Year 7

Conceptual narrative Science: Interdependence and ecosystems

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

Populations of different species are affected by feeding relationships between them. Human impact on this can have diverse and far reaching effects.

What concepts do I want my students to understand?

- Food chains and food webs are models to represent the flow of energy and mass through ecosystems.
- Environmental changes affect feeding relationships.
- Humans impact on food chains and food webs.

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

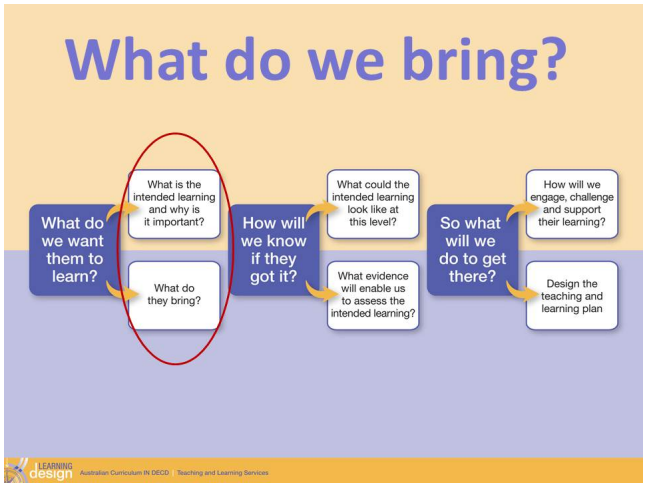
What might my students already know about this concept?

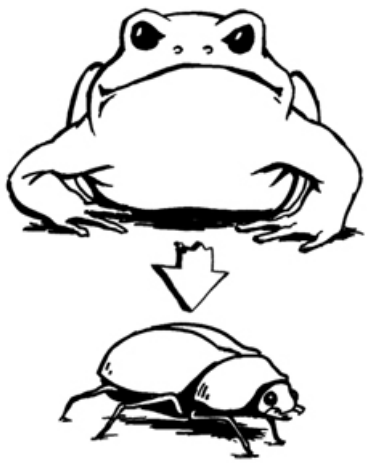
What living things need to survive, and living things live where needs are met. Living things depend on each other and the environment to survive. The growth and survival of living things are affected by the physical conditions of their environment, such as temperature, air quality, availability of water, etc.

What content could I use to explore this concept?

There are many ways to investigate this concept. We could learn this through an e-learning interactive food web model, or by exploring and investigating food webs in our local area, such as a River Red gum tree, a sand dune, a paddock or wetland. You could then research the effect of human activity on these habitats, such as deforestation, agriculture or the introduction of a new species.

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 7, we want our students to understand the interactions between organisms in food chains and webs and the impact humans can have on these.

Year 7 example

In this example, my students will investigate the human impact on the creek near our school.

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. Questions I would ask my students are:

- *What equipment might aid your observations to identify where the animals and plants get their requirements from?*
- *What things can you see that might suggest that humans have had, or are having an impact on the creek environment?*
- *What evidence of what living things are eating / being eaten, is there?*

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, I want my students to describe matter and energy flows through systems, and consider how the organisms within the system relate to each other. Questions I could ask are:

- *What are the relationships between the animals and plants in and around the creek environment? Is there anything unusual? What evidence of eating/ being eaten might you see?*
- *Which plants and animals are native to this area?*
- *Which plants and animals are introduced from other countries?*
- *Which animals are dependent on which plants? Do they all rely on the same plant?*

What do you predict might 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 one plant is removed?*
- *What do you predict might happen if the area is cleared for development?*
- *What do you already know, or what have you observed that led to your prediction?*
- *What other predictions might be plausible?*

I may ask my students to research using secondary sources, to predict what would happen to the organisms if an oil spill occurred nearby?

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 investigation can you design?*

At Year 7, 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:

- *What variables are there in the ecosystem?*
- *Which variable will you investigate? Why?*
- *How might you do this without negatively impacting the ecosystem?*
- *What equipment will you choose that will improve the accuracy in the data you collect?*
- *What safety and ethical aspects will you need to consider?*
- *Are there digital technologies, for example cameras, sound recorders, which might help you to design and record 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 your investigation?*

Questions I could ask my students are:

- *How can you represent the data and your explanations about the ecosystem in a way that you can communicate the patterns and changes with others?*
- *What tools, lists, tables, graphs or drawings might help you to share this information and help you to identify the trends?*
- *How fair was your test? How could it be improved? Who might be interested in this new data?*

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, I want my students to be able to respond to social and environmental problems from a scientifically informed position. To do this I could ask the students:

- *How could this change the way we look after ecosystems and natural bushland in our local area?*
- *Which of your own decisions might this learning influence?*
- *What else could you investigate?*

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 food chains and food webs are a particular type of interdependence, and that humans can impact on these interactions, and on the ecosystems.

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 both 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.