearly	splits into thin sheets	2.7 - 3.0	MUSCOVITE
	white	white, gray, yellowish	2 - 2.5	one direction but usually indistinct	dull, earthy	plastic when wet, crumbly when dry	2.6	KAOLINITE

CLEAVAGE	white	white, gray blue, red clear	2 - 2.5	perfect 3 directions at 90 degrees	vitreous to pearly	water soluble, tastes salty	2.16	HALITE
	white	white, gray brown, red clear & others	1.5 - 2	perfect in one direction 2 indistinct	vitreous to pearly	sometimes as fibrous masses	2.3 - 2.4	GYPSUM
	white	green, gray white, silver & other colors	1	one direction but usually indistinct	pearly to greasy	feels greasy, tiny flakes upon rubbing	2.7 - 2.8	TALC
FRACTURE	yellow or brown	yellow, brown, or black	5 - 5.5	one direction indistinct	dull to admantine	appears fibrous or silky	3.3 - 4.3	GOETHITE
	colorless	black, green brown, pink yellow	7 - 7.5	fracture	vitreous	sometimes striations	3.02 - 3.2	TOURMALINE
	colorless	usually red, green, black or any color	6.5 - 7.5	fracture	vitreous to resinous	sometimes isometric crystals	3.5 - 4.3	GARNET
	colorless	any color	7	conchoidal fracture	vitreous to greasy	sometimes has hexagonal crystals	2.65	QUARTZ
	colorless	olive, green, brown	6.5 - 7	conchoidal fracture	vitreous	frequently as granular masses	3.27 - 4.27	OLIVINE
	reddish	red - brown, silver, or black	5 - 6.5	fracture	dull	sometimes oolitic or magnetic	5.26	HEMATITE
	white	white, gray yellow, red brown	1 - 3	fracture	dull earthy	pisolitic	2.00 - 2.55	BAUXITE

Calculate Your Stride Length

Mapping is an important part of geology. Geologists rely on detailed maps for mining, to find oil, and to locate fossils. They take careful measurements of the different kinds of rocks they find using a number of instruments, including Jacob's staffs and measuring tape. However, sometimes these distances are very long! An easy way for geologist to measure these areas is to use their "stride length". Your stride length is the length between your feet when you take one NORMAL step. Let's calculate your stride length!

Length of the Room:

Let's see how many "strides" it takes you to cross the room. Take a step with your right foot; the distance between your right foot and where you "left" your left foot is one stride. Now walk across the room and count your strides.

Number of Strides to Cross the Room:

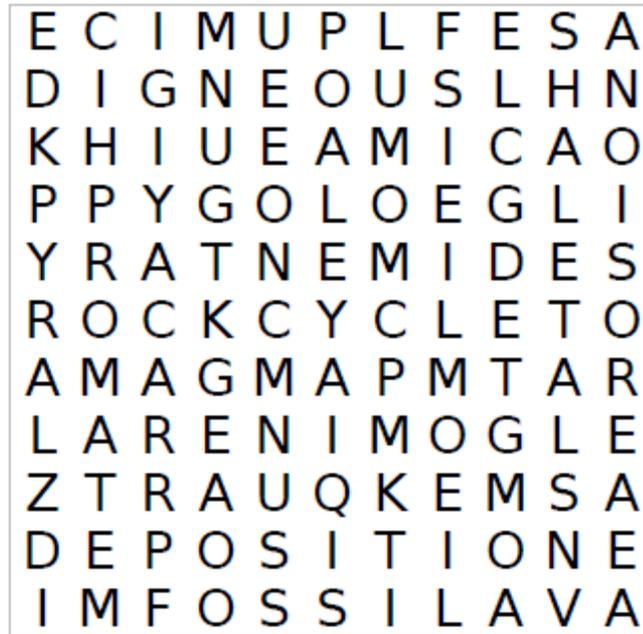
Now it's time to calculate your stride length.

Stride length = the length of the room/ the number of steps it took you to cross the room

Stride length:

Geology Rocks

What is geology? Hint: It's more than just rocks! See if you can find all of the geology words in the puzzle.



deposition
geology
magma
mineral
rock cycle
slate

erosion
igneous
metamorphic
pumice
sedimentary

fossil
lava
mica
quartz
shale

Mineral Museum Label

Below is an example of a mineral specimen label. You can copy the blank label for the students to fill out for their own specimen, or design your own. Note: Index cards make great specimen cards

Element-ary Mineral Museum	No.123
<u>Mineral Name:</u> Calcite	
<u>Location Found:</u> Townsville, PA, USA	
<u>Collected By:</u> John Doe	

	No.
<u>Mineral Name:</u>	
<u>Location Found:</u>	
<u>Collected By:</u>	

Candy Crystals



Adapted from www.sciencebob.com

Materials:

- A wooden skewer, clean popsicle stick, or clean wooden chopstick
- A tall narrow glass or jar
- A clothespin
- 1 cup of water per glass
- 2-3 cups of sugar per glass

Instructions:

1. Clip the skewer/popsicle stick/chopstick in the clothespin so that the stick is hanging inside the glass about 1 inch from the bottom of the glass.
2. When you have the clothes pin at the right length, set the stick and clothespin aside for later.

ADULT SUPERVISION REQUIRED FOR FINAL STEPS!!

3. Pour the water into a pan and bring it to boil.
4. Pour about $\frac{1}{4}$ cup of sugar into the boiling water and stir until ALL of the sugar has dissolved.
5. Keep adding more sugar in small increments of about $\frac{1}{4}$ cup. Make sure that you take time to stir the mixture until it dissolves every time you add more sugar. Keep doing this until you can not dissolve the sugar. NOTE: It will take longer for the sugar to dissolve each time you add more sugar, so you will have to be very patient when you get towards the end of the sugar. Once no more sugar will dissolve, remove it from heat and allow it to cool for at least 20 minutes.

NOTE: If you want colored rock candy, add food coloring to your sugar water. For the best results, make the color very dark.

6. Have the ADULT carefully pour the sugar solution into your jar so that it almost reaches the top (leave about $\frac{1}{2}$ an inch of free space). Place your stick-clothes pin contraption back into the glass, making sure that it is hanging straight down the middle without touching the sides.
7. Allow the jar to fully cool and put it someplace where it will not be disturbed. Let the solution sit for 3-7 days and watch your sugar crystals grow!