

Conceptual narrative Science: Diversity and evolution

In the Biological Sciences strand, there are three main conceptual threads being developed from Foundation through to Year 10. They are the concepts of diversity and evolution, form and function and interdependence and ecosystems.

Big ideas

Living things differ from non-living things in a number of ways.

What concepts do I want my students to understand?

- Describe features common to living things. Living things grow, move, are sensitive to their environment and reproduce.
- Living things can be grouped as plants or animals, on the basis of their observable features.

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 the concepts (diversity and evolution, form and function, interdependence and ecosystems) together, because they complement each other.

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

Introduction

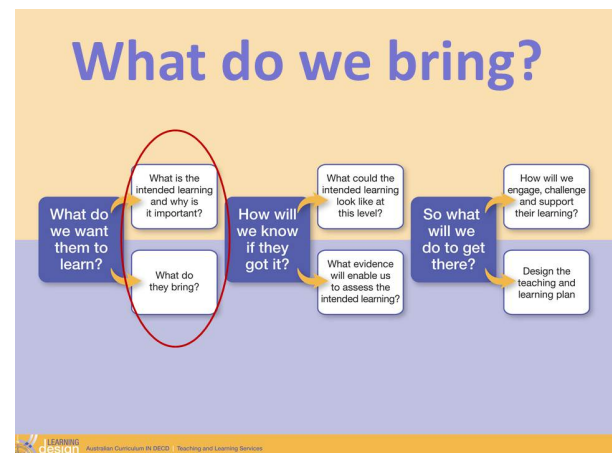
What might my students already know about this concept?

Living things grow, change and reproduce.

What content could I use to explore this concept?

To help students understand this concept, we could sort living and non-living things by using flash cards, PowerPoint, Scootle learning objects, etc. We could start by exploring differences between living, once living or dead things, using the characteristics of living things such as growing, moving, sensitivity and reproducing.

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).



In Year 3, we want students to understand that things can be sorted into two groups as living and non-living. Students group living things based on their observable features.

Year 3 example

In this example, I am going to ask my students to explain how they would group a range of items such as stones, sticks, feathers, insects and plants, as living or non-living.

What do you notice?

How can I help my students make observations?

Using the BitL questions, I could ask:

- *What do you notice?*

In Year 3, I want my students to make observations of the range of living and non-living things in order to group similar things together. Questions I could ask are:

- *What features are the same?*
- *What features are different?*
- *What is interesting?*



What patterns and relationships can you see?

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

Students' 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. They also 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 3, I want my students to use prior knowledge to sort living from non-living things. I could ask my students:

- *What are some features that all living things have in common?*
- *How could you group them?*
- *Are there any exceptions?*
- *What differences are there between living and non-living things?*
- *What questions do you have?*



I would encourage students to ask questions about their observations. For example, What features of a feather would you use to determine if it is a living or non-living thing? I could then get the students to critique the questions as a class.

What do you think if?

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 think if...?*

In Year 3, I want my students to predict how the relationships might change. Questions I might ask my students are:

- *Is there another way to group the range of living and non-living things?*
- *How might you decide if a crystal is a living or non-living thing?*
- *How do we know living and non-living things are in the water around us?*
- *What do they look like when they are growing?*



How can you explore?

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

Using the BitL questions, I could ask:

- *How can we explore?*

In Year 3, I want my students to start planning and conducting investigations with guidance. Questions I could ask the students are:

- *How will you investigate?*
- *Where could we go to find a range of living and non-living things in the water?*
- *What safety aspects do you need to consider?*
- *Who could help us find out?*



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?*

I could ask my students:

How can you share our learning with others?

How can you explain to someone, how to tell if something is living or non-living?

Can you draw diagrams to show what you found out?

Did other people find something different to you?

I might suggest to the students, that they could do a role play of living and non-living things. The class could then guess what things they think they are and provide an explanation of how they know.

- *What do you need to think about when role playing living and non-living things?*

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?*
- *Why is it important to know about grouping living and non-living things?*
- *How does understanding this help you in your life?*
- *How does understanding what is living, help us to protect and care for them?*
- *Who might be interested in this information?*

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 think, work and process scientifically. Students can connect science to their world, and consider why they need to learn that objects might be grouped into living and non-living.

Appendix 1

Appendix 1 shows how the Science as a Human Endeavour strand develops in sophistication and complexity across 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 the concepts of diversity and evolution, form and function and interdependence and ecosystems, together, because they complement each other.

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

Biological sciences

In the biological sciences sub-strand, there are three main conceptual threads being developed from Foundation to year 10. They are the concepts of diversity and evolution, form and function and interdependence and ecosystems.

Let's look at the diversity and evolution concept

Year 2

This concept starts in Year 2 with familiar examples of how living things grow, change and reproduce. Students might look at changes from birth to maturity of different animals and plants, such as chicken eggs or sunflower seeds, comparing the adult with the offspring.

Year 3

In Year 3, the focus is on what distinguishes living things from nonliving things so students might explain why they would classify a range of items from the school environment (e.g. stones, sticks, feathers, insects, and parts of plants) as living or nonliving. Students notice that living things have a variety of external features which can help to group them.

Year 4

In Year 4, the idea that living things grow and reproduce is continued by looking at life cycles, such as when the plant grows, flowers and produces seeds, or the tadpoles change as they mature and become adult frogs.

Year 5

In Year 5, students learn that adaptations help an organism survive in its environment. For example, students might consider how arctic animals have adapted to survive in extreme cold.

Year 7

In Year 7, students discover that there are differences within and between groups of organisms, and use classification further, to enable them to organise and communicate about this diversity. For example, sorting and classifying different species of birds from the local environment.

Year 10

In Year 10, the theory of evolution combines these ideas with the role of genes and DNA, in passing on features or heritable characteristics from one generation to the next. This explains the past and present diversity of life on earth and offers a means to predict possible futures. Students at Year 10 level, are increasingly taking on a global perspective and so consider the relationship of biodiversity, natural selection and evolution.

So, from Year 2 to Year 10, students develop their understanding of evolution and diversity, by building on from their thinking about life cycles, to consider adaptation and survival of familiar objects, and then understand how this supports the theory of evolution by natural selection.