Rock Classification – Teacher Notes

Definitions
Classification means breaking things into groups with similar characteristics.
Rocks are solids found ***naturally*** at the earth's surface.

Early man classified rocks according to their composition and usage. My grandfather told me there were only two kinds of rocks, whinstone and sandstone. Whinstone was any rock that was hard enough to sharpen a knife and anything else was sandstone! He classified rocks by their hardness.
Even the names of rocks have changed in time. Basalt is the name given for a dark coloured volcanic rock nowadays. The name originally came from the Greek for any "very hard stone". The Ancient Egyptians used the same word for slate.
The name sandstone means a rock made of medium grained quartz clasts (broken bits of rock) cemented together by silica or lime. In Western Australia, many of our fabulous "sandy" beaches are mostly composed of broken aragonite seashells with minor quartz clasts. The rock made when these are compacted is sandy limestone not sandstone. The white sands of Albany and Esperance are almost pure quartz (silica) and they would become cemented and compacted into sandstone.

Interesting fact: On the Island of Mull in Scotland a molten dolerite dyke intruded through a bed of mudstone baking it into naturally formed brick. Rocks like this are called "Mullite".

ACTIVITY How can we classify rocks?
This activity gives students a chance to compare and contrast a variety of rocks. Igneous, sedimentary and metamorphic rocks should be included. They first work in groups of three or four and then bring their findings to be shared with their classmates. It is important for scientists to first trial their experiments to see if they will work. Finding what doesn't work is as important as finding what does!
Materials per student

- 2 different kinds of rock. Many students are happy to bring in rocks from home collections. Bags of different rock pebbles are available from garden centres and aquarium suppliers. (Broken brick and cement are manmade and therefore not acceptable).
- A hand lens to examine their rock
- OPTION Water to wet rock

NOTE Using a hand lens or magnifying glass
Many students do not realise that the glass should be held close to the eye and the object, in this case a rock, be brought close to the glass until it comes into focus. Students may wish to practise focussing on their thumb nails or bare knees first. (Moving the glass up and down promotes nausea). Many geologists will breathe heavily on a rock or wet it to help make detail more visible.
The rock in this case is igneous. It is a basalt from Melbourne.

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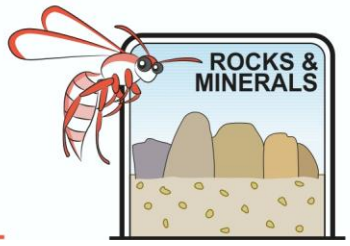

Part 1 Trialling the ideas

1. In their groups of three or four, students are asked to examine their own rocks carefully
2. They then compare and contrast their group's rocks, entering the data on the worksheet provided.
3. They then decide which characteristics are most important for meaningfully separating rocks into groups
4. One team member reports to the class and answers are boarded
5. Using the classes observations, all the rocks are then placed in the suggested groups
6. The class discusses how this classification system could be improved.

Suggestions Colour, size, shape, origin, use, rarity, hardness, crystal size, clast size, mineralogy and chemistry

Problems

- Colour - can be changed by weathering. Basalt is black when fresh and bright red when weathered. Sandstone and rubies would be in the same group. Many rocks have many different colours e.G. granite is white, black and grey. Colour is however one of the characteristics that may be used.
- Size - a broken piece of rock would be classified differently to the original piece
- Shape - a medium sized piece of sandstone would be classified the same as a medium sized piece of chalk and yet be different in every other respect
- Origin - all the rocks in the Pilbara would be classified as the same. This would make finding iron ore or gold very difficult
- Use - limestone, granite and sandstone are all used to build walls. Their differences however require different cutting tools, lifting equipment, polishing tools and cements. They will also weather at different rates. There is an inscribed red porphyry statue in ancient Egypt that has hardly weathered over seven thousand years whilst limestone gravestones a mere one hundred years old have lost their shapes and inscriptions.
- Rarity - Mookaite is a beautiful radiolarian chert found on Mooka Creek near Gascoyne junction. http://www.outbackmining.com/mookaite. Equally rare are diamonds found at Argyle.
- Crystal size - comparison of size of the same mineral crystals in rocks can give indication of rate of cooling but comparison cannot be made between different minerals
- Clast size - gives good indications of distance from source rock but different rocks will break down at different rates.
- Minerology - will give a good indication of type of magma in igneous rocks and type and degree of metamorphism in metamorphic rocks.

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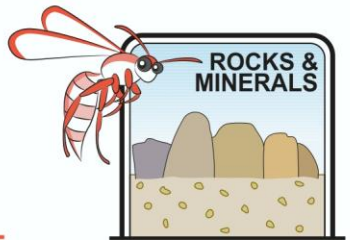

Part 2 Classification

Geologists classify rocks into three groups:

1. Igneous (fire born) rocks
   These are crystalline and usually hard. The size of the crystals indicates the rate of cooling of the rock from original molten magma. e.g. granite, basalt and pumice.

2. Sedimentary rocks
   These are assembled from broken bits of rock (clasts) and may contain remnants of living things. These have been compacted and cemented to form rock. They often show bedding structure. e.g. sandstone, slate and limestone.

3. Metamorphic rocks
   These are rocks which have been subjected to pressure and partially remelted. They retain some of their original sedimentary or igneous structures. They are crystalline in part and some of the crystals are aligned by pressure forming schistocity (natural planes of weakness)

Teachers' notes on more specific classification for the three rock types are included in this package (with photographs).

Teacher demonstration - Eggciting Eggsamples

Materials

- Frypan
- 4 eggs

Students are asked to draw and describe the changes that happen to the raw egg as it is laid down uncooked (sedimentary rock), fried (metamorphic rock)/partial changes and scrambled (igneous rock)

Using eggs as examples

Rock type	Drawing of egg	Changes to egg	Rock types
Sedimentary rock (Laid down)	Scale?	Fresh egg Control against which change can be measured. Separate white and yolk zones Yolk domed higher than white	1. Sandstone 2. Limestone 3. Siltstone Mudstone Conglomerate Evaporites Breccia Limestone Chalk
Metamorphic rock (Pressure and heat)	Scale?	Fried egg Egg size decreases Egg becomes more solid	1. Marble (meta-limestone)

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		Yolk dome flattens Colours change Still similar to original egg with yolk and white	2. Quartzite (meta-sandstone) 3. Gniess (meta-granite) Schists (meta-sandstone & shale) Slate (meta-mudstone)
Igneous rock (Reassembled)	**Scale?**	Scrambled egg Not similar to original egg in structure or shape. Separates into solids and a liquid Colour changes	1. Granite 2. Basalt 3. Dolerite Gabbro Andesite Pumice Diorite Rhyolite

Did the chemical composition of the egg change? The same elements are there but in different combinations.

To which rock classification did your two rocks belong?

Rock A _____

Rock B _____