

Writing in science, level 3

Interdependence

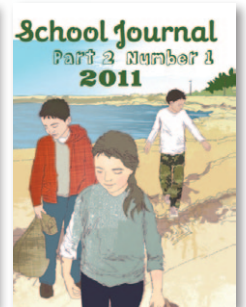
Overview

This resource provides examples of purposeful curriculum learning within the science context of interdependence, but the primary focus is on the planning and teaching of the writing skills and knowledge that support students' learning in this context. Refer to Teaching Writing across the Curriculum in Years 4–6 for more information about using writing across the curriculum.

These materials use two texts from the Ministry of Education's instructional series to support the curriculum learning and the writing tasks. The selected texts have themes that relate to the context of interdependence.



Connected 2
2010



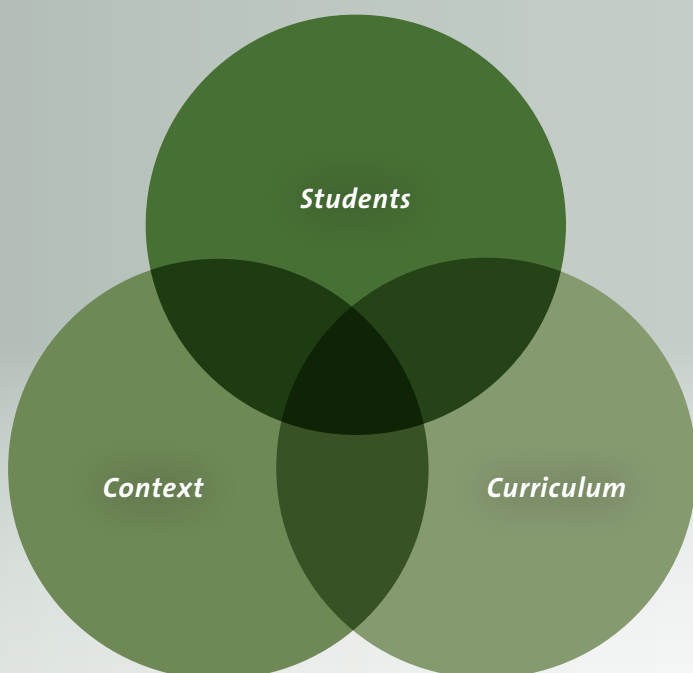
School Journal
Part 2 Number 1
2011

Three aspects of planning

When planning, consider:

- the big ideas that underpin the New Zealand Curriculum and the big ideas contained in the science curriculum
- the relevance of the topics and contexts for your students
- the learning strengths and needs of your students.

These three aspects of planning (curriculum, context, and the students' learning strengths and needs in the particular focus areas – see the diagram below) are integral and reciprocal. They naturally overlap and so learning tasks and activities address all three aspects. It is the point where the planning starts that may vary.



Students' literacy strengths and needs

Writing

What skills and knowledge do my students bring to the learning?
What support will my students need to:

- create relevant content?
- use text structures and language features appropriate to their purpose and audience?
- select and use tools to plan and organise ideas and information to meet their writing purpose?
- use vocabulary that clearly conveys ideas, experiences, and information?

Context (for inquiry and learning)

Interdependence

Big idea: A change in part of an ecosystem affects other parts.

- Living things are dependent on the environment and each other to survive and thrive.
- Human intervention makes a difference to the environment.
- We need to understand interdependence if we are to make a positive impact on the environment.

Curriculum

Science

- Living World – Ecology: Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced.
- Nature of Science – Investigating in science: Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.
- Nature of Science – Participating and contributing: Explore various aspects of an issue and make decisions about possible actions.

Texts that support the theme of interdependence

Connected 2 2010 – “The Man in the Outside Office” (article)

Relevant themes:

- Living things are dependent on the environment and each other to survive and thrive.
- Human intervention makes a difference to the environment.

School Journal, Part 2 Number 1, 2011 – “Puketī Robins” (article)

Relevant themes:

- Human intervention makes a difference to the environment.
- We need to understand interdependence if we are to make a positive impact on the environment.

Texts related by theme

School Journal, Part 1 Number 4, 2005 – “A Very Special Frog” (article)

Connected, 1, 2007 – “The Secret Underground”

School Journal, Part 1 Number 4, 2008 – “Wrybills at Risk” (article)

School Journal, Part 3 Number 1, 2009 – “The Bittern” (story)

School Journal, Part 4 Number 1, 2010 – “Deer, Oh Deer” (Article)

School Journal, Part 1 Number 1, 2011 – “Te Taonga Nui a Tāne” (article)

Texts	Text features and structure	Supporting strategies
<i>Connected 2 2010 – “The Man in the Outside Office”</i>	<ul style="list-style-type: none"> • Direct speech as quotations that speak to the audience • Non-continuous sequence • Mix of present and past tenses • Variety of past verb forms: “The marks had been made”, “It was in his home patch”, “He’s even been part of” • Variety of sentence structures, including simple, compound, and complex • Use of analogy: ecologist = tree detective • Use of photographs, with captions, to support the text. 	<p>Build on the students’ prior knowledge – make links to what they know about descriptions.</p> <p>Direct the students to the text and explain that you are going to show them how this author describes. For example, “He saw golden eagles and giant vultures and heard wolves that prowl around the villages trying to snatch little goats.”</p> <p>Ask questions to support the students to identify the impact of the nouns and descriptive verbs. Provide opportunities for them to transfer techniques they have learnt to their own writing.</p> <p>Make deliberate links between reading (identifying the main ideas) and writing (summarising). Support the students to transfer this learning to their writing plan.</p> <p>Support the students to identify specific language that is persuasive, articulating its effect. Invite, and expect them to think about, their choice of words to persuade.</p>
<i>School Journal 2.1.11 – “Puketī Robins”</i>	<ul style="list-style-type: none"> • Mixed text type – changes in tense between parts of the recount (present and past tenses) and the explanation (present tense) • A variety of past verb forms in the second part of the recount • Use of verbs to describe movement and actions • Use of a map and photographs (some with captions) that support the text • Use of a footnote to describe mealworms • Variety of sentence structures, including the use of passive, simple, compound, and complex sentences. 	<p>Notice what the writer has done. Direct the students to the first two pages, noting the way the author goes straight into the scene and action and sets up questions, rather than giving a clearer orientation followed by events in sequence as a typical recount would.</p> <p>Make connections with the students’ prior knowledge. What do they know about recounts and explanations?</p> <p>Co-construct success criteria for an effective explanation, making connections to other explanations the students have read or heard. Provide opportunities for them to explain orally how something else works and to listen to explanations as well.</p> <p>Explore useful language for explanations, for example, language to describe cause-and-effect relationships (such as sentences using “makes”, “as a result”, “cause”), language to describe means-and-purpose relationships (such as sentences using “in order to”, “so that”, “the purpose of”), and language to signal sequence (such as “next” and “after”).</p>

Instructional Focus: Writing

Begin by describing for your students the sort of writing they will be doing to support their learning. As a way of creating an authentic learning experience, students could then share these texts with the wider community by using an online publishing solution – for example, a wiki or a Google website.

Three learning processes

The writing tasks described below relate to three learning processes:

1. building knowledge
2. investigating
3. developing understanding.

1. Building knowledge

Support the students to build their knowledge and understanding about the lives of animals and plants and how people can help to protect and develop their environments. Learning activities to explore these ideas could include locating and gathering information from texts and teacher-selected websites, visiting a local bush environment, talking to experts, and viewing online video clips. Such activities involve discussion in pairs and groups and lend themselves to a variety of writing tasks. Support the students to know what to write, how much to write, and the best format in which to do this.

Writing demands	Prompts to support planning
<p>The writing demands related to building knowledge include:</p> <ul style="list-style-type: none"> • using precise language, diagrams, and sketches to describe important features of plants and animals • structuring and organising their information • summarising and synthesising their information into a description or information report. 	<ul style="list-style-type: none"> • What do my students know about close observation and describing what they see? • How will they record information in a way that allows them to go back to the source material if required? • What graphic organisers (including digital) will best support them as they do this? • What support will they need in order to write about what they are learning? • What type of language (words, phrases, sentences, and text types) do students need to use in their writing, and how can I support them with it? • How can I provide opportunities for them to explore the topic, discuss it, and plan their writing in their first language?

Task: Students think about and record ideas and information

Students Possible responses to the task	Teacher Possible deliberate acts of teaching
<p>Students describe a classroom plant.</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p><i>The plants has lots of thin vines winding round a central branch. There are smaller vines coming off the main ones with even smaller stems coming off. The leaves grow in groups of three off a main stem. Each leaf is small to medium size and light green and the stems are pale brown with a bit of green. The stems are slightly furry and wind up around a middle branch. The leaves have pointed ends. There are veins running down the centre of each leaf, with other veins running from the middle vein to the pointed part on the outside of the leaf.</i></p> </div> <p>What the writing shows</p> <p>The student's writing shows close and precise observations of the distinguishable features of a particular plant. It includes the use of subject-specific nouns ("branch", "stems", "veins"), adjectives ("thin", "furry"), and verbs ("winding", "running").</p>	<p>The following could be an initial set of activities before you ask the students to move beyond the two texts.</p> <p>Explain why scientists need to use precise language to describe what they see or notice. You could use the example in <i>Connected</i>, page 11, paragraph 2:</p> <ul style="list-style-type: none"> • "The marks had been made by chisel-shaped teeth, not the rounded teeth of possums." If the observation had not been so precise or the notes so precise, the scientists would have thought possums were the problem. Scientists use their precise descriptions to explain phenomena, for example, why a plant or animal has a particular lifestyle or the impact of one thing on another. <p>Ask questions and prompt the students to notice what else the scientists used to describe their observations – for example, a labelled photo, other photos, and drawings.</p>

Students describe the features of an animal in the environment.

The pukeko is a medium sized bird. Its plummage is dark blue on the chest and glossy green/black on the back and wings. It has a scarlet red beak and pale red legs and feet. Its legs are long and it doesn't have webbed feet. Instead it has four very long seperated claws. This helps it to walk in swampy areas and not sink. The beak is short and pointed for eating grass, insects, berries and seeds. Underneath its tail there are fluffy white feathers and they stand out when the bird is disturbed.

What the writing shows

The student uses precise science words and phrases to develop a detailed description of a pukeko, including “plummage”, “scarlet red beak”, “it doesn’t have webbed feet”, “long seperated claws”, and “is disturbed”.

Model a description of the class pet or pot plant. Tell the students you are going to describe something to them, but you will miss out the first part (the introduction) and they need to guess what it is. Describe your item in a logical sequence, including its features, where it lives, and what it does. After the students have guessed what it is, ask them what kinds of things you described and how you grouped them together (refer to criteria for good descriptions if you have them).

Use their ideas to draw up a graphic organiser in three columns, similar to the one below, adding a section for the introduction. Together, fill in the sections for the body of your description. Note that the sections can be of very different lengths and in a different order, depending on the topic.

Ask the students to work in pairs to fill in the first column for the introduction. Discuss as a group. Then ask the pairs to write an introduction and to share with other pairs. Give feedback and offer corrections if necessary.

With students who find this challenging, you could co-construct another example using the graphic organiser. Select a subject everyone is familiar with. Make notes in the graphic organiser and then co-write each section.

Sections	Notes	Description
Introduction (definition)		
Features		
Where it lives/is found		
What it does/is used for		

Explain and model how graphic organisers can help to sort ideas and information. Explain how headings help. Discuss some of the key descriptors often used to portray features, for example, colour, texture, size, and shape. These could be used as reminders when the students are creating their own descriptions.

Ask them to:

- choose one of the plants or animals in the articles
- use an organiser similar to yours and describe the main features
- describe each feature in detail
- think about the order of their headings.

Encourage English language learners to make notes for their descriptions in their own language first.

Encourage the students to share their responses and critique each other’s work, including the details they have selected as key information. Once they realise the importance of being very careful in their observations and very precise with their language (for example, to distinguish one bird from another), focus on the particular plants or animals within the environment you are exploring.

Ongoing teaching points:

- building specific descriptive vocabulary
- using appropriate and useful organisers for the observations.

2. Investigating

Support the students to understand how descriptions are often used to develop explanations. They will become aware that questions (and hypotheses) are developed because something has been noticed – as observed and described by them – and that these questions will inform and direct their ongoing research process. By identifying, recording, and ordering key questions related to the big ideas about interdependence within a particular environment, they will be able to direct their investigation.

Writing demands	Prompts to support planning
<p>The writing demands of investigating include:</p> <ul style="list-style-type: none"> developing questions using precise language refining the language in their questions as the students work towards a hypothesis. 	<ul style="list-style-type: none"> Do my students know how to ask useful and key questions? Do they know the difference between asking questions and hypothesising? What do they need to know about ordering questions? What modelling will support their understanding?

Task: Students make sense of ideas and information

Students Possible responses to the task	Teacher Possible deliberate acts of teaching						
<p>Students record observations, questions, and hypotheses.</p> <table border="1"> <thead> <tr> <th>Observations</th> <th>Questions</th> <th>Hypotheses</th> </tr> </thead> <tbody> <tr> <td> <p><i>Pukeko live in flaxes in swampy area on edge of bush near the stream.</i></p> <p><i>Lots of grasses and small plants in swamp near flaxes.</i></p> <p><i>Pukeko chicks in the flaxes.</i></p> <p><i>Seagulls and kingfishers around the swamp.</i></p> </td> <td> <p><i>What is it about the flaxes that helps them to survive?</i></p> <p><i>What are the birds looking for when they wade in the swamp?</i></p> <p><i>What kinds of food would they be able to get into their beaks?</i></p> </td> <td> <p><i>I think there must be lots of small plants, insects and worms in the swamp because the pukeko always dig around with their young ones. They must be finding food for them otherwise they wouldn't stay. I also think the food supply must be quite good as other birds are searching too.</i></p> </td> </tr> </tbody> </table>	Observations	Questions	Hypotheses	<p><i>Pukeko live in flaxes in swampy area on edge of bush near the stream.</i></p> <p><i>Lots of grasses and small plants in swamp near flaxes.</i></p> <p><i>Pukeko chicks in the flaxes.</i></p> <p><i>Seagulls and kingfishers around the swamp.</i></p>	<p><i>What is it about the flaxes that helps them to survive?</i></p> <p><i>What are the birds looking for when they wade in the swamp?</i></p> <p><i>What kinds of food would they be able to get into their beaks?</i></p>	<p><i>I think there must be lots of small plants, insects and worms in the swamp because the pukeko always dig around with their young ones. They must be finding food for them otherwise they wouldn't stay. I also think the food supply must be quite good as other birds are searching too.</i></p>	<p>Model the initial observation on page 11 of the <i>Connected</i> article and the possible questions and hypotheses of the scientists:</p> <ul style="list-style-type: none"> Observation: The marks were made by chisel-shaped teeth not rounded teeth. Observation: Possums have rounded teeth. What would the scientists be thinking? I wonder what animals have chisel-shaped teeth? How could we find out? <p>Tell the students that questions and/or hypotheses are generally about trying to work out the relationship between things – interdependence. Discuss how you develop a hypothesis after a series of questions from general to specific.</p> <p>Ask them to look at some of their observations and discuss some possible questions, such as:</p> <ul style="list-style-type: none"> Do you have a range of open and closed questions? What do you know about different types of questions? <p>Explain how scientists would need to record these questions during observations. You could model with some students' work. Discuss the benefits of different ways of recording questions. (There is no one best way, but you could start developing criteria about what needs to be there. For example, the questions need to be clearly linked to an observation, sub-questions need to be linked to the major question, and so on.) Explain that questions are often developed when scientists are talking with others about their observations – when they start putting ideas together.</p> <p>Ask the students to discuss in small groups, what they have observed about particular plants and animals and whether they think there is any relationship. Support English language learners with the language needed to express opinions and causal relationships. You could offer several examples and use these to construct speaking frames to help them participate in the discussions. For example:</p> <p>I think ... because ...</p> <p>I think there must be ... because ...</p> <p>(In the examples above, the students will need to produce challenging phrases and clauses to fill in the gaps. Some may need further support.)</p>
Observations	Questions	Hypotheses					
<p><i>Pukeko live in flaxes in swampy area on edge of bush near the stream.</i></p> <p><i>Lots of grasses and small plants in swamp near flaxes.</i></p> <p><i>Pukeko chicks in the flaxes.</i></p> <p><i>Seagulls and kingfishers around the swamp.</i></p>	<p><i>What is it about the flaxes that helps them to survive?</i></p> <p><i>What are the birds looking for when they wade in the swamp?</i></p> <p><i>What kinds of food would they be able to get into their beaks?</i></p>	<p><i>I think there must be lots of small plants, insects and worms in the swamp because the pukeko always dig around with their young ones. They must be finding food for them otherwise they wouldn't stay. I also think the food supply must be quite good as other birds are searching too.</i></p>					
<p>What the writing shows</p> <p>The student's questions reflect a curious mind. There is a clear link between what is observed and what is asked and hypothesised. The student's questions have some sort of hierarchy or order, from very open and general to more specific.</p>							

3. Developing understanding

Scientists use rational argument to persuade their audience, without any use of emotive language. Support the students to work as scientists and to use their information and evidence (notes, descriptions, drawings, diagrams, answers to questions, and interviews) to develop arguments from what they have learnt, in order to persuade the reader to share their opinion. This will require the students to work in groups to explain, debate, and justify their ideas before writing about them.

Writing demands	Prompts to support planning
<p>The writing demands when developing understanding include:</p> <ul style="list-style-type: none"> persuading a reader that changes to the environment of a particular plant or animal could have detrimental or positive effects. 	<ul style="list-style-type: none"> Have I made the connections explicit, to allow the students to transfer what we have learnt? What support do they need to develop their written arguments? Do they understand how a scientific plan of action can be described? How will I lead them to notice and moderate the effect of emotive language?

Task: Students communicate their knowledge and understanding

Students Possible responses to the task	Teacher Possible deliberate acts of teaching
<p>Students persuade a reader why an environment should not be changed.</p> <div data-bbox="95 981 778 1400" style="border: 1px solid black; padding: 10px;"> <p><i>The local swamp is home to several plants and birds, including pukeko. The swamp provides good food for the pukeko and their chicks. The pukeko eat the weeds, grasses, worms, small fish and insects living there. Because of their diet they need to live in these conditions.</i></p> <p><i>If people drain the swamp to make room for a new road, then the habitat of the pukeko would be destroyed. It is unlikely they would survive because this is the only swampy area in the hole district.</i></p> <p><i>It would be better if the road went around the swamp instead of through. This would keep the habitat safe for the pukeko.</i></p> </div> <p>What the writing shows</p> <p>The student's writing shows a hypothesis about how a particular bird is suited to its habitat and how it might respond to an environmental change. This is supported by explanation and descriptions. The writer uses this information to suggest possible human actions to preserve the environment for this bird.</p>	<p>Model persuasion using factual description and explanation rather than emotive language. Compare emotive language with a factual tone to help the students understand the difference. For example:</p> <ul style="list-style-type: none"> <i>Stoats, possums, and rats were eating the eggs and young chicks and destroying the birds' habitat.</i> (Fact) <i>But the arrival of predators such as stoats, rats, and possums made the forest a dangerous place for birds.</i> (Fact, with emotive language) <p>Discuss where you may see the same argument and the two different techniques used. For example, you may be able to compare the writing in a Department of Conservation article or website with that in a Forest and Bird article or website (or any other lobby group). Discuss where and why you would find the different types of writing and who would be the audience.</p> <p>Model building a scientific argument. Ensure that every explanation or opinion is supported with reasons from the descriptions and investigation.</p> <p>Give feedback on the students' use of:</p> <ul style="list-style-type: none"> specific content about the habitat of the pukeko a structure that supports the development of a hypothesis specific vocabulary choices for clarity and precision.