Year 7

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

The distinction between renewable and non-renewable resources depends on the time frame considered.

What concepts do I want my students to understand?

- Some resources are renewable, some are non-renewable.
- Water is a resource that cycles through the environment.
- Resources cycle through the environment at different rates, which determines how renewable they are.
- Human use of resources affects their availability.

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?

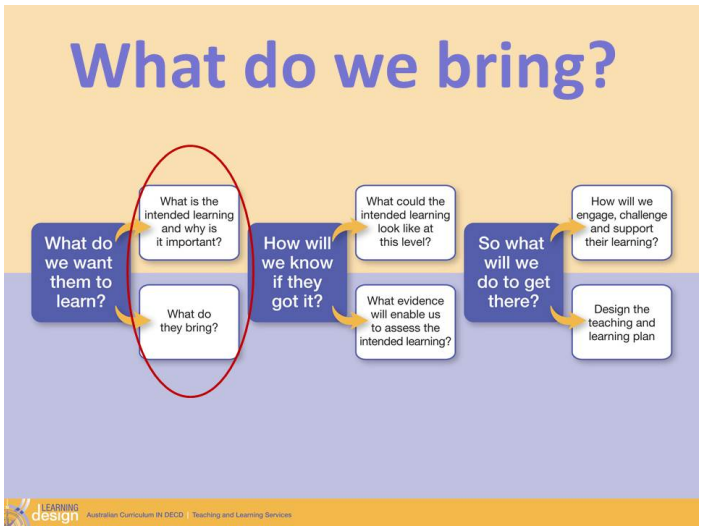
Students may know that:

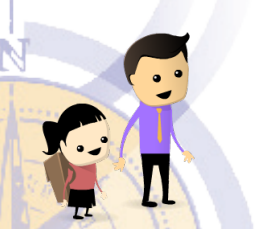
- Living and non-living things in the environment change over time.
- Resources like water move through the environment.
- Weather can cause gradual change in the features of the surface of the Earth.
- Earthquakes and volcanic eruptions are catastrophic events with far reaching effects.

What content could I use to explore this concept?

There are many ways to investigate this concept. We could look at a resource like water or metals, or different energy sources and investigate human impact on these.

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).





At Year 7, we want our students to understand that some of the Earth's resources are renewable and some are not.

Year 7 example

For example, I am going to ask my students to analyse the use of water in the community.

What do you observe?

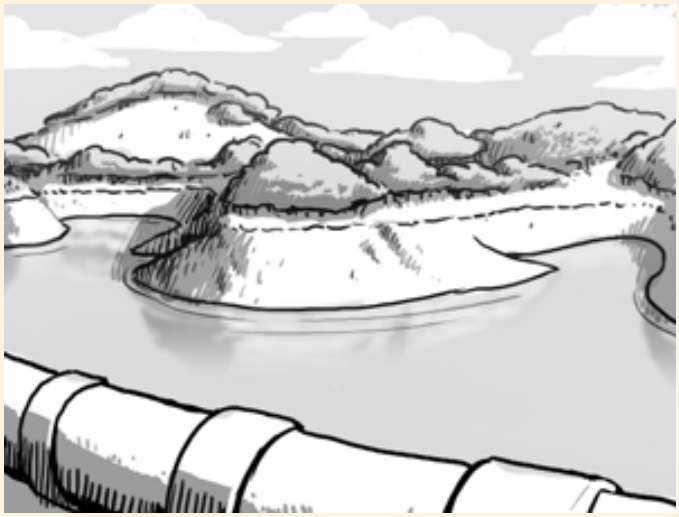
How can I help my students make observations?

Using the BitL questions, I could ask:

- *What do you observe?*

At Year 7, I want my students to observe differences that change over time and geographically in the available sources of water. They may use secondary data sources about rainfall, river flows and water usage. Questions I would ask my students are:

- *Where does our water come from?*
- *How many different sources?*
- *How is water the same or different from different sources?*
- *How do the sources change in different places? Different times?*
- *What are the biggest uses of water?*



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 can you see?*

At Year 7, we want students to describe matter and energy flows through the systems. Questions I could ask are:

- *How does the source affect the use?*
- *Are there patterns in where water is sourced?*
- *What are the similarities between different water sources? What are the differences?*
- *What are your questions?*
- *How quickly can this water source be renewed?*
- *Is there a relationship between renewal and use?*
- *Can the water source be used up totally?*
- *What criteria cause us to think of a resource as renewable?*

What do you predict will happen?

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

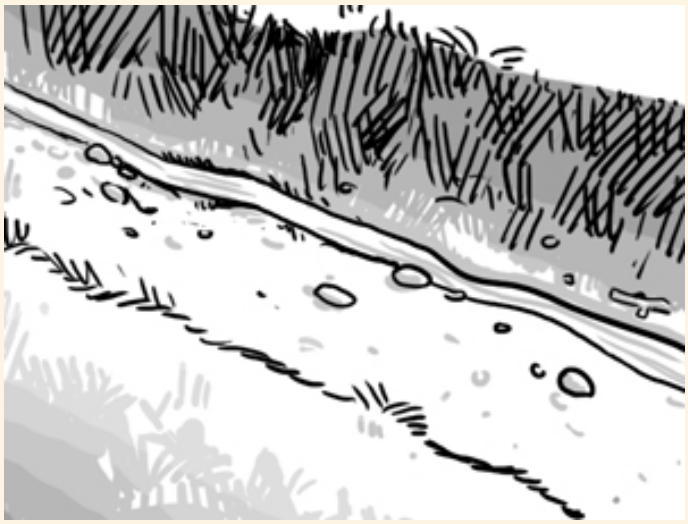
Students ask testable questions that help them to narrow the focus of the inquiry. These questions provide opportunities for students to make predictions.

Using the BitL questions, I could ask:

- *What do you predict will happen?*

At Year 7, students start to make predictions based on scientific knowledge. I could ask my students:

- *What do you predict might happen if we use more water from the river?*
- *What do you predict might happen if there is less rain in the Snowy Mountains? If more water is allowed to flow down the Snowy River? If there was a ban on watering gardens?*
- *What other predictions might be plausible?*



What investigations could you design?

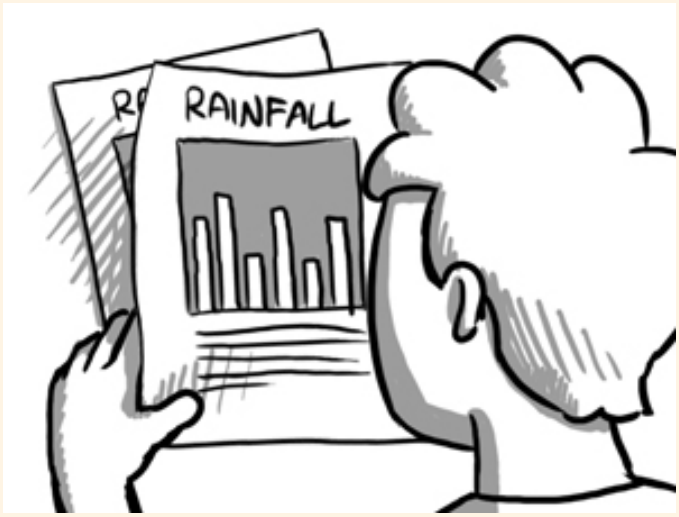
These questions support students to develop science inquiry skills and problem solve.

Using the BitL questions, i could ask:

- *What investigations could you design?*

At Year 7, we want students to plan and carry out investigations using field work, experiments and secondary data. Questions I could ask my students are:

- *What variables are there in the way water is sourced and used?*
- *What could you change?*
- *What would you measure?*
- *What equipment would improve the accuracy of your data?*
- *What data from other sources might be useful?*
- *What digital technology might help in designing and carrying out your investigation?*



How can you review and communicate?

How can I help students share their observations and questions?

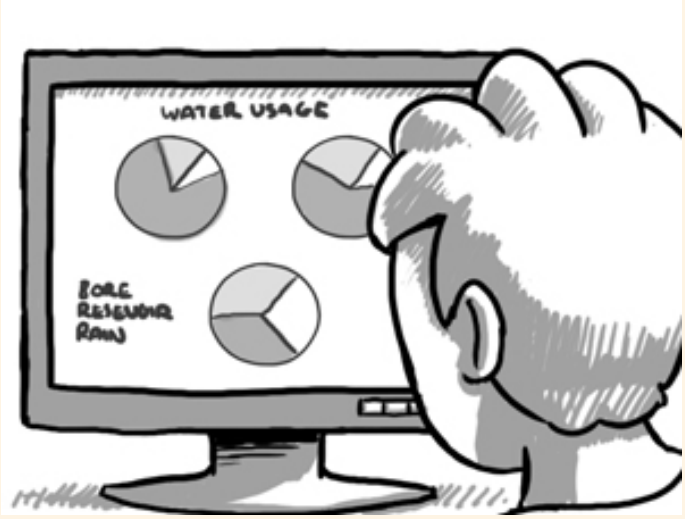
These questions stimulate student's reasoning and help them analyse, draw conclusions and make generalisations about the concepts.

Using the BitL questions, I could ask:

- *How can you review and communicate?*

In Year 7, we want students to communicate using scientific language and representations using digital technologies as appropriate. Questions I could ask my students are:

- *How can you represent the data and your explanations about the sources and uses of water, in a way that shows the patterns and relationships?*
- *What images, lists, tables, graphs, maps or diagrams might help you to share this information and help you to identify the trends?*
- *How fair was your test?*
- *How could it be improved?*
- *What can you conclude from your data?*
- *How might someone else view this differently?*



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 7, we want our students to be able to respond to social and environmental problems from a scientifically informed position. Questions I might ask include:

- *How does an understanding of the way water cycles through the environment, influence sustainable decisions for our country in the future?*
- *How does understanding this change the way you might act or think about this?*
- *Who might need to know this?*
- *What else could you investigate now?*

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 that human use of water affects how it cycles through the environment.

Appendix 1

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. 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