Making Sense of Rock Charts

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Topic: Advanced Rock Cycle

Grade Level: High School

Big Idea:
Earth is continuously changing.
Earth is a complex system of interacting rock, water, air and life.

Misconceptions:
All rocks are the same.
All rocks were formed at the same time.

Michigan Content Standards

Priority Standard ES.4A: Explain the relationship between the rock cycle and plate tectonics and describe the processes that change one kind of rock into another.

Aligns with specific state standards:

E3.1A: Discriminate between igneous, metamorphic, and sedimentary rocks and describe the processes that change one kind of rock into another.

Essential features of Inquiry "Structured"

Sharpens /clarifies questions given by teacher

Given data/chart and asked to analyze

Given possible ways to use evidence to formulate explanation

Given possible connections

Communicates and justifies explanations

Purpose:

Before starting to identify rocks, it is helpful to know a little bit about how they are formed and how they are classified. Rock charts are usually used to help identify the different names of rocks by analyzing their unique characteristics and properties. These charts contain a wide range of information and characteristic and can be difficult at first for students to use. In this activity students will be given the opportunity to use these graphs and figure out how they work on their own. After completing this activity, students will be able to differentiate between the three types of rocks: igneous, sedimentary and metamorphic.

Learning Objectives

Students will be able to interpret the 3 different rock charts that classify igneous, sedimentary and metamorphic rocks.

Materials

Copies of the 3 rock classification charts: igneous, sedimentary and metamorphic.

Construction paper

Glue sticks

Scissors

Lesson

-Students can work in pairs or alone.

-Each group of students will be given a copy of the three rock charts. No explanation is given to the students about how to read and interpret these charts. (I use the charts in our lab book because they are in color.)

-Students will be given a list of statements about rocks and it is their task to determine if each statement is true or false by using the graphs.

-On a piece of paper, have student make two columns. Label one **True** and the other **False**.

-Students are to analyze each statement and determine if it is true or false by reading the charts. Have students cut out each statement and glue under the correct column.

-After all of the statements have been determined true or false, have students pair up with another group and compare answers. Have students work out discrepancies and make any final changes it necessary.

-On a separate piece of paper, have students rewrite all of the false statements and make then all true by using the charts.

Assessment

Students will construct a graphic organizer by summarizing what they have learned. List 5 characteristics of each type of rock.

Example: Igneous: 1. Classified by texture, course, fine, porphyritic and glassy.

2. They are also classified by % of light and dark materials.

3. If rocks are light in color they are classified as felsic.

4. If rocks are dark in color they are classified as mafic.

5. Felsic rocks have high silica content.

Extension

After this activity, students are now ready to name rocks by identifying their characteristics. This activity should give students some confidence and knowledge about identifying the three types of rocks.

True or False?

-Use the three rock charts to determine if each of the statements are true or false.
-One a piece of paper, have student make two columns. Label one **True** and the other **False**.
-Cut out each statement and clue under the appropriate column.
-On a separate piece of paper, rewrite all of the false statements and make them true.

Granite is a course grained sedimentary rock.

Basalt has more than 50% dark materials.

Andesite is calcium rich.

Basalt has a glassy texture.

Peridotite has an ultramafic chemical composition.

Granite is a light colored igneous rock.

Breccia is a chemical sedimentary rock.

Grain size $\frac{1}{2}$ mm is classified as a medium texture.

Fossilliferous limestone is made of shells.

The formula for rock salt is NaCl.

Shale has the finest texture of sedimentary rocks.

Marble is a sedimentary rock.

The parent rock for slate is limestone.

Gneiss is foliated.

Schist has undergone more metamorphism than slate.

Anthracite is a non-foliated, fine textured, igneous rock.

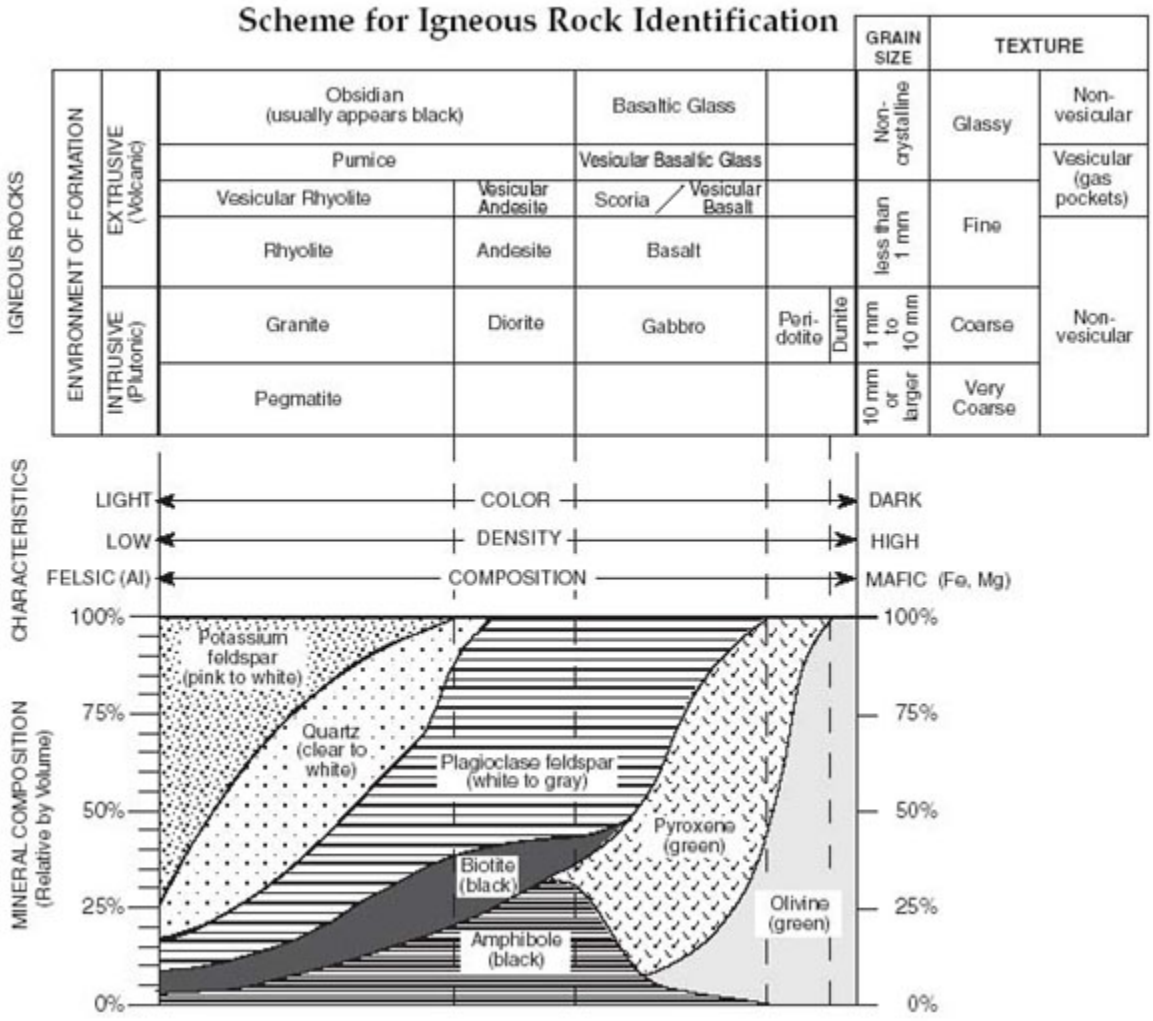
Gneiss has undergone more metamorphism than schist.

Anthracite is a fine grained, non-foliated metamorphic rock.

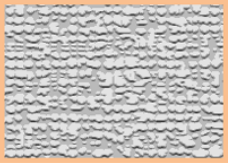
Granite has high silica content.

Olivine is felsic, low iron and magnesium content.

*Here are some sample charts to use for the activity. Many more can be found on the internet ort in Earth Science textbooks.



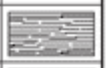
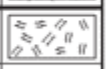
http://depthome.brooklyn.cuny.edu/geology/core332/geofield.htm

Clastic Sedimentary Rocks			
Texture (grain size)		Sediment Name	Rock Name
Coarse (over 2 mm)		Gravel (rounded fragments)	Conglomerate
		Gravel (angular fragments)	Breccia
Medium (1/16 to 2 mm)		Sand	Sandstone
Fine (1/16 to 1/256 mm)		Mud	Siltstone
Very Fine (less than 1/256)		Mud	Shale

Chemical Sedimentary Rocks			
Composition	Texture (grain size)	Rock Name	
Calcite	Fine to coarse crystalline	Crystalline Limestone	
		Travertine	
	Shells and cemented shell fragments	Coquina	Biochemical Limestone
	Shells and shell fragments cemented with calcite cement	Fossiliferous Limestone	
	Microscopic shells and clay	Chalk	
Quartz	Very fine crystalline	Chert (light color) Flint (dark color)	
Gypsum	Fine to coarse crystalline	Rock Gypsum	
Halite	Fine to coarse crystalline	Rock Salt	
Altered plant fragments	Fine-grained organic matter	Bituminous Coal	

http://upload.wikimedia.org/wikipedia/commons/7/76/Sedimentary_Rock_Chart.png

Scheme for Metamorphic Rock Identification

TEXTURE		GRAIN SIZE	COMPOSITION	TYPE OF METAMORPHISM	COMMENTS	ROCK NAME	MAP SYMBOL
FOLIATED	MINERAL ALIGNMENT	Fine	MICA, QUARTZ, FELDSPAR, AMPHIBOLE, GARNET, PYROXENE	Regional (Heat and pressure increase with depth)	Low-grade metamorphism of shale	Slate	
		Fine to medium			Foliation surfaces shiny from microscopic mica crystals	Phyllite	
					Platy mica crystals visible from metamorphism of clay or feldspars	Schist	
	BAND-ING	Medium to coarse			High-grade metamorphism; some mica changed to feldspar; segregated by mineral type into bands	Gneiss	
NONFOLIATED		Fine	Variable	Contact (Heat)	Various rocks changed by heat from nearby magma/lava	Hornfels	
		Fine to coarse	Quartz	Regional or Contact	Metamorphism of quartz sandstone	Quartzite	
			Calcite and/or dolomite		Metamorphism of limestone or dolostone	Marble	
		Coarse	Various minerals in particles and matrix		Pebbles may be distorted or stretched	Metaconglomerate	

http://regentsprep.org/Regents/earthsci/units/rocks/metamorphicrockid.gif