

Exploring Minerals

Grade Level: 3 - 4

Purpose and Goals: This lesson begins by guiding students to the connection between differences in rocks and the presences of minerals in the rocks. The differences in rocks are dependent on the number, kind, and amount of minerals in the rocks. After examining rocks for the presence of different minerals, the students will be introduced to Illinois minerals, learn about properties of minerals, and perform hardness test on several minerals. Observations and test data will be recorded in their Science notebooks.

Targeted Objective: Identify properties of minerals and be able to identify certain minerals using specific tests.

Background: Minerals are materials which are not plants or animals and are found in nature. Rocks may be made of only one mineral or several minerals. This is why minerals are called the building blocks of rocks. To identify minerals, we can look for clues. One clue is color. Many minerals have distinctive colors. Another clue is texture. Some minerals are rough; others are smooth. Checking for luster or shininess is another way to identify minerals. Some are bright and shiny, like metals. Others may be glassy, others pearly, and some dull. A good test for identifying minerals is the scratch test. A mineral's hardness can be determined with the Mohs scale. This scale ranks minerals' hardness according to whether the minerals can scratch and be scratched by various materials. This lesson allows students to further sharpen their process skills of observing, describing, recording, and concluding.

Materials:

For each student:

A rock (from the classroom collection)
Science notebook
Hand lens
Hardness Rating Sheet (Appendix 1)

For each group of 4 students:

Set of four Illinois minerals, numbered as follows: (1) Fluorite, (2) Gypsum, (3) Calcite, (4) Quartz
Penny, paper clip, empty glass baby food jar
Copy of Mohs Hardness Scale (Appendix 2)

For the class:

Chart tablet
Marker

Procedure:

1. Hand out Science notebooks. Have students retrieve their rocks from the classroom collection. Ask the students to refer to the page in their Science notebooks for the lesson on Exploring Rocks. Question 3 asked, “How can you tell that these rocks are made of more than one material?” Ask students if they know what these “materials” are called. Guide them to the term mineral. Tell the students that minerals are the building blocks of rocks, because all rocks are made up of one or more minerals. Spend some time discussing the differences between minerals and rocks. Have the students turn to a new page in their Science notebooks and write today’s date. Have them write the definition of a mineral in their Science notebook.
2. Have the students examine their rocks with the hand lens. How many different minerals can they see in the rocks? What determines differences? Guide them to a discussion of color, texture, and luster. Have the students return their rocks to the class collection. NOTE: It would be helpful to have a set of minerals to look at while they are looking at their rocks.
3. Tell the students they are going to have the opportunity to examine some Illinois minerals to see if they can identify them by their properties. Put the students in groups of four and give each group a set of four numbered minerals. Have them write a thorough description of each mineral in their Science notebooks. Tell them to be sure to include properties of color, texture, and luster for each mineral. Allow about ten minutes for this activity. Follow with a class discussion of mineral properties. Write Mineral 1, Mineral 2, Mineral 3, and Mineral 4 on the chart tablet and have groups offer characteristics of each mineral. Ask, “What if I were to ask you to hold up the mineral that is white? Which one would you hold up? What if I were to ask you to hold up the rough one? The shiny one?” Students should point out that more than one mineral has each of those properties. Draw their attention to this fact on the chart tablet. (Words such as shiny, rough, and white should appear numerous times.) Tell the students they will perform one more test to identify these minerals.
4. Before beginning the scratch test, ask each group to predict which mineral they think is the hardest. Record the predictions on the chart tablet. Give each group a penny, a paper clip (Have them unbend it.), and an empty glass baby food jar. Hand out the Hardness Rating Sheet to all students and explain how to use it. Give the group time to test the minerals by scratching them with their fingernail, the penny, and the paper clip. Ask them to attempt to scratch the surface of the glass jar with each mineral. After they have tested the minerals and placed X’s in the proper places on their Hardness Rating Sheets, give each group a copy of the Mohs Hardness Scale and have them use it to determine the name of each mineral in its appropriate place on their sheets. They should then finish the sheet by writing the minerals’ names in order of hardness (hardest to softest) on the sheet. Have a class discussion and write on the chart tablet each group’s list of minerals in the order they determined. How many were correct in their

prediction? (Quartz is the hardest, then fluorite, then calcite, then gypsum.) How many groups had correctly predicted quartz as the hardest mineral?

5. Visit the ISM Geology Online GeoGallery Web site. Have the students work in pairs. Assign or let each pair choose one mineral from the Web site. They should collect information to create an oral presentation on that mineral. They will report to the class the mineral's name, description, and use. Their presentation should use visual aids, such as pictures (drawn or printed) and maps. NOTE: You could have the students work in small groups of 3 to 4 if time is a premium. Students with a home computer could research some part of the site and report back to the group. Have some books available to aid with identification. Two good ones are:

- Mottant, A., R. Crispi, and G. Liborio. 1978. Simon & Schuster's Guide to Rocks & Minerals. New York: Simon & Schuster, Inc.
- Pough, F. 1996. Peterson Field Guide Series: A Field Guide to Rocks and Minerals. Boston: Houghton Mifflin Company.

Questions: Have the students answer this question in their Science notebooks:
“How can knowing how hard a mineral is make a difference in how that mineral is used?”

Extensions:

1. Special needs students may draw the minerals and/or verbally describe them to other students who can scribe for them.
2. Some students may want to use the Mohs scale to test other minerals from the classroom collection and report their findings to the class.
3. Students could also look at other Illinois minerals on the ISM Geology Online GeoGallery Web site, matching them with ones in the classroom collection from the Illinois State Geological Survey (if the classroom has one).
4. The McGraw Hill Web site at <http://www.mhln.com> has an informative mineral identification Web movie for viewing.

Assessment:

- Student Hardness Rating Sheets: Is information accurate and complete?
- Science notebook: Do descriptions cover properties of color, texture, and luster?
- Observation Check List during collaborative group work. (Appendix 4)
- Oral Presentations Rubric. (Appendix 3)

Resources:

McGraw Hill Science 2002, Earth Science, Unit C, pp.C6-C7

Illinois State Museum Geology Geogallery Web site
<http://geologyonline.museum.state.il.us/geogallery>

Rocks and Minerals/Rock Cycle chart, Ready Reference, Instructional Fair, TS Denison

Lesson Specifics:

Skills: Predicting, exploring, observing, recording, analyzing, communicating.

Duration: Two class periods for activities, one or two class periods for oral presentations.

Group size: Any.

Setting: Classroom.

Illinois State Board of Education Goals and Standards:

11A: Know and apply the concept, principles, and processes of scientific inquiry.

12 E: Know and apply concepts that describe features and processes of the Earth and its resources.

13A: Know and apply the accepted practices of science.

ADDITIONAL ONLINE RESOURCES

1. Online stores to purchase bagged rocks and minerals:
<http://www.rocksandminerals.com> <http://www.geoprime.com>
2. The Mineral Gallery: Web site with photos and information on mineral specimens, plus minerals to purchase: <http://mineral.galleries.com>
3. Free software download for MAC: Rocks! 1.0:
http://mac.tucows.fi/macteach_size.html
4. Rocks and Minerals links compiled by third grade at Arthur Elementary School:
<http://arthur.k12.il.us/arthurgs/rocklile.htm>
5. List of books and web site links on rocks and minerals:
http://eho.org/rocks_resource_list.htm
6. Educational outreach program: Mineral and Rocks Box test:
<http://dnr.state.il.us/mines/kdz3.htm>
7. Wonderful web site covering all areas of rocks and minerals study, as well as tips for rock collecting. Good lesson plans for elementary teachers: Rock Hounds:
<http://www.fi.edu/fellow/payton/rocks/index2.html>
8. More lesson plans and units from the Mineral Information Institute:
<http://www.mii.org/lessons.php>
9. Geomysteries: Located at Indianapolis Children's Museum web site (click on Kids): <http://www.childrensmuseum.org>
10. This Planet Really Rocks: award winning child-created geology project with games, facts, jokes, activities: <http://library.thinkquest.org/J002289>

HARDNESS RATING SHEET

Name:				
Date:				
Put an X in each box where the object can scratch the mineral or be scratched by the mineral.				
	Fingernail	Penny	Paper clip	Glass
Mineral 1 _____(name)				
Mineral 2 _____(name)				
Mineral 3 _____(name)				
Mineral 4 _____(name)				
Write the four minerals in order of hardness. (hardest to softest)				
1				
2				
3				
4				

MOHS HARDNESS SCALE

HARDNESS	MINERAL	COMMON TESTS
1	Talc	fingernail will scratch it
2	Gypsum	
3	Calcite	a copper coin will scratch it
4	Fluorite	glass or a penknife will scratch it
5	Apatite	
6	Feldspar or Orthoclase	will scratch glass
7	Quartz	
8	Beryl or Topaz	
9	Corundum	
10	Diamond	will scratch all common materials

Oral Presentation Rubric : **Mineral Report**

Student Name _____

Date _____

CATEGORY	4	3	2	1
Content	Shows a full understanding of the topic.	Shows a good understanding of the topic.	Shows a good understanding of parts of the topic.	Does not seem to understand the topic very well.
Stays on Topic	Stays on topic all (100%) of the time.	Stays on topic most (99-90%) of the time.	Stays on topic some (89%-75%) of the time.	It was hard to tell what the topic was.
Comprehension	Student is able to accurately answer almost all questions posed by classmates about the topic.	Student is able to accurately answer most questions posed by classmates about the topic.	Student is able to accurately answer a few questions posed by classmates about the topic.	Student is unable to accurately answer questions posed by classmates about the topic.
Speaks Clearly	Speaks clearly and distinctly all (100-95%) the time, and mispronounces no words.	Speaks clearly and distinctly all (100-95%) the time, but mispronounces one word.	Speaks clearly and distinctly most (94-85%) of the time. Mispronounces no more than one word.	Often mumbles or can not be understood OR mispronounces more than one word.
Preparedness	Student is completely prepared and has obviously rehearsed.	Student seems pretty prepared but might have needed a couple more rehearsals.	The student is somewhat prepared, but it is clear that rehearsal was lacking.	Student does not seem at all prepared to present.

Collaborative Work Skills: Science Group

Student Name _____

Date _____

CATEGORY	4	3	2	1
Contributions	Routinely provides useful ideas when participating in the group and in classroom discussion. A definite leader who contributes a lot of effort.	Usually provides useful ideas when participating in the group and in classroom discussion. A strong group member who tries hard!	Sometimes provides useful ideas when participating in the group and in classroom discussion. A satisfactory group member who does what is required.	Rarely provides useful ideas when participating in the group and in classroom discussion. May refuse to participate.
Focus on the task	Consistently stays focused on the task and what needs to be done. Very self-directed.	Focuses on the task and what needs to be done most of the time. Other group members can count on this person.	Focuses on the task and what needs to be done some of the time. Other group members must sometimes nag, prod, and remind to keep this person on-task.	Rarely focuses on the task and what needs to be done. Lets others do the work.
Working with Others	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.
Attitude	Never is publicly critical of the project or the work of others. Always has a positive attitude about the task(s).	Rarely is publicly critical of the project or the work of others. Often has a positive attitude about the task(s).	Occasionally is publicly critical of the project or the work of other members of the group. Usually has a positive attitude about the task(s).	Often is publicly critical of the project or the work of other members of the group. Often has a positive attitude about the task(s).