



## Thinking in Scientific Ways

## Developing and Communicating Scientific Understanding

ACCESS THE SCIENCE EXEMPLARS ONLINE AT [www.tki.org.nz/r/assessment/exemplars/sci/](http://www.tki.org.nz/r/assessment/exemplars/sci/)

LEVEL 1 2 3 4 5

## Balancing Act

## THE LEARNING CONTEXT

The teacher's intended outcomes were for the students to:

- explain the effect of intervention on the relationships within a food web
- use evidence to support their explanation of a scientific model.

The intended outcomes were aligned to the following "big ideas":

- The balance of a food web can be changed by intervention.
- Scientists develop models based on evidence to clarify their explanations.

The class studied the consequences of removing items from the food web. They visited a garden and observed small animals living on the plants. They collected small animals and later identified them from library books. After viewing a video on introduced species to New Zealand, they discussed the effect of these species on the local ecology.

The class built food chains based on researched or supplied information and made a food chain mobile. This led to a discussion of the consequences of removing an animal or plant from a food chain. In the next activity they used the different food chains to construct a food web and explained the effect of the removal of one animal or plant from a food web.

## Teacher-student conversation

Several weeks after the completion of the unit:

- Teacher: What do you mean when you say "Carnivores keep the number of herbivores down?" Why do you think this balance so important?
- Stefanie: The herbivores, if their numbers were not kept down by the carnivores, would grow in numbers to the point where they would cause a lot of damage to the plants. But if the top predator was removed then the carnivores would grow in number as well and could then eat more of the herbivores. Those animals such as the mice would increase to huge numbers if the hawk was removed. This might cause a huge problem with too many mice damaging food supplies. Balance is where they are kept under control by other animals.

## WHERE TO NEXT?

To move Stefanie towards the next learning step the teacher could help her focus on:

- seeking other explanations that fit the evidence (thinking in scientific ways)
- applying her understanding to a social issue by researching about the effects of the introduction of exotic plants and animals, or biological controls into New Zealand (developing and communicating scientific understanding).

The teacher could:

- encourage her to return to the "big idea" that stated evidence must be used to support explanations, and then encourage her to use this idea in other contexts, such as the Moon landing conspiracy or fibres and fabrics. Stefanie could use articles and concept cartoons to support her argument (thinking in scientific ways)
- encourage her to compare changes to food relationships following the introduction of new species (developing and communicating scientific understanding).

## CURRICULUM LINKS

*Science in the New Zealand Curriculum*  
Achievement Objectives

**Level 4: Making Sense of the Living World**

Students can use simple food chains to explain the feeding relationships of familiar animals and plants, and investigate effects of human intervention on these relationships.

*Science in the New Zealand Curriculum*, page 60  
[http://www.tki.org.nz/r/science/curriculum/p60\\_61\\_e.php](http://www.tki.org.nz/r/science/curriculum/p60_61_e.php)

**Levels 3 and 4: Developing Scientific Skills and Attitudes**

**Processing and interpreting:** Students can identify trends and relationships in recorded observations and measurements by making links within organised data.

*Science in the New Zealand Curriculum*, page 46  
[http://www.tki.org.nz/r/science/curriculum/p44\\_51\\_e.php](http://www.tki.org.nz/r/science/curriculum/p44_51_e.php)

**Level 4: Making Sense of the Nature of Science and its Relationship to Technology**

Students can investigate examples of simple technology to clarify some scientific ideas.

*Science in the New Zealand Curriculum*, page 32  
[http://www.tki.org.nz/r/science/curriculum/p32\\_33\\_e.php](http://www.tki.org.nz/r/science/curriculum/p32_33_e.php)

## REFERENCE

Ministry of Education (1993). *Science in the New Zealand Curriculum*. Wellington: Learning Media.



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LEVEL	1	2	3	4	5
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# Balancing Act

## WHAT THE WORK SHOWS

Stefanie shows that she understands the long-term effects on animals and plants when one food source is removed from the food web. She uses scientific vocabulary correctly to show the effects on the food web.

**FOOD CHAINS**

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graph LR
    TREES --> INSECTS
    GRASSES --> INSECTS
    GRASSES --> MICE
    GRASSES --> GRASSHOPPERS
    GRASSES --> GOATS
    INSECTS --> LIZARDS
    INSECTS --> HAWKS
    MICE --> HAWKS
    GRASSHOPPERS --> SMALL_BIRDS
    LIZARDS --> HAWKS
    SMALL_BIRDS --> HAWKS
    
```

**Explain what would happen if lizards were removed from the food web.**

If lizards were removed from the food web there would be a lot of insects, because there is only one other animal on there that eats insects (apart from lizards). If the number of insects increase, there will be more damage to the plants. Also, Hawks would have less prey as lizards are an important part of their diet. Small birds may increase in number, as there is more food, but they may also decrease, as Hawks will need new prey. Carnivores help keep the number of herbivores down. (This balance is very important.)

**Draw a food chain that is part of this food web. The food chain must contain small birds.**

grasses → grasshoppers → small birds → Hawk

Stefanie's food web

**Progress Indicator**  
 Thinking in Scientific Ways

**Suggesting explanations**

Stefanie suggests an explanation and considers others linked to the evidence in her written explanation.

**Progress Indicator**  
 Developing and Communicating Scientific Understanding

**Using scientific ideas in constructing explanations**

Stefanie's explanation of the multiple relationships within the food web, and the need to maintain balance within a food web clearly indicates that she can construct an explanation for an experience using appropriate scientific ideas.

**Using scientific vocabulary**

She uses a range of scientific terms and symbols appropriately.