Year 8

Conceptual narrative Science: The Earth's surface

In the Earth and space sciences sub-strand, there are two main conceptual threads being developed from Foundation through to Year 10, Earth in space and the Earth's surface.

Big ideas

Different kind of rocks are formed when different combinations of heat and kinetic energy act on materials in the Earth's crust.

What concepts do I want my students to understand?

- Igneous rocks are formed when molten material from inside the Earth cools.
- Sedimentary rocks are formed when other rocks are weathered into small pieces, deposited and cemented together.
- Metamorphic rocks are formed when other types of rock are changed by heat or pressure.

Appendix 1 shows how the three interwoven strands, Science Understanding, Science as a Human Endeavour and Science Inquiry Skills, work together to build the sophistication and complexity of the science concepts from Foundation to Year 10.

This conceptual narrative illustrates one of the nine science concepts from the Australian Curriculum: Science Content structure. It tells the story of the concept in isolation of the eight others. However, there are situations when it is advisable to teach both concepts (Earth in space and the Earth's surface) together, because they complement each other.

Note: Not all concepts are specifically addressed in each year level.

Introduction

What might my students already know about this concept?

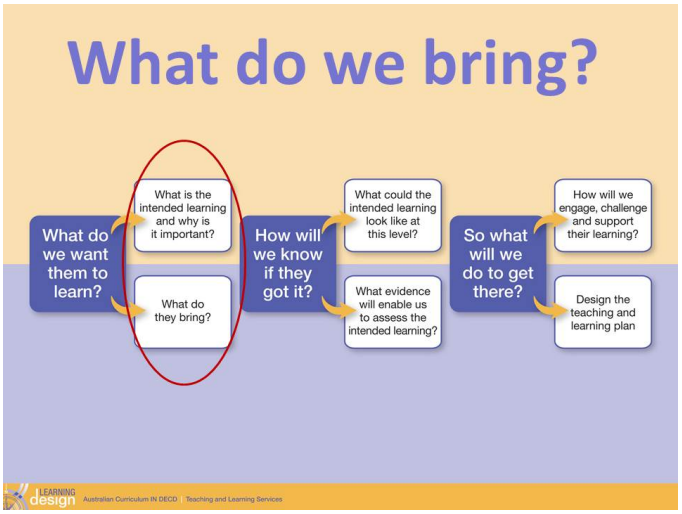
Students will be aware that:

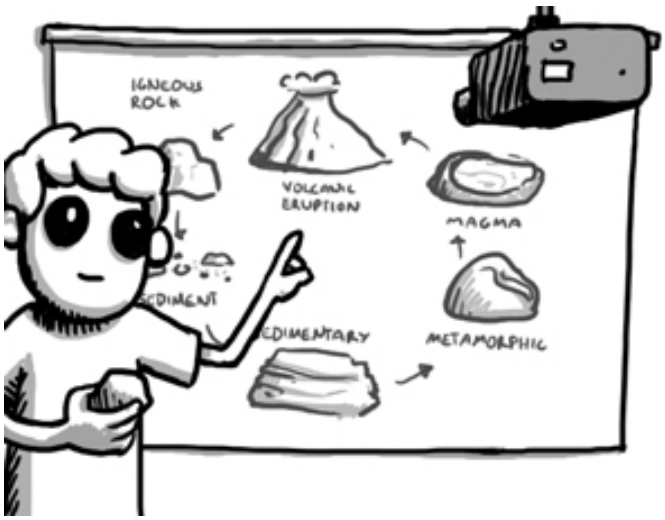
- Lava is molten rock which comes to the surface in volcanoes.
- Material resources cycle through the Earth's surface at different rates.
- There are both sudden and gradual changes in the surface of the Earth.

What content could I use to explore this concept?

We could learn this concept through investigations of the sources of gold or other metals, different rocks used as building materials or a study of a landscape with evidence of different kinds or rock.

Now to bring the essence of scientific understanding to life, let's think about this concept through the six questions from the Bringing it to Life tool (BitL).





The science understanding for students at Year 8 level is that the three different types of rock are formed by processes within the Earth.

Year 8 example

For this example I will take my students on a field trip to Victor Harbor.

What do you observe?

How can I help my students make observations?

Using the BitL questions, I could ask:

- *What do you observe?*

In Year 8, I want students to make field observations of different kinds of rock and how they are distributed geographically. I want them to use their senses to see and feel differences between rocks. Questions I could ask my students are:

- *What do you notice about the rocks you see?*
- *How are they the same? Different?*
- *What do you notice about where different kinds of rocks are?*
- *How could you record this?*

What patterns and relationships can you see?

How can I help students to see patterns and relationships? What questions might my students ask?

Student's curiosity leads them to ask questions. These questions help students to order their findings into a pattern to be able to make comparisons or find relationships. These questions support students to be more precise and foster analysis and classification of the observations.

Using the BitL questions, I could ask:

- *What patterns and relationships do you see?*

In Year 8, I want my students to identify relationships within systems. I may prompt them by asking:

- *Are they different from a distance or close in?*
- *How might the different rocks have been formed?*
- *How might they have got to where they are?*

If I gave them some information about the rock cycle, I could ask:

- *Which of these rocks did we find at Victor Harbor?*
- *How does this information make you think differently about how they were formed?*
- *What energy is involved in the formation of these rocks?*
- *Where does it come from?*

What do you predict will happen?

How can I help students to identify and formulate investigable questions?

Students ask testable questions that help them to narrow the focus of the inquiry. These questions provide opportunities for students to make predictions.

Using the BitL questions, I could ask:

- *What do you predict will happen?*

In Year 8, I want my students to make predictions based on scientific knowledge. In this example, I want my students to predict how the Victor Harbor area might have looked in the past when these rocks were formed. I might ask:

- *What would the area have been like when the granite was formed?*
- *What might have happened between then and now for it to look like it does?*
- *Which rocks do you think are the oldest? Why?*
- *How do you think the quartz seam got in the granite?*
- *What other rock formations do you think we would see at other places on the south coast? Why?*

What investigations could you design?

These questions support students to develop science inquiry skills and problem solve.

Using the BitL questions, I could ask:

- *What investigations could you design?*

I want my students to test their predictions. Questions I might ask my students are:

- *Which places will you investigate?*
- *What samples do you need to collect?*
- *What environmental considerations are there about collecting these?*
- *How would you find out about places you can't visit?*
- *Where could you find information or see specimens of rocks from other South Australian places?*

How can you review and communicate?

How can I help students share their observations and questions?

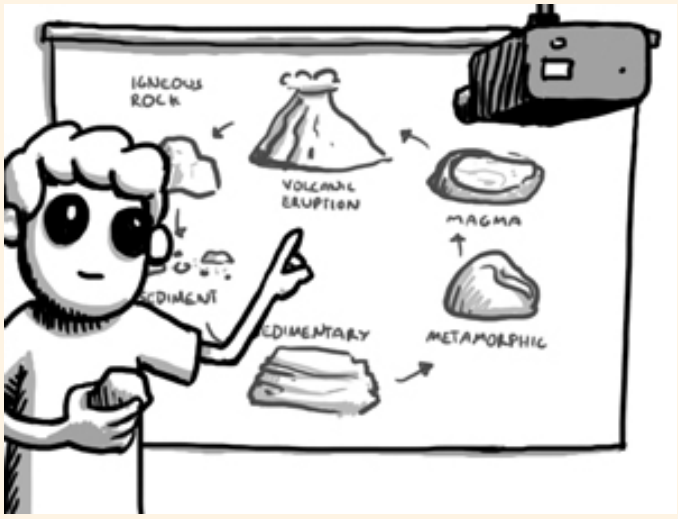
These questions stimulate student's reasoning and help them analyse, draw conclusions and make generalisations about the concepts.

Using the BitL questions, I could ask:

- *How can you review and communicate?*

At Year 8, I want my students to use the rock cycle to develop their explanations of what they have found through their investigation. I could ask them:

- *How does the rock cycle explain your observations about the rocks you observed at Victor Harbor?*
- *What maps, diagrams, videos or animations will help you communicate this?*
- *How could digital technology help?*



So what? What next?

How can I help students apply the concepts in a range of authentic contexts?

These questions support student's reasoning, to expand or change their ideas from their experience and evidence and generalise to new contexts.

Using the BitL questions, I could ask:

- *So what? What next?*

In Year 8, I want my students to start thinking about where this knowledge may be used in society. I could ask my students:

- *Who would be interested in the rock formations at Victor harbor? Why?*
- *What would it be like if we didn't know this?*
- *Who might think differently about how they are formed?*
- *When are the different views useful?*

Concluding comments

What concepts might students develop through working with the BitL questions in this way?

By exploring this science understanding through these questions, we can help our students to be able to think, work and process scientifically. Students can connect science to their world and consider why they need to learn about how different rocks are formed.

Appendix 1

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This conceptual narrative illustrates one of the nine science concepts from the Australian Curriculum: Science Content structure. These concepts develop in depth and breadth of understanding from Foundation to Year 10. This conceptual narrative tells the story of the concept in isolation of the eight others. However, there are situations when it is advisable to teach both concepts (Earth in space and the Earth's surface) together, because they complement each other.

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Earth and space sciences

In the Earth and space sciences sub-strand, there are two main conceptual threads being developed from Foundation through to Year 10. They are the concepts Earth in space and the Earth's surface. Let's look at the concept the Earth's surface.

Foundation

This begins in the Foundation year with students linking the weather to the effects it has on their daily life, for example how the weather can determine what clothing they wear.

Year 1

In Year 1, students observe changes in the landscape, such as water evaporating from a puddle or a sand castle washing away after the tide comes in.

Year 2

In Year 2, students focus on how we use resources from the Earth, including water. We want students to understand how they use water so they can identify ways to conserve water.

Year 4

At Year 4, students look at a range of changes to the surface of the Earth over time. Students group these changes as those caused by natural agents such as erosion or by human activity such as deforestation.

Year 6

In Year 6, students learn that sudden geological changes like earthquakes and volcanoes, and extreme weather conditions like hurricanes can affect the Earth's surface.

Year 7

In Year 7, students group the Earth's resources as renewable or non-renewable. For example, students can compare fossil fuels which take millions of years to form with wood that grows in decades and biofuel that grows in months. They also learn about the water cycle and that water is as an important resource.

Year 8

In Year 8, students develop an understanding of the rock cycle. They consider the timescale of the processes and formation of igneous, sedimentary and metamorphic rocks. Students also learn that rocks are made up of minerals.

Year 9

When students are in Year 9, they use the theory of plate tectonics to explain how major continental plate movement predicts areas prone to earthquakes and volcanic activity. Students identify global patterns of geological activity, such as considering the role of heat energy and convection currents in the movement of tectonic plates, and relating the extreme age and stability of a large part of the Australian continent to its plate tectonic history.

Year 10

In Year 10, students understand the connections between the different systems that make up the surface of the Earth. They appreciate how cycles of carbon and other materials involve interactions in the hydrosphere, lithosphere, atmosphere and biosphere. Students learn the role of carbon in the greenhouse effect and its effects on biodiversity.

So from Foundation to Year 10, students broaden and deepen their understanding by building on from their thinking about changes in their immediate surroundings, to consider those in the wider world, and then use models and theories to describe, explain, predict and generalise.