Year 4

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

The sequence of key stages in the life cycle of a plant or animal.

What concepts do I want my students to understand?

- Compare life cycles of different living things, such as a frog with that of a chicken or even a plant.
- Some young resemble their parents while others look different and change form. All animals of a particular kind go through the same stages.

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?

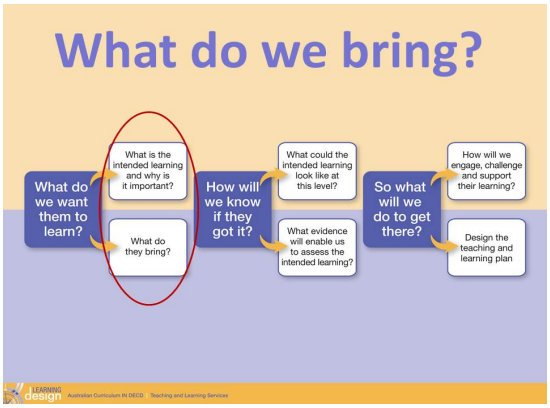
Living things grow, change and reproduce. Features can be used to classify living and non-living things.

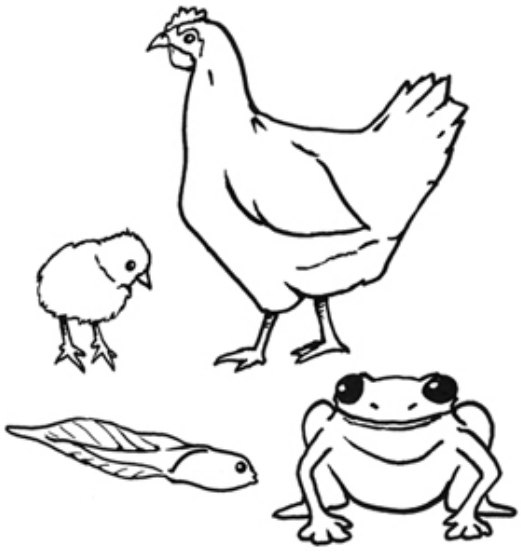
What content could I use to explore this concept?

We could explore this concept through comparing life cycles of a range of plants and animals. We could observe and record the stages of life cycles of different living things such as insects, birds, frogs and flowering plants. For example:

- seed – seedling – flower – fruit – seed
- egg – tadpole – tadpole with tail – frog with legs – adult frog – egg

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 4, we want students to understand how living things change in their life cycle and compare the life cycles of different living things.

Year 4 example

In this example, my students will compare the human life cycle with the life cycle of the sunflower and the frog. They will grow some sunflowers, get some frog eggs to hatch in an aquarium and collect some images of humans of different ages.

What do you notice?

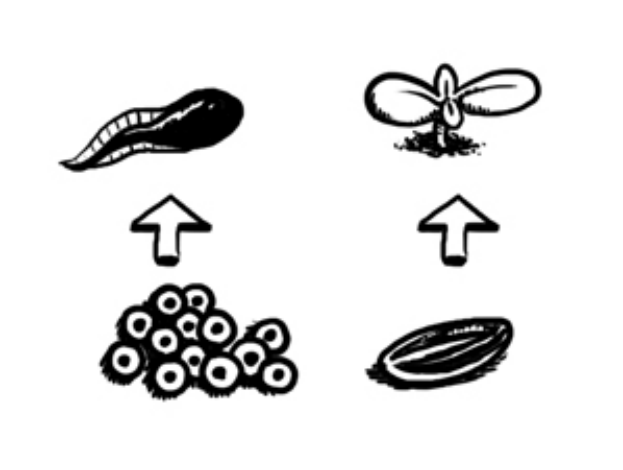
How can I help my students make observations?

Using the BitL questions, I could ask:

- *What do you notice?*

I want my students to use their senses to make observations of the growth of a sunflower from seed, and tadpoles from eggs, and compare these life cycles using their prior knowledge of their own life cycle. Questions I could ask my students are:

- *Where did you come from?*
- *Can you describe the stages of your life?*
- *What features stay the same as the sunflower and tadpole grow?*
- *What features change as the sunflower and tadpole grow?*



What patterns and relationships can you see?

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

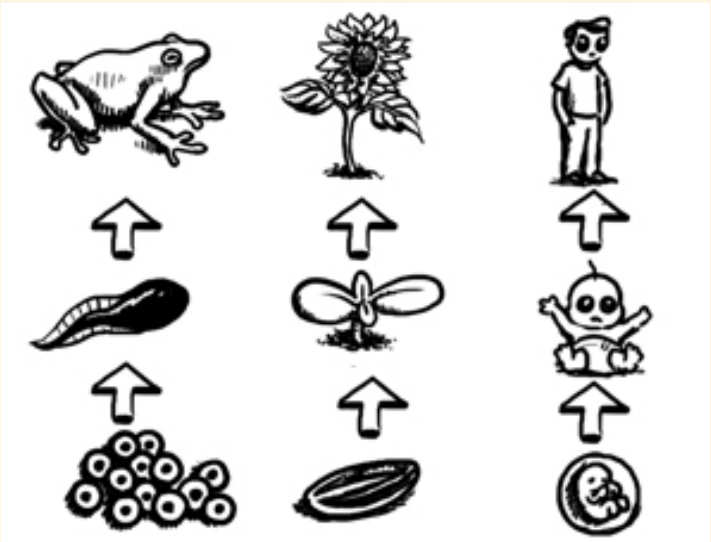
Student's curiosity leads them to ask questions. These questions help students to order their findings into a pattern to be able to make comparisons or find relationships. These questions support students to be more precise and foster analysis and classification of the observations.

Using the BitL questions, I could ask:

- *What patterns and relationships can you see?*

Questions I could ask:

- *What patterns do you notice?*
- *Has everyone's sunflower seed grown the same?*
- *Was there anything unusual?*
- *In what similar ways do the sunflower seeds and tadpoles eggs grow?*
- *How are they different?*
- *What questions do you have about how the sunflower changed over time?*
- *What happened to the frogs over time?*
- *How are the frog and sunflower like your life? How are they different to your life?*
- *What questions do you have about life cycles?*



What do you think if?

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

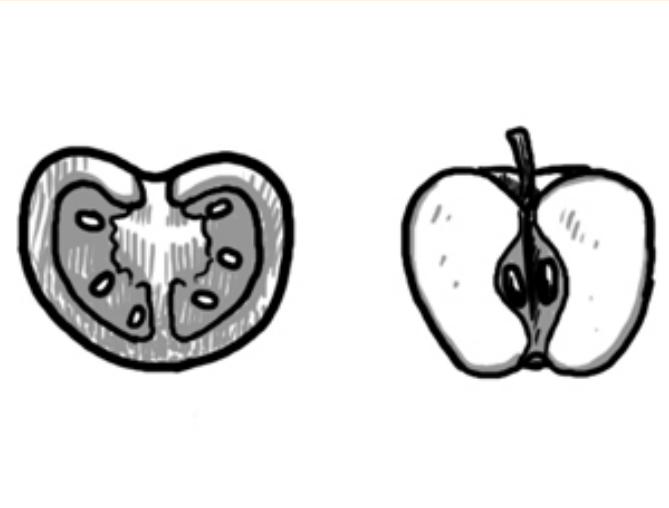
Students ask testable questions that help them to narrow the focus of the inquiry. These questions provide opportunities for students to make predictions.

Using the BitL questions, I could ask:

- *What do you think if...?*

In Year 4, I want my students to predict how the relationships might change within a system.

- *What would happen if you grew tomato seeds?*
- *Do all plants grow and change like sunflowers?*
- *How might you find out about the different stages of growth of tomato plants?*
- *Do all animals start as eggs and grow into adult animals?*
- *Do you think there are more seeds inside a tomato compared to an apple?*
- *Do you think all apples have the same number of seeds?*
- *Do you think all the seeds are the same size? Are there plants which don't have seeds?*



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 you explore?*

At Year 4, I want my students to start planning and conducting investigations with guidance.

- *What could you do to find out if all animals have the same life cycle?*
- *What ideas have you got?*
- *What is your best idea?*
- *Where would you get your seeds from?*
- *How could you test your idea?*
- *How can you make your test fair?*
- *How will you record the changes and growth during your investigation?*

How can you review and communicate?

How can I help students share their observations and questions?

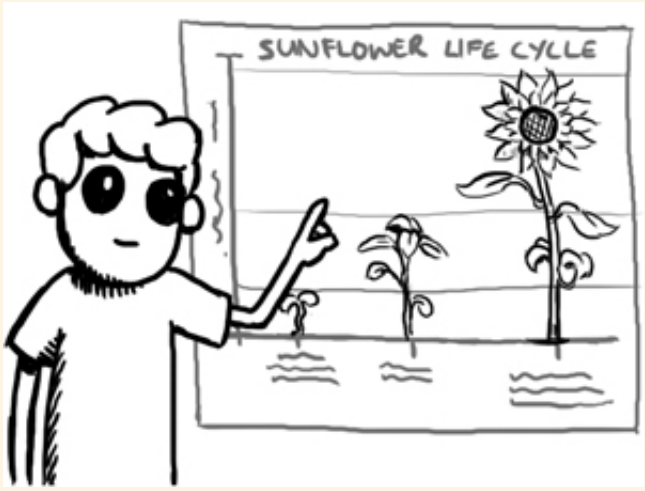
These questions stimulate student's reasoning and help them analyse, draw conclusions and make generalisations about the concepts.

Using the BitL questions, I could ask:

- *How can you review and communicate?*

I can prompt my students:

- *How can you share the information of sunflower life cycles with your classmates?*
- *Can you draw diagrams to show it?*
- *Did other people find something different to you?*
- *Was what you found, the same or different from what you predicted? How?*
- *How are the stages of your life similar to the stages of a frog, sunflower, and tomato?*



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 plant and animal life cycles?*
- *How does understanding these life cycles help you in your life?*
- *How does understanding plant and animal life cycles 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 animals and plants have life cycles.

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.