

Conceptual narrative Science: Interdependence and ecosystems

In the biological sciences sub-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 growth and survival of living things are affected by the physical conditions of their environment.

What concepts do I want my students to understand?

- Physical environmental factors include light, temperature, soil type, water etc.
- These factors affect the growth and survival of plants and animals.

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 all concepts (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.

Introduction

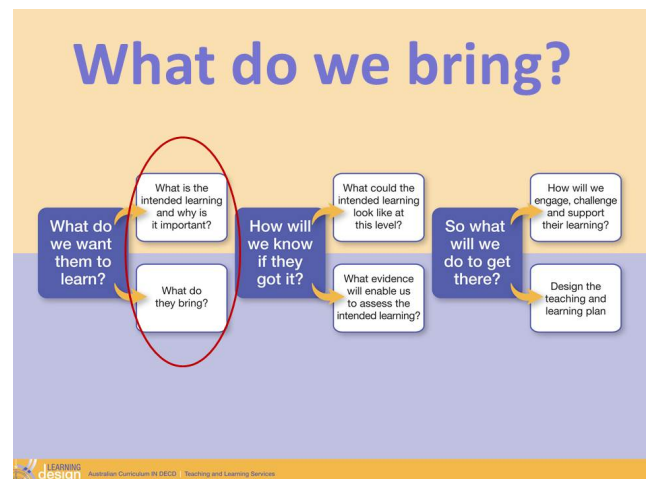
What might my students already know about this concept?

Know what living things need to survive and living things live where their needs are met. Students may also understand how living things depend on each other and the environment to survive.

What content could I use to explore this concept?

Plants provide an ideal way to investigate these concepts as investigating with animals may involve ethical issues. We could grow yeast or bread mould, or different plants in different conditions. Some factors that affect growth and could be tested are, soil aeration, soil temperature, length of daylight, amount of water, etc.

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 6, students learn that environmental influences such as temperature, light, soil type, fertilizers and water, affect the growth and survival of plants and animals.

Year 6 example

For this example, we are going to grow wheat seeds in soil and cotton wool.

What do you notice?

How can I help my students make observations?

Using the BitL questions, I could ask:

- *What do you notice?*

At Year 6, I want my students to observe similarities that change over time. Questions I could ask my students are:

- *What do you notice about the wheat seeds growing?*
- *What features do you notice?*
- *Which features change over time?*
- *What could you measure?*



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?*
- *What similarities between the wheat plants can you see?*
- *What differences?*
- *Do the plants change over time in the same way?*
- *Are they the same height?*
- *Are they all the same colour?*



What do you predict?

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?*

At Year 6, I want my students to predict findings of an investigation. To understand the effect of physical factors on plant growth and survival, we might investigate:

- *What do you predict might happen to the wheat seeds if we made the water salty?*
- *Or, what might happen if we added the nutrient, nitrate to the water?*
- *What other factors do you predict will affect the growth and survival of wheat seedlings?*



How can you test it?

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

Using the BitL questions, I could ask:

- *How might you test this?*

At Year 6, I want the students to develop a fair test, so they can investigate the cause and effect between the variables. Questions I could ask my students are:

- *Which factor / variable will you change?*
- *What will you measure?*
- *What will you keep the same?*
- *Are there any safety or ethical issues to consider?*
- *What equipment would you use to help you make your measurements?*

It is important to remind students that in science we only test one variable at a time to keep the test fair.



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?*

Questions I could use to prompt the students are:

- *How are you going to record your data?*
- *How might you show the changes over time?*
- *How might lists, tables, graphs and diagrams be useful when communicating your findings?*
- *How fair was your investigation?*
- *How might you improve your investigation?*



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 6, I want my students to identify how scientific discoveries are used to solve problems that directly affect people's lives. To do this, I could ask the students:

- *What new learning did you gain from your investigation?*
- *Who might be interested in how plants are affected by a change in the nutrients in the soil?*
- *How might your understanding of how plants are affected by changes in the environment be useful in your life?*
- *Sometimes in the news, we hear that the River Murray is becoming too salty. From what you have learnt why should we be concerned about this issue?*
- *What other investigations has this investigation made you think about?*
- *How do humans change soil conditions? What effects might this have?*



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 animals and plants are influenced by the physical conditions of their environment.

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 all concepts, (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 interdependence and ecosystems concept

Foundation

This starts in the Foundation year where students look at what people and other living things need to survive. For example, the class guinea pig needs food, water and shelter to survive.

Year 1

Year 1 goes a bit wider and students' focus on the idea that plants and animals live where their needs are met. This may vary for different plants and animals. For example, some spiders live under the bark of trees, whereas others like the trap door spider, live under the ground.

Year 4

In Year 4, students understand how living things depend on each other and the environment to survive. Insects and a spider living on a tree demonstrate this. The spider gets shelter and protection from the tree, and the tree gets protection from the spider because the spider eats the insects that could damage the tree.

Year 6

At Year 6, the growth and survival of living things are affected by the physical conditions of their environment. For example, a tree could be affected by extended lengths of darkness. If there is a thick smoke in the atmosphere and the sunlight isn't able to get through, a tree is unable to make its food because it needs sunlight, and so without the sun's light, it will slowly die.

Year 7

In Year 7, students study the interactions between living things which we call organisms and the impact of humans on these interactions. For example, humans introduced the cane toad in Queensland as an attempt to control the native cane beetle, however this impacted on other food chains and food webs.

Year 9

By Year 9, the focus broadens to include how energy and matter flow through whole ecosystems and the effect of both living (biotic) and non-living (abiotic) factors on them. An example of this is the regeneration of a local area that occurs after a bushfire or drought.

So, from Foundation to Year 10, students develop their understanding of interdependence in ecosystems from basic needs of familiar living things to abstract ideas about how energy and matter flows in ecosystems.