From Minerals Big Rocks Grow

YEAR 8
EARTH AND SPACE SCIENCES

QGC | FUTUREMAKERS | QUEENSLAND MUSEUM NETWORK | Queensland Government

Future Makers

Future Makers is an innovative partnership between Queensland Museum Network and Shell's QGC business aiming to increase awareness and understanding of the value of science, technology, engineering and maths (STEM) education and skills in Queensland.

This partnership aims to engage and inspire people with the wonder of science, and increase the participation and performance of students in STEM-related subjects and careers — creating a highly capable workforce for the future.

QUEENSLAND MUSEUM NETWORK

Queensland Government

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

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EXPLORE - EXPLAIN - ELABORATE - EVALUATE

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Teacher Resource

In this activity students will observe the properties of three unlabelled rocks, one of each igneous, sedimentary and metamorphic. They then read a short paragraph about rock types and compare the properties of their rocks with the properties listed in the paragraph. Students use their observations and this paragraph of information to identify which is an igneous, which is a sedimentary, and which is a metamorphic rock. This information will then be used to create a 3D mind-map of the rock cycle. Students will then model the rock cycle and evaluate their model representation.

The Queensland Museum collects rocks, minerals and fossils as a record of Queensland's geological and natural heritage. You may use your own rocks for these activities or borrow Queensland Museum loan kits, including *Fossils, Minerals and Rocks*, or the *Active Earth Kit*. Rocks can also be seen on display in the *Discovery Centre* at Queensland Museum in Brisbane. Photos of rocks have been provided in Appendix 1 for anyone who does not have access to rock specimens.

Reading Rocks

In this activity students will work collaboratively in groups of three to identify rock types. Divide students into groups and then give each student in the group of three a different rock type (igneous, sedimentary and metamorphic).

Students then complete a See-Scan-Analyse activity to facilitate deeper observations of their rocks.

- See: View the rock. Turn it over in your hands to see each side.
- Scan: Look more closely at the rock. What do you notice about the rock?

  Describe the properties of the rock. Students may wish to use words from the *Describing Word Bank*.

  Use a magnifying glass to observe any grains/crystals.

  How does your rock feel? Why does it feel that way?

  Why do you think the rock has these properties?
- Analyse: As a group, compare your rocks. What are the similarities and differences?

Read the information on igneous, metamorphic and sedimentary rocks. Use your observations and this information to determine which rock is igneous, sedimentary or metamorphic, giving reasons.

After students have determined which rock is igneous, sedimentary or metamorphic, you could ask students to create a rock museum in the classroom. Students could bring rocks from home to add to the rock museum. You may wish to share with students the name of their rock so they can identify what minerals the rock is made of.

3D Rock Cycle

Transforming text types requires students to reshape the main ideas of a text into a different form, in the process gaining a deeper understanding of the text. In this activity, students will read a passage of text and use this to create a 3D diagram of the rock cycle using rocks from the first part of this resource, *Reading Rocks* (alternatively you could provide students with a different selection of labelled igneous, sedimentary and metamorphic rocks). Students should read the text once, and then reread while highlighting or making notes. Pencil is recommended when students create their transformation so that they can make changes.

Students should work collaboratively in groups of three, and their 3D rock cycles may be displayed around the room for the duration of the unit. You may also wish to provide students with additional materials to incorporate into their 3D rock cycle, such as small containers of sediment and/or a material to model the magma.

Modelling the Rock Cycle

Models are useful tools in science because they provide visual representations of abstract concepts and help improve explanations and understanding. While models provide valuable tools for learning, it is important for students to understand the strengths and limitations of models to reduce misconceptions.

In this activity, students create a model of the rock cycle using everyday materials, and evaluate their model by comparing it to the rock cycle. You may wish to ask students to create a video to demonstrate how their model represents the rock cycle, or present their model to the class. The rock representations created in this activity could also be added to the *3D Rock Cycle* created in second part of this resource.

Curriculum Links

Science

YEAR 8

Science Understanding

Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153)

Science Inquiry Skills

Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate (ACSIS144)

Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS148)

General Capabilities

Literacy

Comprehending texts through listening, reading and viewing

Composing texts through speaking, writing and creating

Word knowledge

Visual knowledge

Critical and Creative Thinking

Inquiring – identifying, exploring and organising information and ideas

Reflecting on thinking and processes

Analysing, synthesising and evaluating reasoning and procedures

Personal and Social Capability

Self-management

Social awareness

Social management

Intercultural Understanding

Interacting and empathising with others

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Student Activity

Reading Rocks

In this activity you will closely observe and analyse three different rocks to determine if a rock is igneous, sedimentary or metamorphic.

- See: View one rock. Turn it over in your hands to see each side.
- Scan: Look more closely at the rock. What do you notice about the rock?

  How does your rock feel? Why does it feel that way?

  Use a magnifying glass to observe any grains/crystals.

  Describe the properties of the rock. You may use words from the *Describing Word Bank*.

  Why do you think the rock has these properties?

Describing Word Bank

smooth	rough	grains	soft	sharp	layers	foliation	banding	shiny	dull	crystals

- Analyse: Share your thoughts and rock with your group.

  As a group, compare your rocks. What are the similarities and differences?

  Read the information on igneous, metamorphic and sedimentary rocks in the *Rock Type Table*.

  Determine which rock is igneous, sedimentary or metamorphic, giving reasons from your observations and the information provided.

Rock Type Table

Igneous Rocks	Sedimentary Rocks	Metamorphic Rocks
Formed from the cooling and solidification of lava or magma. There are two main types of igneous rock. Intrusive igneous rocks form when magma cools slowly below the Earth's surface, often resulting in large, well-formed grains or crystals of different sizes. These crystals may be easily visible as different colours in the rock, e.g. granite. Extrusive igneous rocks are formed when lava cools quickly producing tiny crystals. Some cool so quickly that they form an amorphous glass – a solid that is a consistent colour and smooth texture, e.g. obsidian.	Made from pre-existing rocks or pieces of organic material. These sediments are transported and deposited in water, eventually forming sedimentary rocks through compaction and cementation. Individual sediment grains can often be identified giving the rock a rough texture. Sedimentary rocks may also contain fossils, and distinctive layering from different sediment types. Examples of sedimentary rocks include sandstone and conglomerate.	Formed from existing rocks that are changed due to intense heat or pressure, transforming them into denser, more compact rocks. The extreme conditions often cause the minerals to form parallel layers. Metamorphic rocks may be identified through the banding patterns of these layers, or foliation where metamorphic rocks break easily along parallel sheets. Examples of metamorphic rocks include gneiss and slate.

3D Rock Cycle

Rocks are always changing, however, we might not notice the changes because they often take a really long time and many changes happen underground or underwater. In this activity you are going to use your igneous, sedimentary and metamorphic rocks to create a 3D diagram of the rock cycle to illustrate how rocks change.

1. Place the rocks in a triangle on a large piece of paper (butchers or A3 paper). Cut out the *Rock Type Table* from Part 1 and glue this information onto the paper with the corresponding rock.
2. Read the *Rock Cycle* passage below.

> ***Rock Cycle***
>
> Have you ever seen a picture of a volcano erupting? This is how some new rocks are formed! When magma and lava cool, igneous rocks are formed. Weathering and erosion of these igneous rocks (and any other type of rock) causes them to break down into smaller sediments (for example, sand). Under the right conditions of compaction and cementation, new rocks can be formed from the sediments of other rocks. We call these rocks sedimentary rocks because they are made of sediments. If either sedimentary or igneous rocks experience high pressures and temperatures, their properties will change, forming a third type of rock – metamorphic. If it gets too hot however, any rock may melt completely into magma. Cooling of the magma starts the rock cycle again with a new igneous rock!

3. Reread the text and make notes on the main points of the text.
4. Transform the written passage into the 3D visual diagram on your large piece of paper. Use arrows and the *Rock Cycle Word Bank* below, and the text from the rock cycle above, to create a 3D rock cycle diagram. Statements in the word bank may be used more than once.

Rock Cycle Word Bank

heat causes melting weathering and erosion compaction and cementation cooling
heat and pressure SEDIMENTS MAGMA/LAVA

5. Take a picture of your 3D rock cycle or draw a diagram in your book.
6. Share your 3D rock cycle with the class.

Modelling the Rock Cycle

Model the rock cycle using everyday materials. Explain how your model represents the rock cycle in the table below. Include an evaluation of the similarities and differences between the rock cycle and model representation.

Comparison of the Rock Cycle and Model Representation

Rock cycle process or object	How it is represented by the model	Similarities	Differences

Appendix 1: Rock Images for From Minerals Big Rocks Grow

Object-based learning is 'a mode of education which involves the active integration of authentic or replica material objects into the learning environment'[4] and is used to prompt investigation and promote student inquiry. At Queensland Museum we use objects for learning whenever possible. For these activities, you may borrow Queensland Museum loan kits, including Fossils, Minerals and Rocks, or the Active Earth Kit.

Rocks may also be purchased from scientific suppliers such as Mad about Science, Crozcare Geological Supplies or Haines Educational. It is important to ensure all rocks are free from asbestos and asbestos-like materials. For more information please see the safety alert on asbestos samples in minerals from the Queensland Department of Education.

If you cannot get access to rocks for the activities in School of Rocks, images of rocks have been provided for analysis.

[4] *Jamieson, A. (2016). Object-based learning: A new mode in Arts West. Retrieved from* https://arts.unimelb.edu.au/articulation/editions/2016-editions/december-2016/object-based-learning-a-new-mode-in-arts-west

Igneous

Sedimentary

Metamorphic