PrimaryConnections®

Australian Academy of Science

Fully aligned with the Australian Curriculum

Growing well

Foundation Year

Biological sciences

About this unit Growing well

Every living thing on Earth has basic needs that must be met in order to survive. Like all animals, we share many needs with plants, such as air, water and appropriate food. However, plants can live without us but we cannot live without them.

The *Growing well* unit is an ideal way to link science with literacy in the classroom. Through hands-on activities students explore how common flowering plants meet their needs for survival. By investigating plant growth in different conditions, they make claims about the basic needs of plants, and compare these to the class pet and research on other animals.

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Foreword

Never has there been a more important time for science in Australia. More than ever, we need a scientifically-literate community to engage in debates about issues that affect us all. We also need imaginative thinkers to discover the opportunities in our exponentially expanding knowledge base. Teachers play a vital role in nurturing the minds of our future citizens and scientists.

The Australian Academy of Science has a long, proud history of supporting science education. Our primary education program, Primary**Connections:** linking science with literacy, now has over 15 years' experience in supporting teachers to facilitate quality learning experiences in their classrooms. Regular evaluations demonstrate the significant impact the program can have on both teacher confidence and student outcomes.

PrimaryConnections has been developed with the financial support of the Australian Government and endorsed by education authorities across the country. It has been guided by its Steering Committee, with members from the Australian Government and the Australian Academy of Science, and benefitted from input by its Reference Group, with representatives from all states and territories.

Key achievements of the program include engaging over 24,000 Australian teachers in professional learning workshops, producing multi award-winning curriculum resources, and developing an Indigenous perspective framework that acknowledges the diversity of perspectives in Australian classrooms.

The Primary**Connections** teaching and learning approach combines guided inquiry, using the 5Es model, with hands-on investigations. It encourages students to explore and test their own, and others', ideas and to use evidence to support their claims. It focuses on developing the literacies of science and fosters lasting conceptual change by encouraging students to represent and re-represent their developing understandings. Students are not only engaged in science, they feel that they can do science.

This is one of 40 curriculum units developed to provide practical advice on implementing the teaching and learning approach while meeting the requirements of the Australian Curriculum: Science. Trialled in classrooms across the country and revised based on teacher feedback, and with the accuracy of the teacher background information verified by Fellows of the Academy, the experience of many brings this unit to you today.

I commend Primary**Connections** to you and wish you well in your teaching.

Professor John Shine, AC Pres AA
President (2018–2022)
Australian Academy of Science

The Primary**Connections teaching and learning approach**

Primary**Connections** units embed inquiry-based learning into a modified 5Es instructional model. The relationship between the 5Es phases, investigations, literacy products and assessment is illustrated below:

Primary**Connections 5Es teaching and learning model**

Phase	Focus	Assessment focus
ENGAGE	Engage students and elicit prior knowledge	**Diagnostic assessment**
EXPLORE	Provide hands-on experience of the phenomenon	**Formative assessment**
EXPLAIN	Develop scientific explanations for observations and represent developing conceptual understanding Consider current scientific explanations	**Formative assessment**
ELABORATE	Extend understanding to a new context or make connections to additional concepts through a student-planned investigation	**Summative assessment** of the Science Inquiry Skills
EVALUATE	Students re-represent their understanding and reflect on their learning journey, and teachers collect evidence about the achievement of outcomes	**Summative assessment** of the Science Understanding

More information on Primary**Connections** 5Es teaching and learning model can be found at: www.primaryconnections.org.au

Reference: Bybee, R.W. (1997). *Achieving scientific literacy: from purposes to practical action*. Portsmouth, NH: Heinemann.

Developing students' scientific literacy

The Primary**Connections** program supports teachers in developing students' scientific literacy. Scientific literacy is considered the main purpose of school science education and has been described as an individual's:

- scientific knowledge and use of that knowledge to identify questions, acquire new knowledge, explain scientific phenomena and draw evidence-based conclusions about science-related issues
- understanding of the characteristic features of science as a form of human knowledge and enquiry
- awareness of how science and technology shape our material, intellectual and cultural environments
- willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen.

Reference: Programme for International Student Assessment & Organisation for Economic Co-operation and Development. (2009). *PISA 2009 assessment framework: key competencies in reading, mathematics and science*. Paris: OECD Publishing.

Linking science with literacy

Primary**Connections** has an explicit focus on developing students' knowledge, skills, understanding and capacities in science and literacy. Units employ a range of strategies to encourage students to think about and to represent science.

Primary**Connections** develops the literacies of science that students need to learn and to represent their understanding of science concepts, processes and skills. Representations in Primary**Connections** are multi-modal and include text, tables, graphs, models, drawings and embodied forms, such as gesture and role-play. Students use their everyday literacies to learn the new literacies of science. Science provides authentic contexts and meaningful purposes for literacy learning, and also provides opportunities to develop a wider range of literacies. Teaching science with literacy improves learning outcomes in both areas.

Assessment

Science is ongoing and embedded in Primary**Connections** units. Assessment is linked to the development of literacy practices and products. Relevant understandings and skills are highlighted at the beginning of each lesson. Different types of assessment are emphasised in different phases:

Diagnostic assessment occurs in the *Engage* phase. This assessment is to elicit students' prior knowledge so that the teacher can take account of this when planning how the *Explore* and *Explain* lessons will be implemented.

Formative assessment occurs in the *Explore* and *Explain* phases. This enables the teacher to monitor students' developing understanding and provide feedback that can extend and deepen students' learning.

Summative assessment of the students' achievement developed throughout the unit occurs in the *Elaborate* phase for the Science Inquiry Skills, and in the *Evaluate* phase for the Science Understanding.

Rubrics to help you make judgments against the relevant achievement standards of the Australian Curriculum are available on our website:
www.primaryconnections.org.au

Safety

Learning to use materials and equipment safely is central to working scientifically. It is important, however, for teachers to review each lesson before teaching to identify and manage safety issues specific to a group of students. A safety icon 

is included in lessons where there is a need to pay particular attention to potential safety hazards. The following guidelines will help minimise risks:

- Be aware of the school's policy on safety in the classroom and for excursions.
- Check students' health records for allergies or other health issues.
- Be aware of potential dangers by trying out activities before students do them.
- Caution students about potential dangers before they begin an activity.
- Clean up spills immediately as slippery floors are dangerous.
- Instruct students never to smell, taste or eat anything unless they are given permission.
- Discuss and display a list of safe practices for science activities.

Teaching to the Australian Curriculum: Science

The Australian Curriculum: Science has three interrelated strands—Science Understanding, Science as a Human Endeavour and Science Inquiry Skills—that together 'provide students with understanding, knowledge and skills through which they can develop a scientific view of the world'.

The content of these strands is described by the Australian Curriculum as:

Science Understanding	
Biological sciences	Understanding living things
Chemical sciences	Understanding the composition and behaviour of substances
Earth and space sciences	Understanding Earth's dynamic structure and its place in the cosmos
Physical sciences	Understanding the nature of forces and motion, and matter and energy
Science as a Human Endeavour	
Nature and development of science	An appreciation of the unique nature of science and scientific knowledge
Use and influence of science	How science knowledge and applications affect people's lives and how science is influenced by society and can be used to inform decisions and actions
Science Inquiry Skills	
Questioning and predicting	Identifying and constructing questions, proposing hypotheses and suggesting possible outcomes
Planning and conducting	Making decisions regarding how to investigate or solve a problem and carrying out an investigation, including the collection of data
Processing and analysing data and information	Representing data in meaningful and useful ways, identifying trends, patterns and relationships in data, and using evidence to justify conclusions
Evaluating	Considering the quality of available evidence and the merit or significance of a claim, proposition or conclusion with reference to that evidence
Communicating	Conveying information or ideas to others through appropriate representations, text types and modes

Above material is sourced from the Australian Curriculum: Australian Curriculum Assessment and Reporting Authority (ACARA). (2020). *Australian Curriculum: Science*. www.australiancurriculum.edu.au

Primary**Connections** has units to support teachers to teach each Science Understanding detailed in the Australian Curriculum: Science from Foundation to Year 6. Units also develop students' skills and knowledge of the Science as a Human Endeavour and Science Inquiry Skills sub-strands, as well as specific sub-strands within the Australian Curriculum: English and Mathematics. Detailed information about its alignment with the Australian Curriculum is provided in each unit.

Unit at a glance — *Growing well*

Phase	Lesson	At a glance
ENGAGE	**Lesson 1** Plant spotters	To capture students' interest and find out what they think they know about how living things have basic needs, including food and water. To elicit students' questions about the basic needs of plants and animals.
EXPLORE	**Lesson 2** Planting investigations ***Session 1*** Getting ready to grow ***Session 2*** How tall?	To provide students with hands-on, shared experiences of what plants need to survive by investigating the growth of plants under different conditions.
	Lesson 3 Plant parts	To provide students with hands-on, shared experiences of observing the leaves, stems and roots of a plant.
	Lesson 4 Going up	To provide students with hands-on, shared experiences of how plants use water.
EXPLAIN	**Lesson 5** What do plants need?	To support the students to represent and explain their understanding about the basic needs of plants. To introduce current scientific views.
ELABORATE	**Lesson 6** What do animals need? ***Session 1*** Looking at an animal ***Session 2*** Yes or no?	To support students to conduct a survey to compare the basic needs of plants and animals.
EVALUATE	**Lesson 7** Care for them all	To provide opportunities for the students to represent what they know about how living things have basic needs, and to reflect on their learning during the unit.

A unit overview can be found in Appendix 6, page 65.

Growing well—Alignment with the Australian Curriculum

Growing well is written to align to the Foundation level of the Australian Curriculum: Science. The Science Understanding, Science Inquiry Skills, and Science as a Human Endeavour strands are interrelated and embedded throughout the unit (see page xi for further details). This unit focuses on the Biological sciences sub-strand.

Foundation Year Science Understanding for the Biological Sciences:	**Living things have basic needs, including food and water (ACSSU002)**
Incorporation in *Growing well*:	Students gather information about the basic needs of plants by observing how they grow under different conditions. Students compare and identify the similarities between plant and animal needs.

AC All the material in the first row of this table is sourced from the Australian Curriculum.

Foundation Year Achievement Standard

The Australian Curriculum: Science Foundation Year achievement standard indicates the quality of learning that students should demonstrate by the end of Foundation Year.

> **By the end of the Foundation Year, students describe the properties** and behaviour **of familiar objects. They suggest how the environment affects** them and **other living things.**
>
> **Students share observations of familiar objects** and events.

The sections relevant to *Growing well* are bolded above. By the end of the unit, teachers will be able to make evidence-based judgements on whether the students are achieving below, at or above the achievement standard for the sections bolded above.

Growing well—Australian Curriculum: Key ideas

In the Australian Curriculum: Science, there are six key ideas that represent key aspects of a scientific view of the world and bridge knowledge and understanding across the disciplines of science. The below table explains how these are represented in *Growing well.*

Overarching idea	Incorporation in *Growing well*
Patterns, order and organisation	Students observe plant growth under different conditions in order to identify patterns in their collected data. They also explore the similarities and differences between two different groups of living things – plants and animals.
Form and function	Students identify parts of plants and the function they play in the plant's survival. They begin to develop an understanding that their form helps them to fulfil their function, for example, roots form a network of very small tubes through the soils to maximise their surface area for absorbing water and nutrients.
Stability and change	Students observe how the needs of plants change depending on the conditions they are in. They also identify needs that are stable, for example, a plant will always need water.
Scale and measurement	Students measure and record growth of plants over time. They organise their observations using a timeline.
Matter and energy	Students directly observe changes to seedling growth (matter) determined by available light energy.
Systems	Students observe and describe how conditions of the environment (ecosystem) affect the features, behaviour and survival of plants and animals. They also identify that animals rely on external sources of food, one of the key relationships between living things in an ecosystem.

Growing well—Australian Curriculum: Science

Growing well embeds all three strands of the Australian Curriculum: Science. For ease of reference, the table below outlines the sub-strands covered in *Growing well*, the content descriptions for Foundation Year and the aligned lessons.

Strand	Sub-strand	Code	Foundation Year content descriptions	Lessons
Science Understanding	**Biological sciences**	ACSSU002	Living things have basic needs, including food and water	1–7
Science as a Human Endeavour	**Nature and development of science**	ACSHE013	Science involves observing, asking questions about, and describing changes in, objects and events	1–7
Science Inquiry Skills	**Questioning and predicting**	ACSIS014	Pose and respond to questions about familiar objects and events	1–7
	Planning and conducting	ACSIS011	Participate in guided investigations and make observations using the senses	1–6
	Processing and analysing data and information	ACSIS233	Engage in discussions about observations and represent ideas	1–7
	Communicating	ACSIS012	Share observations and ideas	1–7

AC All the material in the first four columns of this table is sourced from the Australian Curriculum.

General capabilities

The skills, behaviours and attributes that students need to succeed in life and work in the 21st century have been identified in the Australian Curriculum as general capabilities. There are seven general capabilities and they are embedded throughout the curriculum. For further information see: www.australiancurriculum.edu.au

For examples of our unit-specific general capabilities information see the next page.

Growing well—Australian Curriculum general capabilities

General capabilities	Australian Curriculum description	*Growing well* examples
Literacy	Literacy knowledge specific to the study of science develops along with scientific understanding and skills. PrimaryConnections learning activities explicitly introduce literacy focuses and provide students with the opportunity to use them as they think about, reason and represent their understanding of science.	In *Growing well* the literacy focuses are: • science journals • drawings • word walls • tables • annotated drawings • graphs.
 **Numeracy**	Elements of numeracy are particularly evident in Science Inquiry Skills. These include practical measurement and the collection, representation and interpretation of data.	Students: • use informal measurement to monitor plant growth • represent data from investigations in a graph.
Information and communication technology (ICT) competence	ICT competence is particularly evident in Science Inquiry Skills. Students use digital technologies to investigate, create, communicate and share ideas and results.	Students are given optional opportunities to: • use Interactive Resource technology to view resources.
 **Critical and creative thinking**	Students develop critical and creative thinking as they speculate and solve problems through investigations, make evidence-based decisions, and analyse and evaluate information sources to draw conclusions. They develop creative questions and suggest novel solutions.	Students: • make predictions about growth • solve problems through investigation • develop evidence-based claims • analyse and evaluate data.
Ethical behaviour	Students develop ethical behaviour as they explore principles and guidelines in gathering evidence, and consider the implications of their investigations on others and the environment.	Students: • respect each other's' ideas and opinions • recognise basic needs of plants and animals.
 **Personal and social competence**	Students develop personal and social competence as they work effectively in teams, develop collaborative methods of inquiry, work safely, and use their scientific knowledge to make informed choices.	Students: • establish positive relationships with other students, educators and guest speakers • make responsible choices in investigations • work effectively in teams • expand their capacity to question, solve problems, and display curiosity.
 **Intercultural understanding**	Intercultural understanding is particularly evident in Science as a Human Endeavour. Students learn about the influence of people from a variety of cultures on the development of scientific understanding.	• 'Cultural perspectives' opportunities are highlighted where relevant. • Important contributions made to science by people from a range of cultures are highlighted where relevant.

AC All the material in the first two columns of this table is sourced from the Australian Curriculum.

Growing well—Australian Curriculum: English

Strand	Sub-strand	Code	Foundation Year content descriptions	Lessons
Language	**Language for interaction**	ACELA1429	Understand that language can be used to explore ways of expressing needs, likes and dislikes.	1–7
	Expressing and developing ideas	ACELA1434	Recognise that texts are made up of words and groups of words that make meaning	1–7
		ACELA1437	Understand the use of vocabulary in familiar contexts related to everyday experiences, personal interests and topics taught at school	1–7
Literacy	**Interacting with others**	ACELY1646	Listen to and respond orally to texts and to the communication of others in informal and structured classroom situations	1–7
		ACELY1784	Use interaction skills including listening while others speak, using appropriate voice levels, articulation and body language, gestures and eye contact	1–7
		ACELY1647	Deliver short oral presentations to peers	6
	Creating texts	ACELY1651	Create short texts to explore, record and report ideas and events using familiar words and beginning writing knowledge	1, 3, 7

AC All the material in the first four columns of this table is sourced from the Australian Curriculum.

Growing well—Australian Curriculum: Mathematics

Strand	Sub-strand	Code	Foundation Year content descriptions	Lessons
Number and Algebra	**Number and place value**	ACMNA289	Compare, order and make correspondences between collections, initially to 20, and explain reasoning	5
		ACMNA004	Represent practical situations to model addition and sharing	5
	Patterns and algebra	ACMNA005	Sort and classify familiar objects and explain the basis for these classifications. Copy, continue and create patterns with objects and drawings	5
Measurement and Geometry	**Using units of measurement**	ACMMG006	Use direct and indirect comparisons to decide which is longer, heavier or holds more, and explain reasoning in everyday language	5
		ACMMG007	Compare and order the duration of events using the everyday language of time	5

AC All the material in the first four columns of this table is sourced from the Australian Curriculum.

Cross-curriculum priorities

There are three cross-curriculum priorities identified by the Australian Curriculum:

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia's engagement with Asia
- Sustainability.

Two of these are embedded within *Growing well*, as described below.

Aboriginal and Torres Strait Islander histories and cultures

The Primary**Connections** Indigenous perspectives framework supports teachers' implementation of Aboriginal and Torres Strait Islander histories and cultures in science. The framework can be accessed at: www.primaryconnections.org.au

Growing well focuses on the Western science way of making evidence-based claims about the basic needs of plants and animals. Students make a hypothesis about the basic needs of a plant, and test this using a controlled variable test. They discuss what claims their evidence supports and whether they can generalise to all plants. They also research the needs of animals to contrast and compare.

Aboriginal and Torres Strait Islander Peoples might have other explanations about the needs of other living things. For example, they may see humans, animals and the land within a vast network of relationships that convey a morality and way of dealing with each other.

Primary**Connections** recommends working with Indigenous community members to access local and relevant cultural perspectives. Protocols for engaging with Aboriginal and Torres Strait Islander community members are provided in state and territory education guidelines. Links to these are provided on the Primary**Connections** website.

Sustainability

The *Growing well* unit provides opportunities for students to develop an understanding of how animal life, including their own, is dependant on plant life. Through their investigations, students develop an understanding of what living things, such as plants and animals, need in order to survive. This provides information on how to encourage the sustainable use of natural resources.

Teacher background information

This information is intended as teacher information only. It provides teachers with information relevant to the science concept so they can feel more confident and competent to teach each lesson. The content and vocabulary of this information is at a more detailed and advanced level than what is required for students.

Introduction to the needs of living things

The world is filled with a vast number of different living things. Although they are diverse, all living things grow, move, exchange gas (breathe) and reproduce. Animals use their muscles to move. Plants tend to move by growing, such as stems growing to light or roots searching for water and nutrients in the soil. Some plants can also move in response to external stimuli, for example, the leaves of *Mimosa pudica* (sensitive plant) fold inward and droop after being touched or shaken.

Living things, including humans and other animals, have needs that must be met for them to stay alive. Some needs, such as water, are common to all living things, although relative needs may vary. For example, a cactus plant has very different water needs from a rice plant.

Some needs depend on the type of organism and the environment in which it lives. For example, some plants need to acquire nitrogen from external sources, such as well-fertilized soil. Other plants have root nodules in which special bacteria live that provide them with nitrogen.

Growth and repair of tissues, movement and reproduction are processes that require energy and nutrients. Carbohydrate and fat molecules ('food') are stores of chemical energy. Plants and animal cells can break down the complex molecules to release the energy. When they use oxygen to do this it is called aerobic respiration.

Plants can use the energy in the Sun's rays to produce carbohydrates (sugars). This process is called photosynthesis and is carried out by specialised parts of plant cells called 'chloroplasts'. Chloroplasts contain chlorophyll pigments which are generally green in colour. The process uses carbon dioxide gas and water, and produces oxygen and glucose (sugars). The sugars are stored in plants' tissues or converted into other molecules, for example, cellulose, to build cell walls. When a plant is creating more sugar molecules than it is breaking down, then it produces more oxygen than it consumes.

Students' conceptions

Taking account of students' existing ideas is important in planning effective teaching approaches that help students learn science. Students develop their own ideas during experiences in everyday life and might hold more than one idea about an event or phenomenon.

Students quickly link life with movement but less often with eating (nutrition), breathing (gas exchange) and reproducing. Hence, they might identify lightning as being alive, but not a plant—unless the plant is doing something associated with movement or growth. Many students do not identify trees as being alive, particularly deciduous trees in winter.

Students might identify that animals breathe but not identify that plants also need oxygen to release the energy from the food they have created. This is reinforced by description of forests being the 'lungs of the planet'. Plants both produce oxygen when they create sugars and consume oxygen when releasing stored energy. Some plants only produce sugars in daylight, and so are net produces of oxygen during the day and net consumers of oxygen at night.

To access more in-depth science information in the form of text, diagrams and animations, refer to the Primary**Connections** Science Background Resource available on the Primary**Connections** website:
www.primaryconnections.org.au

Lesson 1 Plant spotters

AT A GLANCE

To capture students' interest and find out what they think they know about how living things have basic needs, including food and water.

To elicit students' questions about the basic needs of plants and animals.

Students:

- participate in a school grounds walk
- discuss the basic needs of plants and animals
- record their ideas about what plants need to grow and stay healthy.

Lesson focus

The focus of the *Engage* phase is to spark students' interest, stimulate their curiosity, raise questions for inquiry and elicit their existing beliefs about the topic. These existing ideas can then be taken account of in future lessons.

Assessment focus

Diagnostic assessment is an important aspect of the *Engage* phase. In this lesson you will elicit what students already know and understand about how:

- living things have basic needs.

Key lesson outcomes

Science

Students will be able to represent their current understanding as they:

- identify plants in the school grounds
- discuss the basic needs of plants and animals
- label a drawing of a healthy plant.

Literacy

Students will be able to:

- contribute to a discussion about the needs of plants and animals
- draw a plant and label what it needs to grow.

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

Teacher background information

Recognising healthy plants

Plants have varied shapes and colours. In order to identify one that is not growing well or is unhealthy you need to be able to compare it with one of the same species growing in optimal conditions. Things to look for include:

- The plant is wilted, that is, the leaves are hanging downwards, curled inwards, and/or the stem is no longer straight. This generally indicates that the plant lacks water, most likely because the soil is dry. For some plants it can also be a sign of too much water.
- Bleached areas on leaves that have just been placed outdoors can indicate sunburn.
- Blackened areas on leaves can indicate frost damage.
- Off-colour, for example, yellow leaves, can be caused by a nutrient deficiency.

Some of these signs are also associated with disease or insect attack.

Plant diversity

Plants live in a wide variety of habitats, for example, seaweed grows in the sea. Sea plants are less likely to have woody structures like tree trunks since they are supported by the water. Land plants generally use their roots to collect water and nutrients, which some sea plants can get from the surrounding water.

Encourage students to look for green on their walk, as it is a sign of photosynthesis and a key clue that something might be a plant. Lichen is one notable exception. It is a mushroom (fungus) that has algae living in it (symbiosis), giving it a green colour. Fungi is a completely separate group of living things, and are more closely related to animals than to plants.

Ask students to look carefully at shrubs (low woody plants) and herbs/grass (non-woody plants): we group many different species under those descriptions. For example, a lawn may include flower bulbs as well as a complex mix of herbaceous plants that are most easily distinguished by their different flower structures. Encourage students to look at sizes, shapes and colours of leaves of different plants.

Seed germination

Plants differ in the time it takes them to grow. Under the right conditions, some seeds germinate quickly. In particular, seeds from plants that have been bred to be cultivated by humans, such as corn, radish, beans, peas, lettuce, cress, marigolds, sunflowers, zinnias, cosmos and dianthus, germinate quickly. Seed germination can generally be hastened by soaking them in warm water for 12 or more hours and keeping them in a warm place.

Seeds should be planted at a depth of about three times the seed's thickness.

Students' conceptions

Students might not be aware of the common structure of land plants. They might think of plants in terms of a single flower with a stem and maybe a leaf. They might not think of roots in the soil or that the plant may not always be flowering. They might not identify trees, bushes and grasses as plants.

Equipment

FOR THE CLASS

- class science journal
- word wall
- 2 potted seedlings (see 'Preparation')
- *optional:* digital camera

FOR EACH STUDENT

- science journal

Preparation

- Read 'How to use a science journal' (Appendix 2).
- Read 'How to use a word wall' (Appendix 3).
- Prepare two pages in the class science journal with the titles 'What we think plants need to grow and stay healthy' and 'What we think animals need to grow and stay healthy'.
- Prepare an 'Our questions' page in the class science journal.
- Begin collecting yoghurt containers (one for each team) to use as watering containers in Lesson 4.
- Start collecting plant tags for Lesson 7.
- A week before this lesson, obtain two similar seedlings in separate pots. Keep the plant tags for Lesson 7. Stop watering one seedling and place it in a cupboard so that it is wilted and unhealthy looking. Keep the other seedling healthy.
- **Or** two weeks before this lesson, germinate two seedlings from fast growing seeds, such as sunflowers, corn, radishes, cosmos and marigolds. Treat one of the seedlings as above so that you have a healthy looking seedling and an unhealthy looking seedling.

- It is possible to contract legionnaires disease from bacteria living in some potting mix. Take special precautions if you intend to use it to grow the seedlings:
  - store potting mix bags securely, away from students
  - do not handle potting mix in the classroom or near students
  - moisten the mix as you open to reduce airborne particles
  - wear a paper mask that fits over your nose and mouth
  - always wear gloves and rinse them afterwards
  - ask students to wash their hands carefully with soap after touching soil.
- Grow (or source) seedlings from fast-germinating seeds for Lesson 2 and Lesson 3 (see 'Preparation' of those lessons).
- Organise for a pet to visit the class for a couple of weeks during the *Elaborate* and *Evaluate* stages (Lessons 6 and 7).
- *Optional:* Display the class science journal with prepared pages and the word wall in a digital format.

Lesson steps

1. Explain that students are going for a walk in the school grounds to look for different types of plants that grow there. Ask students questions, such as:
   - Where will we find plants? What places will have no plants?
   - How will we know it is a plant?
   - What do plants need to help them to grow?
2. Introduce the class science journal and discuss its purpose and features.

Literacy focus

Why do we use a science journal?

We use a **science journal** to record what we see, hear, feel and think so that we can look at it later to help us with our claims and evidence.

What does a science journal include?

A **science journal** includes dates and times. It might include written text, drawings, measurements, labelled diagrams, photographs, tables and graphs.

Record students' ideas in the class science journal (see 'Preparation').

3. During the walk encourage students to look up high, at eye level and on the ground as they search for plants.

   Optional: Take photos of the plants that students identify for display in the classroom.
4. On return to the classroom, discuss the variety of plants that students identified, including different sizes, colours and leaf shapes.

   Optional: Record the plants (words and/or pictures) that were seen in the class science journal.

5 Introduce the two potted seedlings (see 'Preparation'). Ask questions, such as:

- What are the differences between these two plants?
- Does this plant look like it is growing well (healthy)? Why do you think that?
- How can we tell if a plant is not healthy?
- What might a plant need to stay healthy?

Note: In the *Engage* phase, do not provide any formal definitions or correct students' answers as the purpose is to elicit students' prior knowledge.

6 Ask students to do a drawing in their science journal of the plant that is growing well. Remind students to draw all parts of the plant.

7 Discuss the purpose and features of a drawing.

Literacy focus

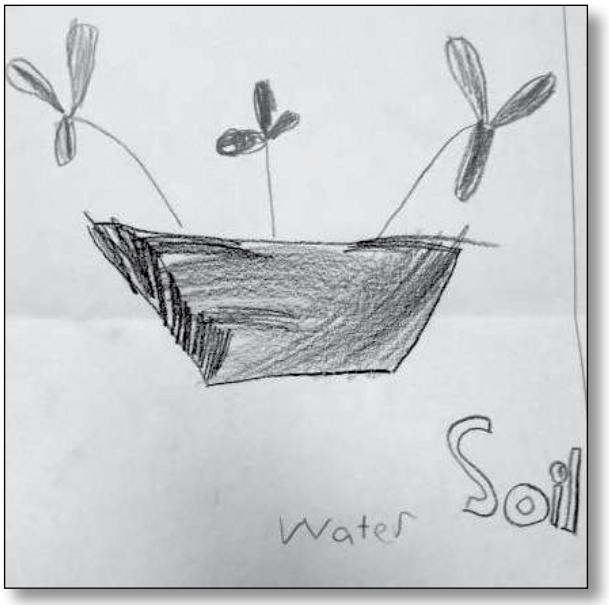
Why do we use a drawing?

We use a **drawing** to illustrate an idea or an object.

What does a drawing include?

A **drawing** includes lines to represent a likeness, image, plan, or design, usually using a pen, pencil or crayon.

8 Ask students to add words or pictures to show what they think the plant needs to grow and stay healthy.



'A healthy growing plant' work sample

9 Allow time for students to complete the activity.

10 Invite students to share their drawings. Ask questions, such as:

- What parts of the plant have you drawn?

- What does the plant need to grow and stay healthy?
- How might parts of the plant help it get what it needs?

Record students' ideas in the class science journal.

11 Ask students to think of an animal, and what it might need to grow and stay healthy (stay alive). Ask questions, such as:

- What animal are you thinking of?
- What does the animal need to grow and stay healthy (stay alive)?
- How do parts of the animal help it to get what it needs?

Record students' ideas in the class science journal (see 'Preparation').

12 Discuss what students would like to know about how plants and animals grow and stay healthy (stay alive). Record any questions students have on the 'Our questions' page in the class science journal (see 'Preparation').

13 Begin a word wall with vocabulary that students have used about plants and animals. Discuss the purpose and features of a word wall.

Literacy focus

Why do we use a word wall?

We use a **word wall** to record words we know or learn about a topic. We display the **word wall** in the classroom so that we can look up words we are learning about and see how they are spelled.

What does a word wall include?

A **word wall** includes a topic title or picture and words that we have seen or heard about the topic.

14 Explain to students that they will add words and pictures to the word wall as they learn more about the basic needs of plants and animals.

Curriculum links

Mathematics

- Draw a map of the school grounds and mark where students walked and where they observed plants.

Lesson 2 Planting investigations

AT A GLANCE

To provide students with hands-on, shared experiences of what plants need to survive by investigating the growth of plants under different conditions.

Session 1 Getting ready to grow

Students:

- choose an investigation question
- work in teams to set up the investigation.

Session 2 How tall?

Students:

- discuss how to record plant growth
- work in teams to make initial records of their plants.

Lesson focus

The *Explore* phase is designed to provide students with hands-on experiences of the science phenomenon. Students explore ideas, collect evidence, discuss their observations and keep records, such as science journal entries. The *Explore* phase ensures all students have a shared experience that can be discussed and explained in the *Explain* phase.

Assessment focus

Formative assessment is an ongoing aspect of the *Explore* phase. It involves monitoring students' developing understanding and giving feedback that extends their learning.
In this lesson you will monitor students' developing understanding of how:

- plants have basic needs including energy, water, nutrients and space.

Key lesson outcomes

Science

Students will be able to:

- discuss what things might affect plant growth
- use their senses to observe and measure plant growth.

Literacy

Students will be able to:

- discuss how to measure plant growth
- contribute to class discussions
- record observations using a drawing.

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

Teacher background information

Plant germination and growth depend on the requirements of the plant and its environment. Most plants tolerate some variability in their environment, such as high and low temperatures, over the course of a day and/or a year. The closer conditions are to optimal for a particular species, the more likely they are to grow rapidly (compared to similar plants in different conditions) and/or flower more rapidly and more abundantly.

Setting up the investigation

Seeds from gardening stores are more likely to germinate relatively quickly and consistently than seeds collected from the environment. This is because they come from plants that have been bred to produce seeds that germinate easily and/or they have been treated to encourage germination.

Research the preferred growth conditions of the plant to ensure that students will see clear results between the plants in 'normal' conditions and those in 'stressed' conditions, for example, lacking water. The clearest results will be from varieties that prefer full sunlight and nutrient-rich soils, and have small seeds, such as sunflower, carrot, radish or basil.

If at all possible, germinate the seeds yourself to be sure of results, particularly the pots that are testing the effect of overcrowding.

It is possible to contract legionnaires disease from bacteria living in some potting mix. Take special precautions if you intend to use it (see Lesson 1, 'Preparation').

Students' conceptions

Students might be aware of the fact that plants need water, particularly as the watering of gardens becomes contentious during droughts. They might not be aware that too much water can 'drown' roots and be just as harmful as not enough water.

Students might be aware that plants need light to grow, although they might not be able to articulate why. They might not realise that more sunlight is not always better for certain types of plants, and that sunlight can burn plant leaves as much as it can burn human skin.

Session 1 Getting ready to grow

Equipment

FOR THE CLASS

- class science journal
- word wall
- team skills chart
- team roles chart
- 1 small bag of potting mixture or nutrient-rich soil
- 1 bucket of sand
- 8 large storage or potting trays
- 8 large self-adhesive labels for trays (see 'Preparation')
- 1 small measuring cup or water mister (see 'Preparation')
- *optional:* digital camera

FOR EACH TEAM

- role wristbands or badges for Manager and Speaker
- each team member's science journal
- 2 potted seedlings (see 'Preparation')
- 2 large self-adhesive labels
- 1 marking pen

Preparation

- Read 'How to organise collaborative learning teams (F–2)' (Appendix 1).
- Display an enlarged copy of the team skills chart and the team roles chart.
- Source seedlings for the investigation, preferably by germinating fast-growing seeds (see 'Teacher background information').
- *Optional:* Plant seedlings with the class, at the end of a term or the very start of a new one.

- It is possible to contract legionnaires disease from bacteria living in some potting mix (see Lesson 1, 'Preparation')
- Create a 'Questions for investigation' page in the class science journal with the following questions:
  - Do plants need **water** to grow and stay healthy?
  - Do plants need **light** to grow and stay healthy?
  - Do plants need **soil** to grow and stay healthy?
  - Do plants need **space** to grow and stay healthy?
- Decide how many teams will do each type of investigation and prepare seedling pots accordingly:
  - 'Water'/'No water' and 'Light'/'Dark': each team has two pots, each with one seedling in potting mix or other nutrient-rich soil.
  - 'Soil'/'Sand': each team has two pots, each with one seedling. One pot is filled with potting mix or other nutrient-rich soil and the other with sand.
  - 'Spaced'/'Crowded': each team has two pots filled with potting mix or other

nutrient-rich soil. One pot has one seedling and the other a large number of seedlings geminated by placing at least ten seeds in the same planting hole.

- Prepare eight trays for the planted pots. Label trays as above: 'Water', 'No water', 'Light', 'Dark', 'Soil', 'Sand', 'Spaced', 'Crowded'. Group the trays on the equipment table in sets of two so that it is clear which tray will be compared with which.
- *Optional:* add images to visually remind students the conditions for each plant on the tray, such as:
  - a blue teardrop for water and one crossed out for no water
  - an orange sun for light and one crossed out for no light
  - a brown square for soil and a yellow square for sand
  - the total number of seeds present.
- Research the water needs of the plant type you have chosen, for example, 20 mL of water every other day or three squirts of a water mister on the soil every day. Ensure students are reminded of this, for example, by finding a small measure and marking a line, writing the number of mists on a misting bottle or creating a reference picture.
- Clear an area of a cupboard or other dark undisturbed area for the 'Dark' tray. Prepare an area for all the other trays to sit in the sunlight relatively undisturbed.
- *Optional:* Display the class science journal with the 'Questions for investigation' page in a digital format.
- **Note:** Session 2 will need to follow shortly after this session as students will measure and mark the beginning height of their seedlings.

Lesson steps

1. Review the previous lesson using the class science journal. Focus on students' ideas and questions about what things plants need to grow and stay healthy.
2. Explain that students will be working in collaborative learning teams to investigate what things plants need to grow and stay healthy.
3. Brainstorm things that might affect the growth and health of plants and record students' answers in the class science journal. Suggestions might include food, water, temperature and space.
4. Show students the seedlings (see 'Preparation'). Discuss how seedlings are young plants. Explain that the class will be using them to investigate whether plants need water, light, soil and space to grow and stay healthy.
5. Discuss how to set up the investigation. Ask questions, such as:
   - Where could we put the plants to make sure they have light? What might happen if they stay in direct sunlight for too long?
   - How much water will we give the plants? What might happen if we water them too much?
6. Introduce the procedure to ensure plants receive the same amount of water (see 'Preparation').

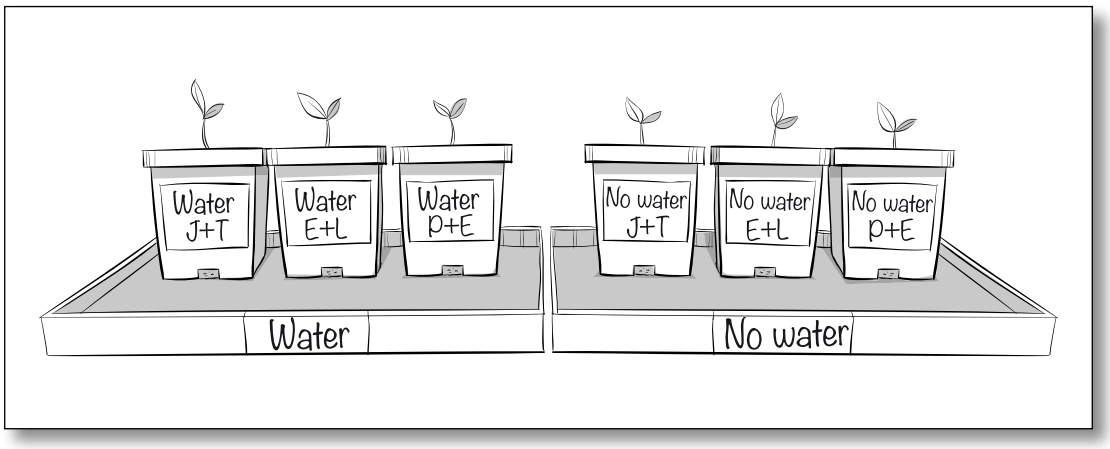
Optional: Some teams investigate what happens when some plants receive too much water or too much sunlight.

7 Introduce the 'Questions for investigation' page in the class science journal (see 'Preparation'). Explain that teams will be investigating one question. Allocate an investigation question for each team.

8 Draw students' attention to the equipment table and discuss its use. Explain that this is where Managers will collect and return materials.

9 Draw students' attention to the grouping of the trays. Discuss which investigation each grouping represents. Refer to the labels as a prompt.

10 Explain that teams will need to label their seedling pots to match the tray, and to identify them as theirs. Model how to do this using the marking pen, for example, by writing 'Water' and adding initials.



Set up of 'Water/No water' investigation

SAFETY

11 Discuss the need to wear disposable gloves and not to sniff the soil when handling potted soil and seeds (see 'Preparation').

12 Form teams and allocate roles. Ask Managers to collect team equipment.

If students are using collaborative learning teams for the first time, introduce and explain the team skills chart and the team roles chart. Explain that students will use role wristbands or badges to help them (and you) know which role each member has.

13 Allow time for teams to label their seedling pots.

Optional: Take photos of each team's plants to keep a visual record of plants' growth.

14 Ask teams to place the pots on the prepared trays.

15 Explain that in the next session (preferably the next day), teams will set up how they will measure the growth of their seedlings over the next few weeks.

16 Update the word wall with words and images. Water all seedling pots except the 'No water' tray, if necessary.

Session 2 How tall?

Equipment

FOR THE CLASS

- class science journal
- word wall
- team skills chart
- team roles chart
- 1 enlarged copy of 'Our plant predictions' (Resource sheet 1)
- *optional:* digital camera

FOR EACH TEAM

- role wristbands or badges for Manager and Speaker
- each team member's science journal
- 2 potted seedlings set up for the investigation (see Session 1)
- 2 popsticks
- 1 marking pen
- 1 copy of 'Our plant predictions' (Resource sheet 1) per team member

Preparation

- Prepare an enlarged copy of 'Our plant predictions' (Resource sheet 1).
- *Optional:* Display 'Our plant predictions' (Resource sheet 1) in a digital format.

Lesson steps

1 Review the previous session, referring to the word wall and science journal. Review the four investigation questions and what each team is investigating.

2 Ask students for ideas on how they could collect and record information about what happens to their seedlings. Discuss ideas with students, such as:
   - drawings
   - taking photos
   - measuring height.

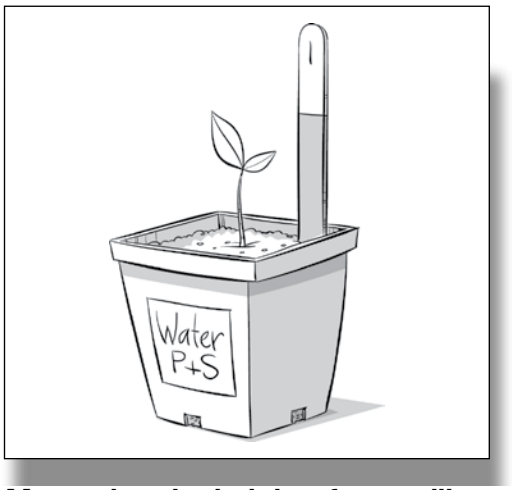
3 Explain that students will be measuring the height of their seedlings each week, using popsticks. Model writing the number '1' at the top of the popstick to show it is the first week or week one.

4 Ask teams to add an identifying mark on the back to show it is their popstick, for example, by adding their initials.

5 Discuss how to measure the height of the plant. Ask questions, such as:
   - How should I hold the popstick?
   - What would happen if I pushed it into the ground? How would that change the measurements? Would that be fair?
   - What would happen if I held it above the ground? How would that change the measurements? Would that be fair?
   - How will we judge the top of the plant? Will it be the top of the stem or the top of the highest leaf? Why is it important for everyone to do it the same each time?

6 Model using the marking pen to mark the height of a plant with a line and then colouring beneath.

Optional: If teams have several plants in their pot, ask them to draw a line for the top of each plant and colour up to the shortest one.



Measuring the height of a seedling

SAFETY

Remind students not to sniff the soil when handling potted soil and seeds, and to wash their hands with soap afterwards (see Lesson 1, 'Preparation').

Optional: Take photos of each team's plants to keep a visual record of plants' growth.

7 Form teams and ask Managers to collect team equipment. Allow time for teams to record the height of their plants.

8 Introduce the enlarged copy of 'Our plant predictions' (Resource sheet 1). Discuss the purpose and features of a table.

Literacy focus

Why do we use a table?

We use a **table** to organise information so that we can understand it more easily.

What does a table include?

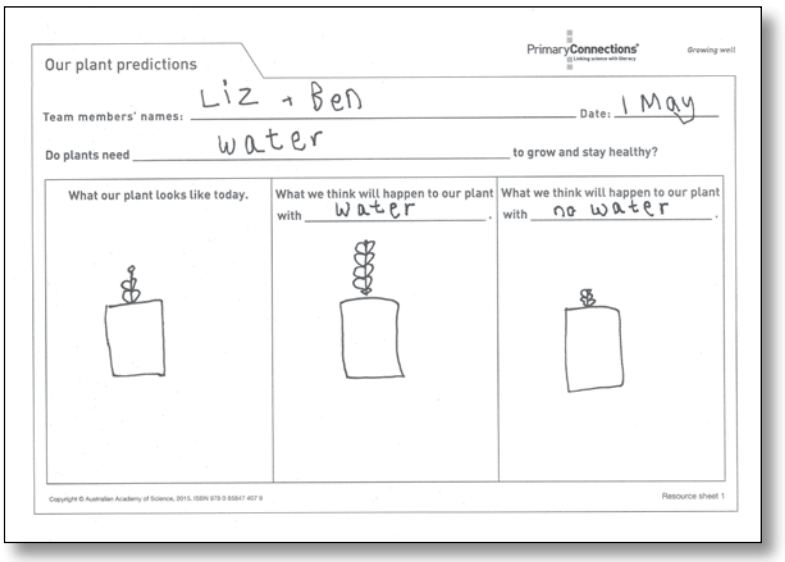
A **table** includes a title, columns with headings and information organised under each heading.

9 Discuss and model how to complete the investigation table and column headings with 'water', 'light', 'soil' or 'space'.

10 Draw students' attention to the heading 'What our plants look like today'. Explain that students will draw what the seedlings look like this week. Discuss how drawing just one picture to represent them both is appropriate since they have been kept in the same conditions until now. Revise the purpose and features of a drawing.

Optional: Take photos of the seedlings.

11 Model a drawing on the enlarged copy of 'Our plant predictions' (Resource sheet 1).


Our plant predictions

PrimaryConnections

Team members' names: Liz + Ben Date: 1 May

Do plants need water to grow and stay healthy?

What our plant looks like today.	What we think will happen to our plant with water.	What we think will happen to our plant with no water.

Resource sheet 1

Work sample of 'Our plant predictions' (Resource sheet 1)

EXPLORE

12 Draw students' attention to the headings 'What we think will happen to our plant….'. Ask teams to draw what they think each seedling pot will look like in three weeks.

Optional: Role-play predictions of what will happen to each seedling.

13 Ask Managers to collect their team's copy of 'Our plant predictions' (Resource sheet 1). Allow time for teams to record their drawings.

14 Ask Speakers to share their team's predictions on their copy of 'Our plant predictions' (Resource sheet 1).

15 Update the word wall with words and images. Water all seedling pots except the 'No water' tray, if necessary.

Curriculum links

English

- Read plant-related information and fiction books, such as *The Tiny Seed*, by Eric Carle.

Indigenous perspectives

- Invite guest speakers to talk about plants indigenous to the area.
- Primary**Connections** recommends working with Aboriginal and Torres Strait Islander community members to access local and relevant cultural perspectives. Protocols for engaging with Aboriginal and Torres Strait Islander community members are provided in state and territory education guidelines. Links to these are provided on the Primary**Connections** website (www.primaryconnections.org.au).

Our plant predictions

Team members' names: _____ **Date:** _____

Do plants need _____ **to grow and stay healthy?**

What our plant looks like today.	What we think will happen to our plant with _____ .	What we think will happen to our plant with _____ .

Lesson 3 Plant parts

EXPLORE

AT A GLANCE

To provide students with hands-on, shared experiences of observing the leaves, stems and roots of a plant.

Students:

- record what they think they know about the parts of a plant
- closely observe all parts of a plant and compare with predictions.

Lesson focus

The *Explore* phase is designed to provide students with hands-on experiences of the science phenomenon. Students explore ideas, collect evidence, discuss their observations and keep records, such as science journal entries. The *Explore* phase ensures all students have a shared experience that can be discussed and explained in the *Explain* phase.

Assessment focus

Formative assessment is an ongoing aspect of the *Explore* phase. It involves monitoring students' developing understanding and giving feedback that extends their learning. It involves monitoring students' developing understanding of how:

- living things have basic needs that they meet through different structures and behaviours.

You will also monitor their developing science inquiry skills (see page ix).

Key lesson outcomes

Science

Students will be able to:

- observe and draw the features of a plant
- compare their observations with their predictions
- discuss how different parts of the plant contribute to helping it grow and stay healthy.

Literacy

Students will be able to:

- create an annotated drawing of a plant
- contribute to class discussions on the different parts of plants.

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

Teacher background information

Plants do not have defined body parts, with set numbers of limbs, in the same way animals do. They are more flexible in the way they grow. Cuttings can regrow roots and become plants again. A whole carrot plant can grow again from the leftover top of a bought carrot.

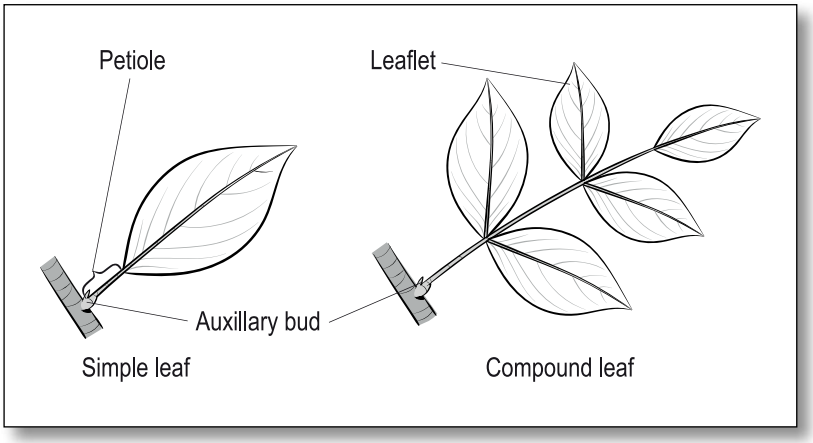
- **Roots:** generally grow below the ground, and can be recognised because they are long, thin branching structures without leaves. They are rarely green. They can anchor plants to the soil and absorb nutrients and water from it. Roots of bulbs can also contract and pull the bulb down into the soil.

  Most plants exchange gases through their roots in the soil. Overwatering can 'drown' roots because it displaces air from the soil and thereby deprives them of oxygen. Some plants have roots that grow partly above the soil, either to absorb water and/or gases directly from the air. Mangroves are an example of the latter; they have roots above the water and the soil.

- **Stems:** the plant structure that bears roots and leaves. They support and elevate leaves and flowers. They also contain vascular systems (tubes): xylem that circulates water and nutrients up to the leaves and phloem that circulates sap, thick with sugars created by photosynthesis in the leaves, down to the roots. Some stems such as tree trunks grow extra strong tissue (wood), allowing them to reach greater heights and bear a heavier load of leaves, flowers and fruits.

  Some plants have very short stems that mostly stay under ground, for example, grasses when they are not flowering. Plants can also send out stems that grow along the ground and create new plants. Some plants, such as cacti, store food or water in their stems, or even use the green surface for photosynthesis.

- **Leaves:** generally flattened structures that are the key area for photosynthesis (creating 'food') of the plant. For flowering plants classed as dicots (for example, Eucalyptus trees), their petiole (stem-like structure) attaches them to the stem of the plant. The place of attachment to the stem often has a bud (an axillary bud), from which extra leaves, flowers or stems can grow. Looking for the bud helps to identify leaves, as compound leaves are divided into several different smaller leaf-like structures (leaflets).



Labelled drawing of two different types of leaves

EXPLORE

Students' conceptions

Students might think that plants get food from the soil through their roots. This is reinforced by the sale of fertilisers with names such as 'plant food'. Plants, like animals, need to intake minerals and nutrients. The difference is that for animals 'food' is also their source of external energy, whereas plants can capture the energy from the Sun's rays through photosynthesis. Most land plants absorb their requirement for water and nutrients through their roots. Other plants have more novel mechanisms, for example, carnivorous plants digest insects to extract nitrogen.

Students might think that plants absorb water through their stems. This is reinforced by the observation that cut flowers survive in vases of water without roots. Water vapour comes out of pores (stomata) on plants' leaves. This causes water and nutrients to flow upwards from the roots through the xylem in the stems. If the ends of the cut stems remain clear from obstruction, including from bacteria and single-celled organisms that are drawn to the sap leaked by phloem, then water can be drawn directly into the exposed xylem tubes. Sachets to prolong the life of cut flowers generally work both to limit bacterial growth and to provide nutrients for the flowers.

Equipment

FOR THE CLASS

- class science journal
- word wall
- team roles chart
- team skills chart
- 1 potted seedling
- 1 enlarged copy of 'Take a look' (Resource sheet 2)
- 1 small paintbrush
- newspaper to cover desks
- *optional:* digital camera

FOR EACH TEAM

- role wristbands or badges for Manager and Speaker
- each team member's science journal
- 2 potted seedlings set up for the investigation (see Lesson 2, Session 1)
- 2 popsticks
- 1 marking pen
- 1 potted seedling (see 'Preparation')
- 1 copy of 'Take a look' (Resource sheet 2) per team member
- 1 small paintbrush
- 1 magnifying glass
- *optional:* disposable gloves (see 'Preparation')

Preparation

- Cover desks with newspaper.
- Source one potted seedling per team of two students (see Lesson 1, 'Preparation'). Loosen the soil around the potted seedlings to make it easier for students to gently pull the plant out of the soil.

- Take care when handling potted soil (see Lesson 1, 'Preparation'). Do not sniff the soil when handling potted soil and seeds, and wear gloves or wash hands thoroughly afterwards.
- *Optional:* provide gloves for students to handle the potted plants, although check for allergies to latex first.
- Prepare an enlarged copy of 'Take a look' (Resource sheet 2).
- *Optional:* Display 'Take a look' (Resource sheet 2) in a digital format.

Lesson steps

1 Review the previous lessons using the class science journal and the word wall, focussing students' attention on the set-up of their investigation.

2 Allow time for teams to make observations and measurements of their seedlings (see Lesson 2, Session 2). Remind students to write the number '2' at the top of the popstick to show that it is week two.

Optional: Take photos of each team's plants to keep a visual record of plants' growth.

3 Draw students' attention to the potted seedling from Lesson 1.
Ask questions, such as:

- How do you know it is a plant?
- What parts of the plant can you see?
- What do you think this part is used for?

Record students' answers in the class science journal.

4 Explain that students are going to work in their collaborative learning teams to look closely at a potted seedling, including the part under the ground.

5 Ask students to draw, in their science journals, what they think the whole potted seedling will look like. Record this under the title 'Before a close look'.

6 Allow time for students to complete the activity.

7 Explain that students will now have a close look at a seedling. Discuss why they are not using their investigation seedlings (because it can damage the plant).

8 Using the class seedling, model how to carefully pull the plant from the pot and brush the soil away with a small paintbrush. Ask students to observe with their eyes and a magnifying glass. Demonstrate how to use the magnifying glass to assist their observations.

Remind students to be careful when handling soil (see 'Preparation').

9 Introduce the enlarged copy of 'Take a look' (Resource sheet 2). Read through and discuss how students will draw their observations of the plant, both above and below the ground.

10 Explain that students will draw what they can see growing above soil level and below soil level on 'Take a look' (Resource sheet 2). Ask students to annotate their drawing by writing words to name the parts of the plant. Discuss the purpose and features of an annotated drawing.

Literacy focus

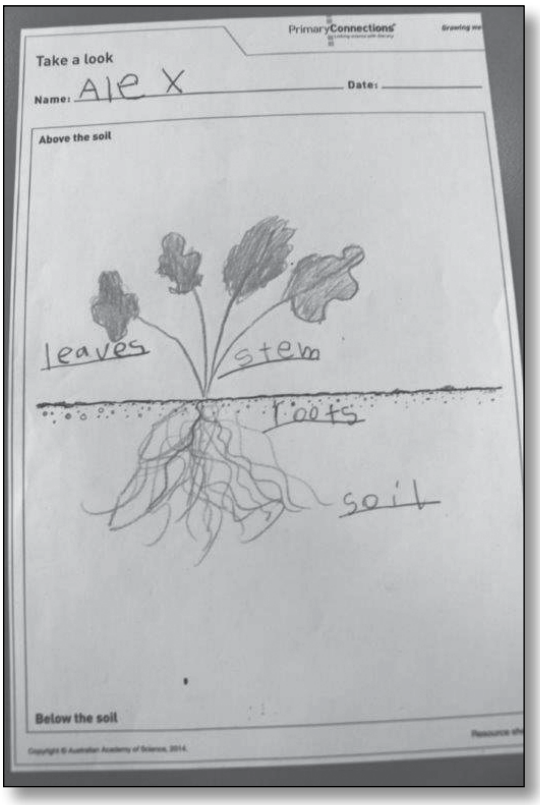
Why do we use an annotated drawing?

We use an **annotated drawing** to show an idea or an object.

What does an annotated drawing include?

An **annotated drawing** includes a picture and words or descriptions about the idea or object.

11 Re-form teams. Ask Managers to collect team equipment. Allow time for the teams to complete the activity.



Work sample of 'Take a look' (Resource sheet 2)

12 Once teams have completed their activity, ask them to wash their hands. Ask Speakers to share their team's findings. Ask questions, such as:

- What was the same between your 'before' drawing and your 'after' drawing?
- What was different between your 'before' drawing and your 'after' drawing?

- What did you think you would see under the soil?
- What part of the plant did you find under the soil?

13 Discuss with students what they think each part of the plant does to help the plant grow and stay healthy. Record students' ideas in the class science journal.

14 Update the word wall with words and images. Water all seedling pots except the 'No water' tray, if necessary.

Curriculum links

English

- Read *The Curious Garden* by Peter Brown. How did Liam learn to be a gardener? What did he do that made the plants grow so well?

Mathematics

- Use small informal measures to measure the length of the plant roots.

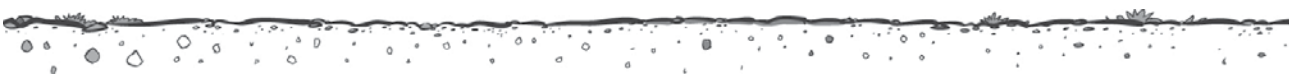
Indigenous perspectives

- Download free Indigenous seasonal calendars from the Top End, which detail many Indigenous food plants. See: **https://www.csiro.au/en/Research/Environment/Land-management/Indigenous/Indigenous-calendars**
- Primary**Connections** recommends working with Aboriginal and Torres Strait Islander community members to access local and relevant cultural perspectives. Protocols for engaging with Aboriginal and Torres Strait Islander community members are provided in state and territory education guidelines. Links to these are provided on the Primary**Connections** website (www.primaryconnections.org.au).

Take a look

Name: _____ **Date:** _____

Above the ground



Below the ground

Lesson 4 Going up

AT A GLANCE

To provide students with hands-on, shared experiences of how plants use water.

Students:

- water plants and observe where the water goes
- discuss the role of plant roots.

Lesson focus

The *Explore* phase is designed to provide students with hands-on experiences of the science phenomenon. Students explore ideas, collect evidence, discuss their observations and keep records, such as science journal entries. The *Explore* phase ensures all students have a shared experience that can be discussed and explained in the *Explain* phase.

Assessment focus

Formative assessment is an ongoing aspect of the *Explore* phase. It involves monitoring students' developing understanding and giving feedback that extends their learning. It involves monitoring students' developing understanding of how:

- plants have basic needs including water, which also transports nutrients.

You will also monitor their developing science inquiry skills (see page ix).

Key lesson outcomes

Science

Students will be able to:

- discuss where the water poured onto a plant goes
- record ideas about roots taking water up to stems and leaves.

Literacy

Students will be able to:

- participate in discussions about plants and their roots
- use drawings to represent watered plants.

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

Teacher background information

Root systems

The main root system of a plant is usually located at the end of the stem under the ground. Some plants have aerial roots growing above the ground.

Roots can perform many functions for the plant, including:

- absorbing water and nutrients including nitrogen
- anchoring a plant in place
- storing food reserves.

Root systems can be much more extensive than the leaf systems we see above ground. A tree's root network can stretch out twice as far as its branches. As roots branch out they become very fine, until they are barely visible to the naked eye. If you look carefully you can see 'root hairs', which maximise the contact area between roots and the surrounding soil.

When some plants are first growing they invest most of their energy into growing a very long thick root (tap root). This allows some trees to seek a water table, which provides a more secure source of water than rainfall. It can also become a tuber full of energy reserves (for example, a carrot) ready to regrow the leaves and stems of the plant if they are damaged by winter frosts, eaten by an animal, or if the plant wants to create flower stems quickly.

Water in plants

Plants need water for photosynthesis. They also need water to transport the nutrients from where they were absorbed, generally the soil, to where they are needed for photosynthesis, generally the leaves. Water and nutrients move upwards through the plant in small tubes in the stem called xylem. Our heart pushes water and nutrients in our blood around our bodies but plants do not have muscle cells and have to rely on different processes.

When you put a clear drinking straw in a glass of water, you can see that the level of the water within the straw is higher than the level in the glass. This is due to capillary action. The thinner the straw, the higher the water will go. Plants have very thin tubes (xylem) and can rely on capillary action to 'pull' water up stems, but only for relatively short distances. Water rushing into the roots due to osmosis creates pressure that can also 'push' the column of water up the xylem tubes. The combination of these two forces can cause water to rise two to three metres in the stems of plants.

Plants also have stomata on their leaves. When they are open water evaporates, cooling leaves down but also pulling water up the stems (transpiration). Water molecules are very cohesive, so when the top of a column of water evaporates it draws water molecules up. We use the same cohesive properties of water when we drink it using a straw.

Flowering plants that are adapted to having regular rainfall or watering will gradually wilt and die without water. Other plants adapt to dry conditions, for example, by having less stomata and by only having them on the underside of the leaf. Some cacti plants store carbon dioxide during the night so they do not always need to open their stomata during the day for gas exchange.

Students' conceptions

Some students might think that plants absorb all their water through their leaves. Plants rarely absorb water through their leaves. However, some leaves and stems are carefully designed to channel water, including dew, down towards the base of the plant. The water penetrates more deeply into the soil and is therefore more protected against evaporation, ensuring that it remains available to the roots.

Equipment

FOR THE CLASS

- class science journal
- word wall
- team roles chart
- team skills chart
- 1 enlarged copy of 'Where does it go?' (Resource sheet 3)
- 1 clear, strong container (see 'Preparation')
- 1 teaspoon of red or blue food colouring
- 2 stalks of celery
- *optional:* digital camera

FOR EACH TEAM

- role wristbands or badges for Manager and Speaker
- each team member's science journal
- 2 potted seedlings set up for the investigation (see Lesson 2, Session 1)
- 2 popsticks
- 1 marking pen
- 1 container for watering (eg, yoghurt container)
- 1 copy of 'Where does it go?' (Resource sheet 3) per team member

Preparation

- Before the lesson, preferably in the morning, place a cut celery stalk in a clear, strong container half full of water with one teaspoon of red or blue food colouring added to the water.
  Note: To ensure that the food colouring can travel through the celery, cut with a sharp implement. This avoids crushing the internal xylem tubes and blocking them.
- Cut the other stalk of celery into slices for students to examine the internal structure.
- Organise plants for students to water in the school grounds. If the school grounds do not have plants, organise for students to visit a nearby park or garden. Discuss with the person responsible for the plants when would be a good time to water them. For example, watering plants in the middle of a hot summer's day can cause them to wilt as it will stimulate the opening up of stomata causing the plant to lose more water than it gains. Clearly mark which plants teams can choose to water.
- Prepare an enlarged copy of 'Where does it go?' (Resource sheet 3).
- *Optional:* Display 'Where does it go?' (Resource sheet 3) in a digital format.

Lesson steps

1 Review the previous lesson using the class journal and word wall. Ask questions, such as:

- What have we learned about plants?
- What are the different parts of plants that we have observed?
- What do we think different parts of a plant might do?

2 Allow time for teams to make observations and measurements of their seedlings (see Lesson 2, Session 2). Remind teams to write the number '3' at the top of the popstick to show that it is week three.

Optional: Take photos of each team's plants to keep a visual record of plants' growth.

3 Discuss with students why we water plants. Ask questions, such as:

- Why does a plant need water?
- Do we need to water plants in the garden on rainy days? Why or why not?
- Do we need to water plants in the garden more or less on hot days? Why or why not?
- Where does the water go when we pour water on a plant?

Record students' answers in the class science journal.

4 Explain that students will be working in collaborative learning teams to water a plant in the school grounds.

5 Form teams and ask Managers to collect equipment from the equipment table.

6 Ask teams to select a plant to water (see 'Preparation').

7 Ask Managers to fill their watering containers with water and direct teams to pour the water on and around the plant. Explain that their task is to watch carefully to see where the water goes.

Optional: Take photos of the teams at work.

8 Return to the classroom. Ask students to draw what they observed happen to the water.

9 Invite Speakers to share their results. Ask questions, such as:

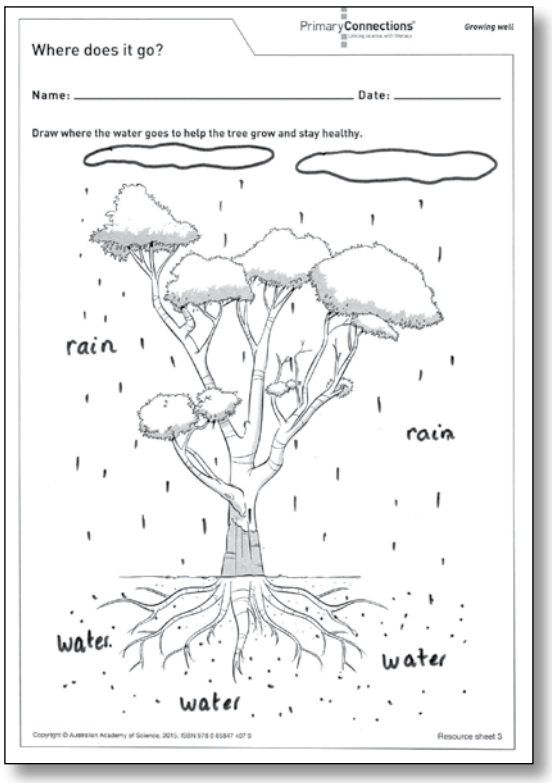
- Did your observations match your predictions? Why or why not?
- Where did most of the water end up?
- Did it stay on the plant? Why do you think that is?
- What do you think happens to the water?

Record students' ideas in the class science journal.

10 Ask students what they do if they need a drink of water when they are playing in the school grounds (go to where they can drink water, for example, from a water bottle in their bag). Discuss how plants cannot move like people, but still need water to grow.

11 Introduce the enlarged copy of 'Where does it go?' (Resource sheet 3). Discuss with students how plants can be big like trees or small like seedlings and can have lots of roots or just a few roots under the ground.

12 As a class, discuss how rain gets to the roots. Draw lines to show how rain gets to the roots of the tree.



'How rain gets to the roots of a tree' work sample

13 Ask students what they think happens to water once it has entered the roots. Record students' thoughts in the class science journal.

14 Distribute the cut pieces of celery (see 'Preparation'). Ask students to hold the piece of celery up to the light and observe carefully.

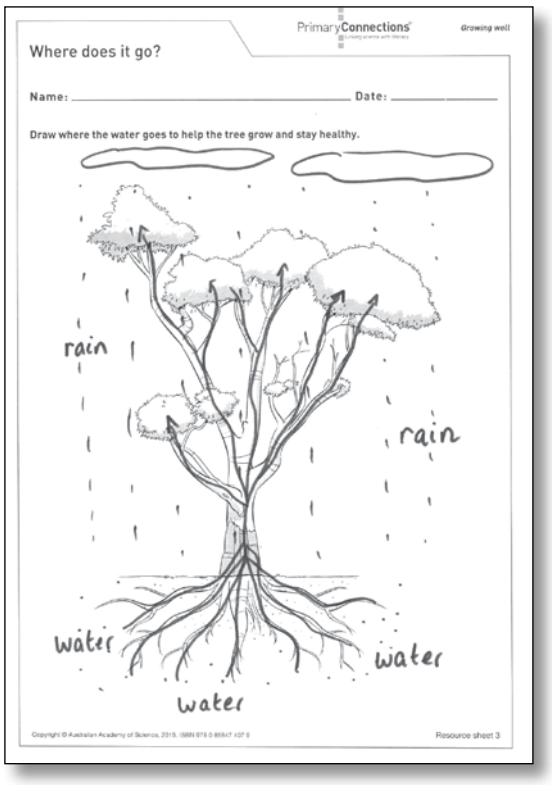
Optional: Ask students to examine their piece of celery with a magnifying glass.

15 Show students the celery stalk that you put in coloured water earlier.
Ask questions, such as:

- What can you see that is different?
- What do you think has happened?
- What do you think the change tells us about how the water gets from the roots to the stems and leaves of plants?

16 Ask students to complete 'Where does it go?' (Resource sheet 3) showing the movement of the water from the soil to the root and then into the rest of the tree.

EXPLORE



Work sample of 'Where does it go?' (Resource sheet 3)

EXPLORE

17 Ask students what they have learned about plants and water from today's lesson. Record students' ideas in the class science journal. For example:

'We learned that we pour water on the ground around the plant so the water goes down to the plant's roots. We learned that water travels from the roots up to the plant's stems and leaves.'

18 Update the word wall with words and images.

Curriculum links

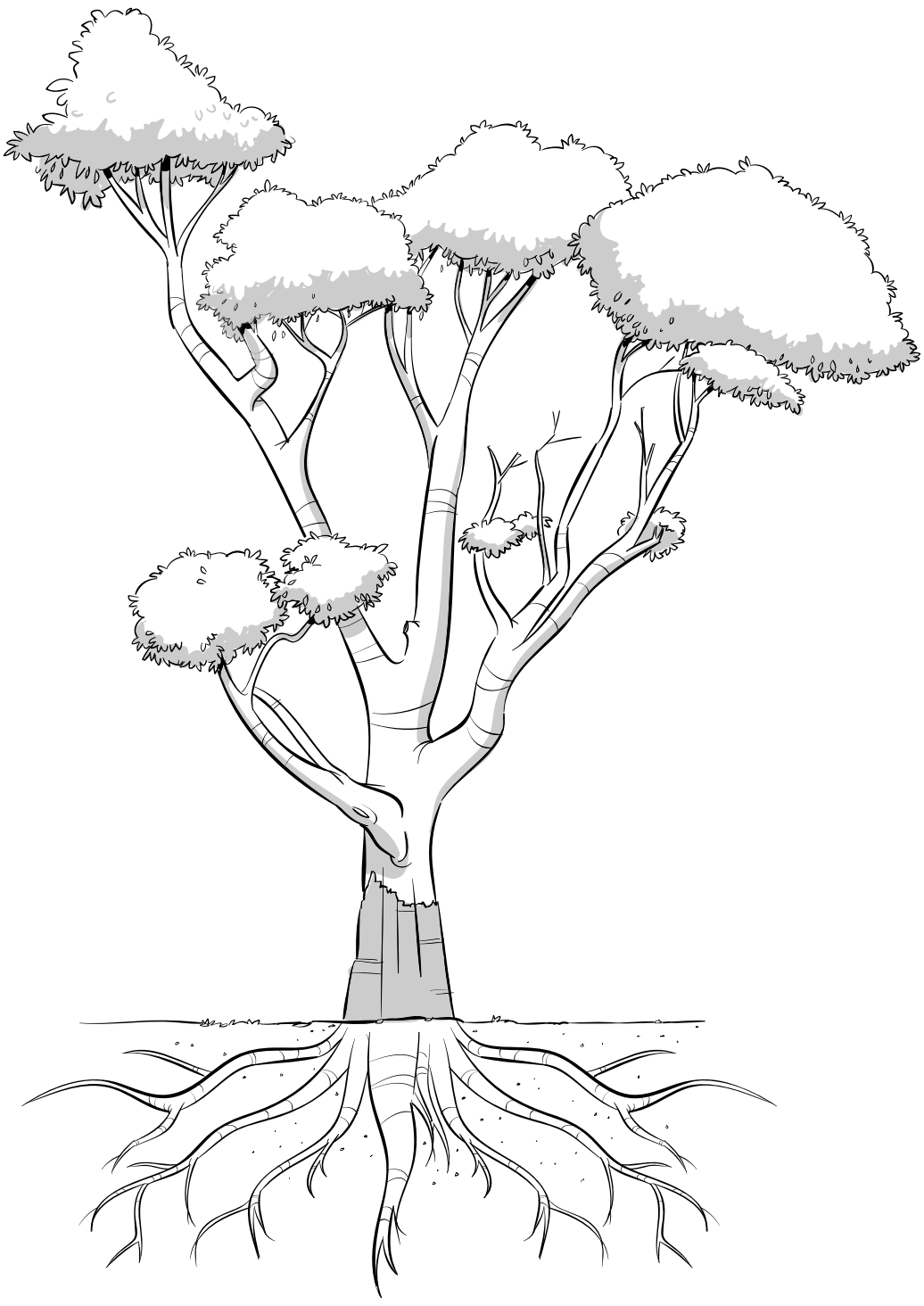
Science

- Create a picture chart of roots that we eat, such as carrots.
- Observe images of different plants and their roots, including taproots.

Where does it go?

Name: _____ **Date:** _____

Draw where the water goes to help the tree grow and stay healthy.



Lesson 5 What do plants need?

AT A GLANCE

To support students to represent and explain their understanding about the basic needs of plants.

To introduce current scientific views.

Students:

- create a graph of each plant's growth
- discuss the findings of each investigation.

Lesson focus

The *Explain* phase students develop a literacy product to represent their developing understanding. They discuss and identify patterns and relationships within their observations. Students consider the current views of scientists and deepen their own understanding.

EXPLAIN

Assessment focus

Formative assessment is an ongoing aspect of the *Explain* phase. It involves monitoring students' developing understanding and giving feedback that extends their learning. In this lesson you will monitor students' developing understanding of how:

- living things, such as plants, have basic needs including energy, water, nutrients and space.

You will also monitor their developing science inquiry skills (see page ix).

Key lesson outcomes

Science

Students will be able to:

- compare results of the investigations with predictions
- discuss popstick measurements and compare results
- explain the basic needs for plant growth.

Literacy

Students will be able to:

- present information in a graph
- contribute to discussions about what plants need to grow.

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

Teacher background information

Light

Plants need light in order to get the energy they need to grow. They capture light energy in specialised cell structures, chloroplasts, which have a pigment called chlorophyll. The chloroplasts transform light energy into chemical energy (sugars). Plants use the sugars:

- to make cell structures needed for growth
- to create and store high energy molecules, such as fats or complex carbohydrates
- to break down again to release the energy necessary to fuel cell processes and stay alive.

For the majority of plants, red is the wavelength of light energy that the chloroplasts capture and use the most efficiently. If you subtract red wavelengths from white light you get green, hence the colour of most leaves. The varying types of greens often reflect the different wavelengths of other colours (blue or yellow) that are also captured. Some plants are more adapted to low light conditions, with special combinations of chlorophyll pigments that do not do as well in high light conditions.

If a plant does not receive enough light it will expend its energy stores growing towards the potential light sources it needs (often giving it a spindly appearance). Unlike pines, flowering plants cannot create chlorophyll in the dark. When chlorophyll breaks down it releases yellow pigments. That is why a plant grown in darkness will gradually turn yellow or white as its chlorophyll degrades and is not replaced.

Note: The light/no light investigation should give a clear result in ten days. Both seedlings will grow initially, since the plant without light has energy stores from the seed. However, those without light will have a very different appearance, such as thin and spindly, and then will die.

Nutrients

Plants can store energy from light, but there are still essential minerals that they need in order to maintain their cells, build complex molecules and grow. The specific amounts and types of elements required depends on the plant, but include nitrogen, potassium, phosphorus and magnesium. Generally, plants absorb these dissolved in water from the soil. Some plants have bacteria living in their root nodules that allow them to fix nitrogen from the air, for example, Cytisus scoparius (Scotch broom) is particularly efficient at fixing nitrogen. Deficiency in minerals will result in inadequate growth, lack of flowering or inability of the plant to survive.

Note: The soil/sand investigation will take longer to produce results than the water or light investigations. This is because the seedlings have stores of nutrients. Once those stores are exhausted the plants in sand should not grow as well. This may be compounded by the fact that sand does not hold water as well.

Water

The amount of water a plant needs to take in depends on its size and how efficient the species is at conserving water. Plants need water to fill their cells not only in order to facilitate the biochemical processes of life but also to help the plant stay upright. Plants also use water to circulate minerals up to the leaves and to take sugars down to the roots. The process of transpiration draws water up the plant and cools it, causing water loss in the process.

Too much water means that roots cannot exchange gas with the air and some land plants may drown. It can also encourage the growth of microorganisms that might infect the plant ('rot'). Too little water and the plant dehydrates. A plant that is not meeting its water needs will first droop, as cells no longer push against their cell walls and keep upright. It will eventually die.

Note: The unwatered seedlings will probably die within three to four days. Encourage students to examine what happened to the plants after they died, and to reflect on when they could be sure that the plant was no longer alive.

Space

In order to thrive, plants require a certain amount of space, for example, trees need space to spread their roots to gather water and minerals and in which to put their leaves to capture light to create energy. Competition with other plants includes competing for space, both below and above ground, and also competing for limited resources of light, water and minerals.

Note: The crowded seedlings cannot physically take each other's space, but should encourage students to think about how each plant needs space. They may initially grow taller, in a bid to capture more of the light. Given the water and nutrients received is shared among more plants, their growth will eventually slow compared to a single seedling.

EXPLAIN

Equipment

FOR THE CLASS

- class science journal
- word wall
- team roles chart
- team skills chart
- 1 enlarged copy of 'Which grew tallest?' (Resource sheet 4)
- *optional:* photos of plants taken throughout the investigations
- *optional:* digital camera

FOR EACH TEAM

- role wristbands or badges for Manager and Speaker
- each team member's science journal
- each team member's completed copy of 'Our plant predictions' (Resource sheet 1; see Lesson 2, Session 2)
- 2 potted seedlings set up for the investigation (see Lesson 2, Session 1)
- 2 popsticks
- 1 marking pen
- measuring popsticks from each week
- 1 bottle of PVA glue
- 2 copies of 'Which grew tallest?' (Resource sheet 4) per team member

Preparation

- Prepare an enlarged copy of 'Which grew tallest?' (Resource sheet 4).
- Prepare a double page in the class science journal with the following layout:

Our question: What happens to a [sunflower's]* growth when it doesn't get water? We thought that:	What we found out: How we know:

*insert the name of your seedling type here.

- Prepare similar pages for the other investigation questions:
  - What happens to a sunflower's growth when it doesn't get light?
  - What happens to a sunflower's growth when it grows in sand instead of soil?
  - What happens to a sunflower's growth when it is crowded?
- Decide what will happen to the seedlings that survived the experiment, for example, organise for them to be planted in the school grounds.
- Read Appendix 4 'How to facilitate evidence-based discussions'.
- *Optional:* Display 'Which grew tallest?' (Resource sheet 4) in a digital format.

Lesson steps

1 Revise the previous lessons using the class science journal and word wall.

2 Allow time for teams to make final observations and measurements of their seedlings (see Lesson 2, Session 2). Remind students to write the number '4' at the top of the popstick to show that it is week four.

Optional: Take photos of each team's plants to keep a visual record of plants' growth.

3 Ask teams to compare their plants with the predictions they recorded on 'Our plant predictions' (Resource sheet 1). Ask questions, such as:

- What did you think the plants would look like?
- Did your results match your prediction? Why or why not?
- What have you learned?

Record students' ideas in the class science journal.

4 Introduce the enlarged copy of 'Which grew tallest?' (Resource sheet 4). Read through and discuss with students.

5 Explain that students will have two copies of the resource sheet and will work in their collaborative learning teams to make two graphs of how their plants grew over the past four weeks. Discuss the purpose and features of a graph.

Literacy focus

Why do we use a graph?

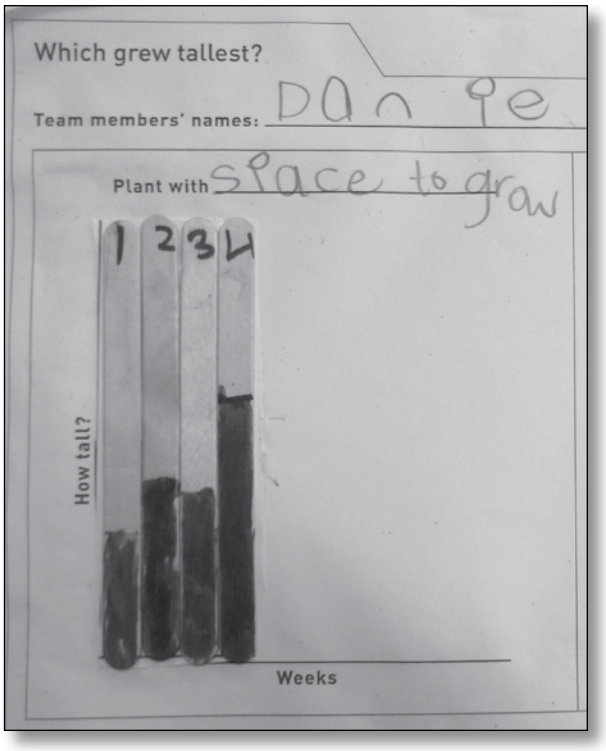
We use a **graph** to organise information so we can look for patterns. We use different types of graphs, such as picture, column or line graphs, for different purposes.

What does a graph include?

A **graph** includes a title, axes with labels on them and the units of measurement.

6 Model how to complete the title of each section and then paste in the measuring popsticks from each week to make the graph.

7 Re-form teams. Ask Managers to collect equipment from the equipment table. Allow time for teams to complete the activity.



Work sample of 'Which grew tallest?' (Resource sheet 4)

8 Introduce the 'Questions for investigation' pages from Lesson 2 in the class science journal.

9 For each investigation question, ask Speakers from teams that investigated that question to present their findings. Record in the relevant page of the class science journal (see 'Preparation'). Ask questions, such as:

- What does your graph tell us about how your plant grew?
- Which plant grew the tallest?
- Which plant looked healthier at the end of the four weeks?
- What have we learned about what plants need?

Optional: Use the photos taken throughout the investigation to create a photo timeline. Compare it to the graph.

10 Discuss all teams' results and complete the following sentence (claim) in the class science journal:

'Plants need _____ to grow and be healthy.'

11 Draw students' attention to the fact that this claim is about the type of seedlings that they tested. Ask students if they think all plants need the same things in the same amounts.

12 Explain that scientists think that plants have similar needs to grow and stay healthy:

- water and nutrients from the soil
- light
- water, but not too much
- space or room to grow.

Add any extra information below the recorded claim in the class science journal.

13 Explain that different plants need different types of nutrients and different amounts of water and sunlight.

14 Discuss what will happen to the seedlings now that the investigation has finished.

15 Update the word wall with words and images.

Curriculum links

Science

- Watch how a farmer looks after his apple trees.
  See: **https://education.abc.net.au/home#!/media/30276/growing-apples**

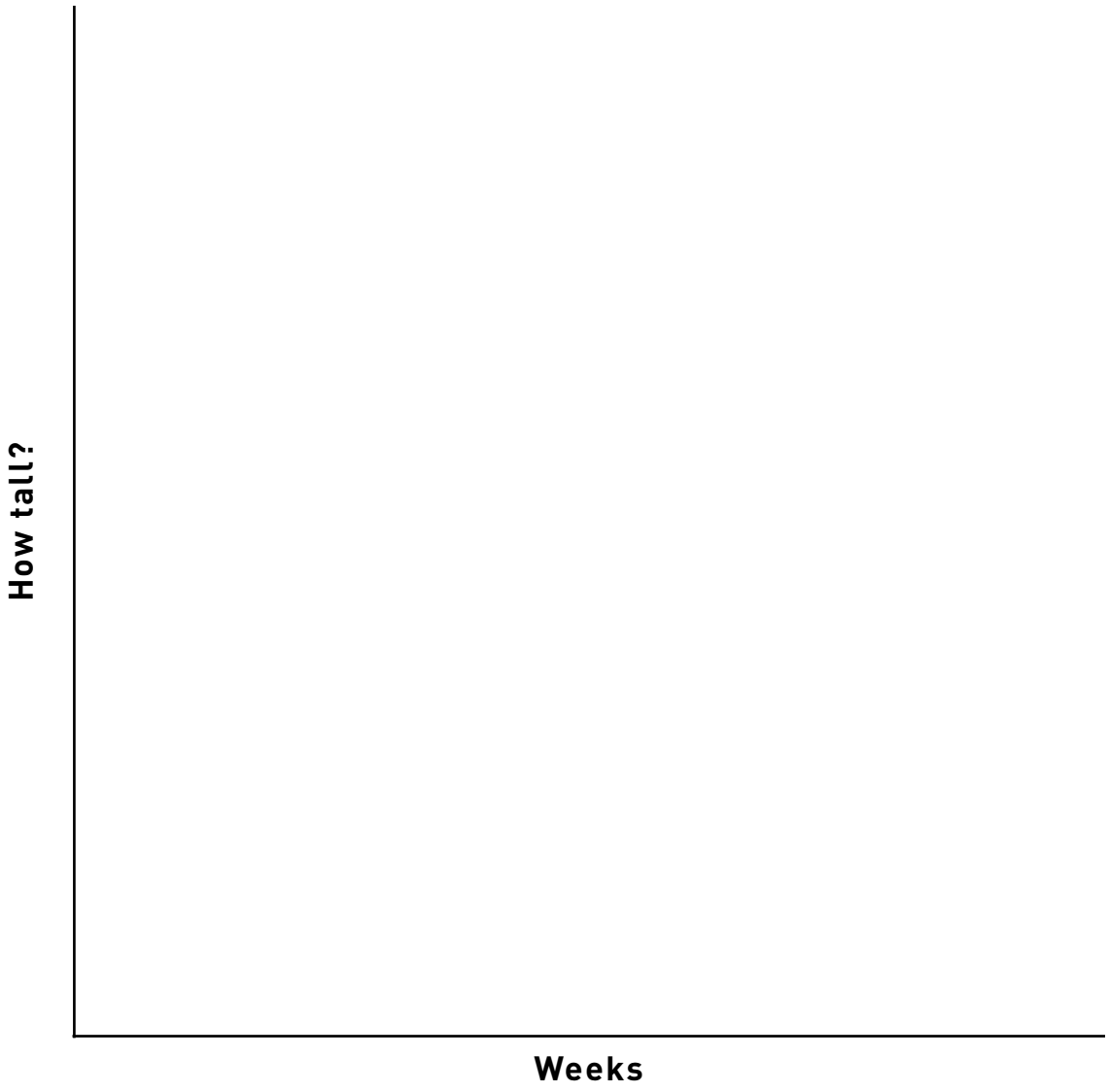
Mathematics

- Use the plants from the investigation to make a two-column 3D floor graph: healthy plants and unhealthy plants.

Which grew tallest?

Name: _____ **Date:** _____

Plant with _____



Lesson 6 What do animals need?

AT A GLANCE

To support students to conduct a survey to compare the basic needs of plants and animals.

Session 1 Looking at an animal

Students:

- survey the needs of a chosen animal
- record their findings.

Session 2 Yes or no?

Students:

- share their observations
- participate in a Yes/No activity about their animal's needs.

Lesson focus

In the *Elaborate* phase students plan and conduct an open investigation to apply and extend their new conceptual understanding in a new context. It is designed to challenge and extend students' science understanding and science inquiry skills.

Assessment focus

Summative assessment of the Science Inquiry Skills is an important focus of the *Elaborate* phase (see page v).

Key lesson outcomes

Science

Students will be able to:

- discuss the needs of animals
- identify the needs of pets
- identify similarities and differences between plant and animal needs.

Literacy

Students will be able to:

- draw and label the needs of an animal
- participate in class discussion comparing plant and animal needs
- participate in a Yes/No activity to present their information.

ELABORATE

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

Teacher background information

The needs of animals:

Food

Animals need to eat in order to gain the energy they need to survive. Animals also need essential nutrients. For example, mammals need to ingest calcium in order to be able to build bones. Animals generally meet their nutritional needs through eating plants or other animals, although some may directly eat minerals, for example, from rocks. Different animals have different nutritional needs and not all animals can digest all types of food. Certain minerals, for example, salt, are necessary for the body but can cause problems if eaten in too high a dose.

Gas exchange ('Air')

Land-based animals breathe in air (a mixture of gases) to extract and dissolve oxygen into their blood stream. Breathing also allows animals to expel carbon dioxide, which is produced when sugars are broken down. When carbon dioxide becomes concentrated in the bloodstream it can damage cells. Aquatic animals, for example, fish, can access oxygen dissolved in the water around them and release carbon dioxide back into it. Goldfish can pump new water across their gills, which is the equivalent of breathing.

Water

The amount of water an animal needs to take in depends on its size, how efficient the species is at conserving water and what level of physical activity the animal has undergone. For example, larger animals need more water than smaller animals because they have more cells and water is an essential component of cells and their chemical reactions. Animals can ingest water by drinking but also through eating foods with high water content.

Animals need water to help the body expel waste and toxins as urine. Being dehydrated reduces the amount of urine produced by the kidneys and therefore reduces the amount of waste that can be removed from the blood stream. Animals that live in the desert have very efficient kidneys that can produce urine that is very concentrated and therefore uses less water.

Water is also lost through evaporation. Sometimes this is useful. Some mammals, including humans, use the cooling effect of evaporation to help regulate their body temperature through perspiration. The larger the surface area of the animal, the more evaporation occurs and the more water it needs to take in. Water is also lost through breathing because our bodies release moisture into the air as we breathe it out. Our lungs need moist air to function properly and can become irritated and less resistant to infection if they become dry.

Space

Animals need space in which to live, for example, a spider needs space in which to set up a web to catch prey and kangaroos need a certain amount of space in which to graze. A larger population of animals will need a larger area to live in. As populations grow through breeding, the animals will need more space in which to live and to supply sufficient food. If lacking space or resources, animals enter into competition to get what they need to survive.

Shelter

Some animals need shelter to hide from predators or to avoid extreme temperatures. Becoming too hot can be lethal. For example, small desert marsupials need a burrow to escape the heat of the Sun, so a shelter can be a basic requirement for survival. The basic need for shelter for mammals is determined by the characteristics of the animal and the characteristics of the environment, including temperature and potential dangers. Shelter can also be important when reproducing, as offspring are generally more vulnerable than adults and need protection.

Sleep

Sleep is also essential for many animals. This is a vulnerable time for most animals, and they need protection. This protection might involve part of their body, for example, a turtle's shell, or involve finding a safe or sheltered place to sleep, for example, koalas sleep high up in tree branches.

Light

Diurnal animals (active during the day) need sunlight (or artificial lighting that mimics sunlight) in order to synthesise Vitamin D. Vitamin D is an essential nutrient to keep animals healthy, as it supports a host of important body functions including calcium absorption and bone growth. Nocturnal animals and deep sea creatures can synthesise Vitamin D without need for light.

Overexposure to sunlight can carry risks for animals also, including an increased risk of skin cancer. These risks depend on the adaptations of the animal in question.

Needs vs wants

The focus of this unit is the minimal needs for survival. Students may identify things that pets want in their lives to be happy, such as love, companionship and toys. While these are necessary comforts, it is possible to survive without them. In contrast, it is not possible to live without air, food, water or shelter for extended periods.

Students' conceptions

Students might not understand the role food plays in the body. They might not connect the intake of food to their growth and well-being, as they would be unaware that some chemicals in food are used to build and repair cells. Other chemicals are broken down to release stored energy to be used for physiological processes.

Because humans cannot breathe under water, students might not think that aquatic animals need oxygen. However, they still need oxygen to release energy from their food. Aquatic mammals, such as dolphins and whales obtain oxygen from the air in the same way that humans do. Fish can access oxygen dissolved in water using their gills.

Introducing a pet into the classroom

This lesson requires the observation of an animal. Each Australian state and territory has animal ethics requirements for school investigations involving vertebrate animals (those with a backbone, such as mice and rabbits). You will need to comply with any requirements of the relevant Animal Welfare Act if you choose to have a vertebrate as a class pet.

Insects and crustaceans are invertebrate animals and are not covered by the Animal Welfare Act but still require care and consideration.

SAFETY

Some students might suffer from allergies to certain animals. Check students' health records before choosing to bring a pet into the classroom.

Session 1 Looking at an animal

Equipment

FOR THE CLASS

- class science journal
- word wall
- 1 class pet
- 1 enlarged copy of 'Information note for families' (Resource sheet 5)
- 1 enlarged copy of 'My animal' (Resource sheet 6)

FOR EACH STUDENT

- 1 'Caring for animals' folder (see 'Preparation')

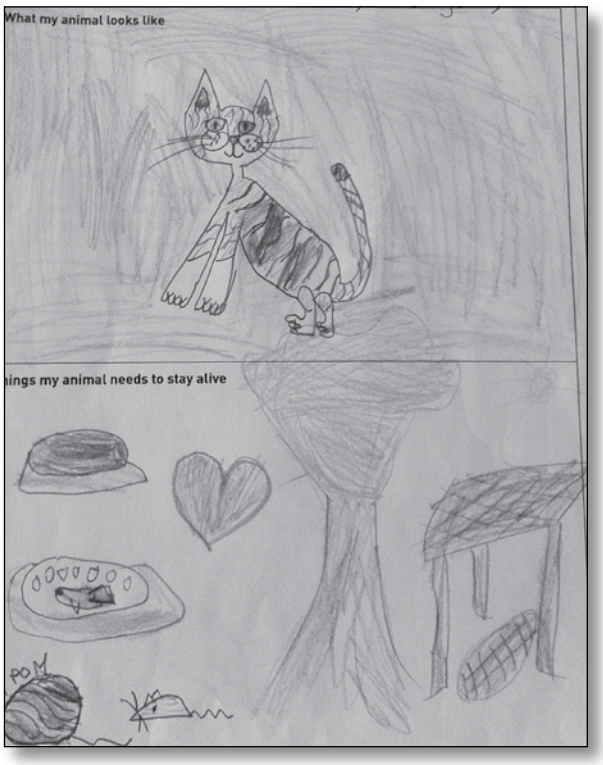
Preparation

- Prepare a code of conduct for working with animals. For example:
  - leave the pet if it is sleeping
  - wash your hands before and after touching the pet
  - be gentle with the pet.
- Prepare a pet care roster for tasks such as refilling the pet's water, refilling the pet's food and cleaning the pet's shelter. Ensure all students are involved in caring for the class pet.
- Make a 'Caring for animals' folder for each student that includes a copy of 'Information note for families' (Resource sheet 5) and 'My animal' (Resource sheet 6).
- Decide when students will present the information collected and write the date on 'Information note for families' (Resource sheet 5).
- Prepare an enlarged copy of 'Information note for families' (Resource sheet 5) and 'My animal' (Resource sheet 6).
- *Optional:* Display 'Information note for families' (Resource sheet 5), 'My animal' (Resource sheet 6) and the code of conduct in a digital format.

Lesson steps

1. Review the previous lessons using the class science journal and word wall, focussing students' attention on what they identified that plants need to grow and stay healthy.
2. Revisit what students think animals need in order to grow and stay healthy as recorded in the class science journal (see Lesson 1). Explain that another way to think about this is to think about what animals need in order to stay alive. Ask students if they have any new thoughts about this, and record on the page.
3. Explain that a pet will be joining the class for the rest of the unit and that they will be looking after it.
4. Display and discuss the code of conduct for working with animals. Add additional student suggestions to it. Support the text with pictures where possible.
5. Introduce the pet to the class and allow time for students to interact with it.
6. Ask students to suggest ideas about how the class will take care of the pet in the classroom. Ask questions, such as:
   - What will the pet need while it's in our classroom?
   - What kind food will we feed it?
   - How will we care for the pet over the weekend?

   Record students' ideas in the class science journal.
7. Introduce the pet care roster (see 'Preparation'). Explain what information you used to determine the needs of the pet, include its food and water requirements.
8. Explain that students are going to compare the needs of the class pet with another animal. Introduce the 'Caring for animals' folder prepared for each student.
9. Introduce the enlarged copy of 'Information note for families' (Resource sheet 5). Read through and discuss.
10. Introduce the enlarged copy of 'My animal' (Resource sheet 6). Explain that students will draw or take a photo of an animal and write what it needs to stay alive.



Work sample of 'My animal' (Resource sheet 6)

11 Discuss where students might find this information, for example:

- they might look at their pet or a pet of someone they know
- they could discuss animal care with a zoo keeper or ranger
- they could research an animal of their choosing using books or the internet.

12 Give each student a folder to take home.

ELABORATE

Information note for families

Name: _____ **Date:** _____

Introducing the 'Growing well' project

This term, our class has been learning about what plants need to grow and stay healthy. We are now exploring what other living things, such as animals, need to stay alive.

Students are asked to choose an animal to report back about. This might be a pet or a favourite animal from a story.

Tasks

Each student is asked to:

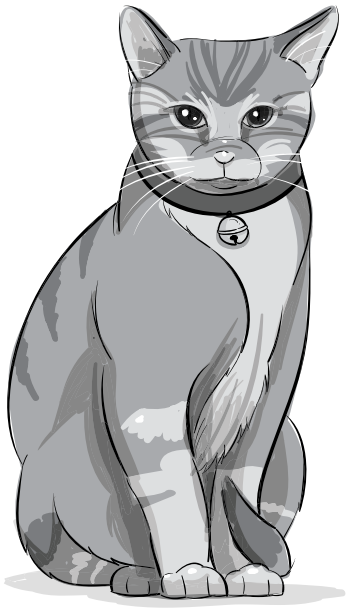
- Take a photo or do a drawing of their animal.
- Find out what things the animal needs to stay alive, such as food, water and shelter. Find this out by asking people who care for it or by looking for information in books or on the internet.
- Draw and label the things the animal needs to stay alive.

Students will be asked to share their folders with their classmates on

_____.

Thank you.

Class teacher



My animal

Name: _____ **Date:** _____

What my animal looks like

Things my animal needs to stay alive

Session 2 Yes or no?

Equipment

FOR THE CLASS

- class science journal
- word wall
- Yes and No signs (see 'Preparation')

FOR EACH STUDENT

- science journal
- completed copy of 'My animal' (Resource sheet 6)

Preparation

- Prepare 'Yes' and 'No' signs (approx. 30 cm x 20 cm) to display on opposite sides of classroom.
- Prepare a page in the class science journal as follows:
  1. Does your animal need food to stay alive? Yes No
  2. Does your animal need music to stay alive? Yes No
  3. Does your animal need water to stay alive? Yes No
  4. Does your animal need clothes to stay alive? Yes No
  5. Does your animal need air to stay alive? Yes No

Lesson steps

1 Ask students to share the results of their 'Caring for my animal' folder with a partner.

2 Ask students to discus with their partner how the needs of their animal compare with the needs of the class pet. Ask questions, such as:

- What needs of your animal are similar to the class pet? Why do you think that is?
- What needs of your animal are different to the class pet? Why do you think that is?

Record students' ideas in the class science journal.

3 Show students the 'Yes' and 'No' signs placed on opposite sides of the classroom.

4 Show students the prepared page in the class science journal with the questions about the needs of their animals. Explain that you will read out each question, one at a time, and students will look at their completed copy of 'My animal' (Resource sheet 6) and move to stand next to the sign that matches the answer about their animal.

5 Ask students to contribute ideas for further questions, for example, by consulting their completed copy of 'My animal' (Resource sheet 6).

6 Read the first question, 'Does your animal need food to stay alive?'. Ask students to look at their page and go to the 'Yes' sign if they think their animal needs food to stay alive, or go to the 'No' sign if they think it does not.

7 Ask students to share with someone standing next to them what food their animal eats. Ask some students to share their responses with the class.

8 Discuss with students where most of the class are standing and circle the matching answer—Yes or No—in the class science journal.

Optional: Record the number of students at each sign.

9 Repeat steps 5 to 7 for each of the questions.

10 Ask students questions, such as:

- Did all animals need the same things? Why do you think that is so?
- What can we definitely say that most animals need?

11 Discuss with students how different animals require different types of food, but all need a balanced diet.

12 Ask students what words they can use to complete the sentence (claim):

'Animals need _____ to stay alive (grow and be healthy).'

Record the completed sentence (claim) in the class science journal.

13 Update the word wall with words and images.

Curriculum links

Science

- Organise a guest speaker, such as a veterinarian, ranger, gardener or horticulturist, to talk about how they care for animals or plants in their work.

Lesson 7 Care for them all

AT A GLANCE

To provide opportunities for students to represent what they know about how living things have basic needs, and to reflect on their learning during the unit.

Students:

- construct a virtual class garden
- write a tag with plant care information
- reflect on their learning during the unit.

Lesson focus

In the *Evaluate* phase students reflect on their learning journey and create a literacy product to re-represent their conceptual understanding.

Assessment focus

Summative assessment of the Science Understanding descriptions is an important aspect of the *Evaluate* phase. In this lesson you will be looking for evidence of the extent to which students understand how:

- living things have basic needs including food and water.

Key lesson outcomes

Science

Students will be able to:

- identify common features of a plant, such as leaves and roots
- describe the use of plant parts for particular purposes, such as obtaining water
- identify the basic needs of plants and animals.

Literacy

Students will be able to:

- contribute to discussion about the needs of plants and animals
- create a collage of a plant and its parts
- create a tag to communicate plant needs
- reflect on their learning during the unit.

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

Equipment

FOR THE CLASS

- class science journal
- word wall
- 1 enlarged copy of 'Plant tag' (Resource sheet 7)
- collage materials
- plant tags

FOR EACH STUDENT

- science journal
- A4 sheet of paper
- 1 copy of 'Plant tag' (Resource sheet 7)

Preparation

- Prepare an area large enough to accommodate a plant drawing and a care tag from each student.
- Arrange to have some real plant tags from discarded pot plants.
- Collect collage materials for students to create their plant, and animal, drawings for the virtual class garden, including coloured paper, pipe cleaners and cellophane.
- *Optional:* Display 'Plant tag' (Resource sheet 7) in a digital format.

Lesson steps

1 Review the class science journal and word wall. Ask questions, such as:

- What things does a plant need to stay healthy and grow?
- What parts of the plant help it get what it needs?
- What things does our class pet need to stay alive?
- What things do all animals need to stay alive?

2 Review the completed claims in the class science journal about what plants need to grow and be healthy (see Lesson 5) and what animals need to stay alive (see Lesson 6).

3 Ask students what words they can use to complete the sentence:

'Plants and animals both need _____ to grow, be healthy and stay alive.'

Record the completed sentence (claim) in the class science journal.

4 Explain that the class is going to create a virtual class garden. Explain what 'virtual' means (simulated, pretend).

5 Show students the collage materials (see 'Preparation'). Explain that students will use the materials to make a plant that will become part of the virtual garden. Discuss the parts of the plant that they might include and why.

6 Introduce a real plant tag and show students the picture side. Explain that the tag came from a pot plant. Show students that there is information on the back of the tag that tells people how to care for the plant.

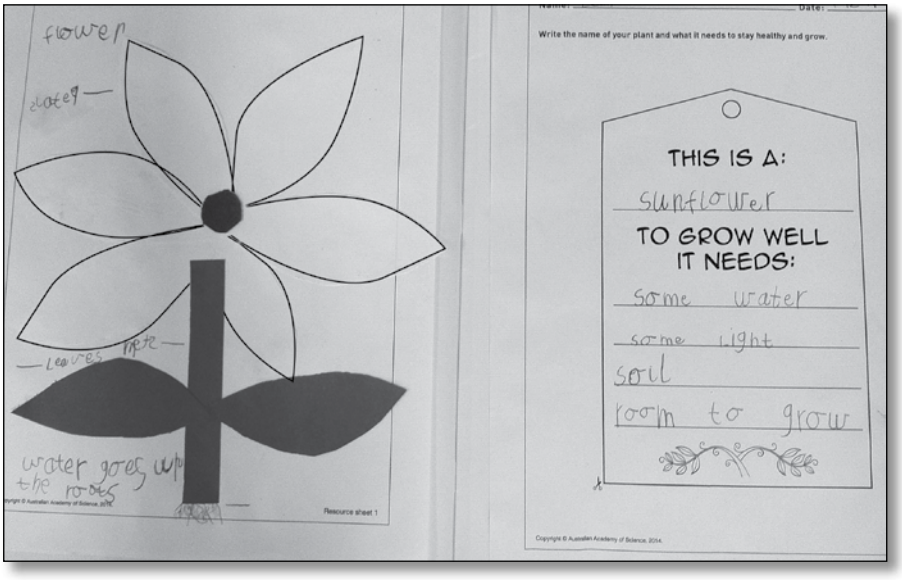
7 Introduce the enlarged copy of 'Plant tag' (Resource sheet 7) and explain that each student will write a care tag, cut it out and paste it beside their plant. Explain that they will then add their plant and tag to the virtual class garden.

8 Ask students what information they might write on the care tag. Ask questions, such as:

- What does a plant need to stay healthy and alive?
- How could we record the things needed by our plant?

9 Distribute one 'Plant tag' (Resource sheet 7) and one A4 sheet of paper for the annotated drawing to each student. Remind students to include all parts of the plant, including roots, in their collage drawing.

10 Allow time for students to complete the activity.



Work sample of collage drawing and 'Plant tag' (Resource sheet 7)

11 *Optional:* Ask students to also complete a collage of an animal with a care tag.

12 Discuss the drawings and information presented on the care tags.

13 Revisit the 'Our questions' in the class science journal to see if any questions remain unanswered.

14 Ask students to reflect on their learning during the unit. Ask questions, such as:

- What do both plants and animals need to grow, be healthy and stay alive?
- If a plant is not growing well, what can you do to help it?
- What do you need to give an animal so that it can stay alive?
- What do you know about plants that you did not know before?
- What activities did you enjoy? Why?
- What are you still wondering about?

Record students' ideas in the class science journal.

Curriculum links

Design and Technologies

- Plant seedlings in outside garden area. Discuss types of tools needed to care for garden.

Plant tag

Name: _____ **Date:** _____

Write the name of your plant and what it needs to stay healthy and grow.

Appendix 1
How to organise collaborative learning teams (F–Year 2)

Introduction

Students working in collaborative teams is a key feature of the Primary**Connections** inquiry-based program. By working in collaborative teams students are able to:

- communicate and compare their ideas with one another
- build on one another's ideas
- discuss and debate these ideas
- revise and rethink their reasoning
- present their final team understanding through multi-modal representations.

Opportunities for working in collaborative learning teams are highlighted throughout the unit.

Students need to be taught how to work collaboratively. They need to work together regularly to develop effective group learning skills.

The development of these collaborative skills aligns to descriptions in the Australian Curriculum: English. See page xiii.

Team structure

The first step towards teaching students to work collaboratively is to organise the team composition, roles and skills. Use the following ideas when planning collaborative learning with your class:

- Assign students to teams rather than allowing them to choose partners.
- Vary the composition of each team. Give students opportunities to work with others who might be of a different ability level, gender or cultural background.
- Keep teams together for two or more lessons so that students have enough time to experience working together successfully. If you cannot divide the students in your class into teams of three, form two teams of two students rather than one team of four. It is difficult for students to work together effectively in larger groups.
- Keep a record of the students who have worked together as a team so that by the end of the year each student has worked with as many others as possible.

Team roles

Students are assigned roles within their team (see below). Each team member has a specific role but all members share leadership responsibilities. Each member is accountable for the performance of the team and should be able to explain how the team obtained its results. Students must therefore be concerned with the performance of all team members. It is important to rotate team jobs each time a team works together so that all students have an opportunity to perform different roles.

For F–Year 2, teams consist of two students—Manager and Speaker. (For Year 3–Year 6, teams consist of three students—Director, Manager and Speaker.) Each member of

the team should wear something that identifies them as belonging to that role, such as a wristband, badge, or coloured clothes peg. This makes it easier for you to identify which role each student is doing and it is easier for the students to remember what they and their team mates should be doing.

Manager

The Manager is responsible for collecting and returning the team's equipment. The Manager also tells the teacher if any equipment is damaged or broken. All team members are responsible for clearing up after an activity and getting the equipment ready to return to the equipment table.

Speaker

The Speaker is responsible for asking the teacher or another team's Speaker for help. If the team cannot resolve a question or decide how to follow a procedure, the Speaker is the only person who may leave the team and seek help. The Speaker shares any information they obtain with team members. The teacher may speak to all team members, not just to the Speaker. The Speaker is not the only person who reports to the class; each team member should be able to report on the team's results.

Director (Year 3–Year 6)

The Director is responsible for making sure that the team understands the team investigation and helps team members focus on each step. The Director is also responsible for offering encouragement and support. When the team has finished, the Director helps team members check that they have accomplished the investigation successfully. The Director provides guidance but is not the team leader.

Team skills

Primary**Connections** focuses on social skills that will help students work in collaborative teams and communicate more effectively.

Students will practise the following team skills throughout the year:

- Move into your teams quickly and quietly
- Stay with your team
- Take turns.

To help reinforce these skills, display enlarged copies of the team skills chart (see the end of this Appendix) in a prominent place in the classroom.

Supporting equity

In science lessons, there can be a tendency for boys to manipulate materials and girls to record results. Primary**Connections** tries to avoid traditional social stereotyping by encouraging all students, irrespective of their gender, to maximise their learning potential. Collaborative learning encourages each student to participate in all aspects of team activities, including handling the equipment and taking intellectual risks.

Observe students when they are working in their collaborative teams and ensure that both girls and boys are participating in the hands-on activities.

TEAM ROLES

Manager

Collects and returns all materials the team needs

Speaker

Asks the teacher and other team speakers for help

TEAM SKILLS

1. Move into your teams quickly and quietly

2. Stay with your team

3. Take turns

Appendix 2
How to use a science journal

Introduction

A science journal is a record of observations, experiences and reflections. It contains a series of dated, chronological entries. It can include written text, drawings, labelled diagrams, photographs, tables and graphs.

Using a science journal provides an opportunity for students to be engaged in a real science situation as they keep a record of their observations, ideas and thoughts about science activities. Students can use their science journals as a useful self-assessment tool as they reflect on their learning and how their ideas have changed and developed during a unit.

Monitoring students' journals allows you to identify students' alternative conceptions, find evidence of students' learning and plan future learning activities in science and literacy.

Maintaining a science journal aligns to descriptions in the Australian Curriculum: Science and English. See pages xi and xiii.

Using a science journal

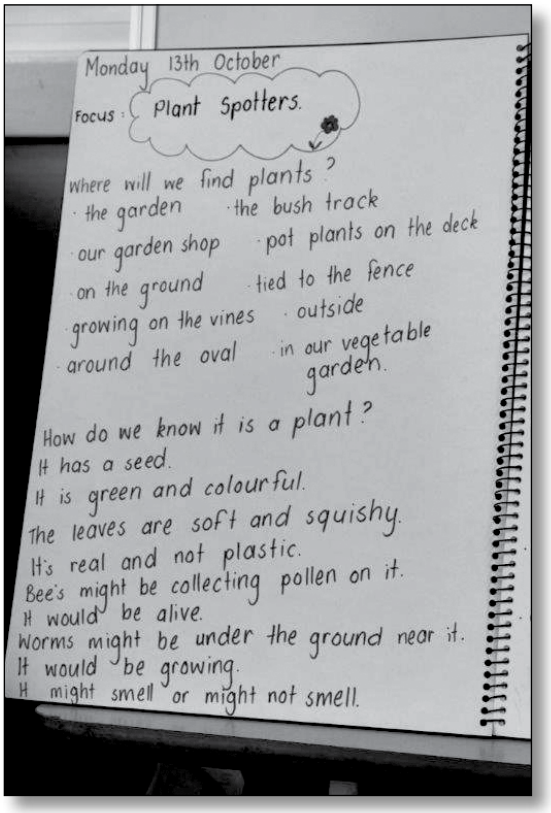
1. At the start of the year, or before starting a science unit, provide each student with a notebook or exercise book for their science journal or use an electronic format. Tailor the type of journal to fit the needs of your classroom. Explain to students that they will use their journals to keep a record of their observations, ideas and thoughts about science activities. Emphasise the importance of including pictorial representations as well as written entries.
2. Use a large project book or A3 paper to make a class science journal. This can be used at all year levels to model journal entries. With younger students, the class science journal can be used more frequently than individual journals and can take the place of individual journals.
3. Make time to use the science journal. Provide opportunities for students to plan procedures and record predictions, and their reasons for predictions, before an activity. Use the journal to record observations during an activity and reflect afterwards, including comparing ideas and findings with initial predictions and reasons. It is important to encourage students to provide evidence that supports their ideas, reasons and reflections.
4. Provide guidelines in the form of questions and headings and facilitate discussion about recording strategies, such as note-making, lists, tables and concept maps. Use the class science journal to show students how they can modify and improve their recording strategies.
5. Science journal entries can include narrative, poetry and prose as students represent their ideas in a range of styles and forms.

6 In science journal work, you can refer students to display charts, pictures, diagrams, word walls and phrases about the topic displayed around the classroom. Revisit and revise this material during the unit. Explore the vocabulary, visual texts and ideas that have developed from the science unit, and encourage students to use them in their science journals.

7 Combine the use of resource sheets with journal entries. After students have pasted their completed resource sheets in their journal, they might like to add their own drawings and reflections.

8 Use the science journal to assess student learning in both science and literacy. For example, during the *Engage* phase, use journal entries for diagnostic assessment as you determine students' prior knowledge.

9 Discuss the importance of entries in the science journal during the *Explain* and *Evaluate* phases. Demonstrate how the information in the journal will help students develop literacy products, such as posters, brochures, letters and oral or written presentations.



***Growing well* science journal**

Appendix 3
How to use a word wall

Introduction

A word wall is an organised collection of words and images displayed in the classroom. It supports the development of vocabulary related to a particular topic and provides a reference for students. The content of the word wall can be words that students see, hear and use in their reading, writing, speaking, listening and viewing.

Creating a class word wall, including words from different dialects and languages, aligns to descriptions in the Australian Curriculum: English. See page xiii.

Goals in using a word wall

A word wall can be used to:

- support science and literacy experiences of reading, viewing, writing and speaking
- provide support for students during literacy activities across all key learning areas
- promote independence in students as they develop their literacy skills
- provide a visual representation to help students see patterns in words and decode them
- develop a growing bank of words that students can spell, read and/or use in writing tasks
- provide ongoing support for the various levels of academic ability in the class
- teach the strategy of using word sources as a real-life strategy.

Organisation

Position the word wall so that students have easy access to the words. They need to be able to see, remove and return word cards to the wall. A classroom could have one main word wall and two or three smaller ones, each with a different focus, for example, high-frequency words.

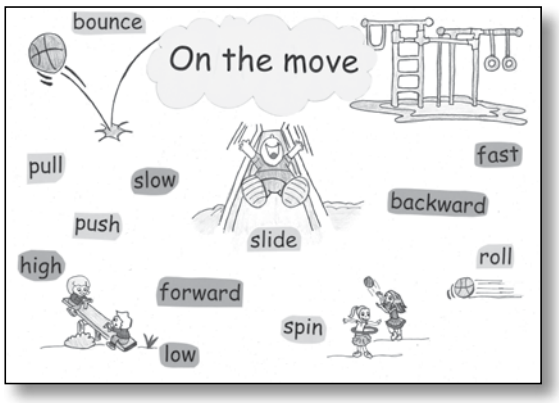
Choose robust material for the word cards. Write or type words on cardboard and perhaps laminate them. Consider covering the wall with felt-type material and backing each word card with a self-adhesive dot to make it easy for students to remove and replace word cards.

Word walls do not need to be confined to a wall. Use a portable wall, display screen, shower curtain or window curtain. Consider a cardboard shape that fits with the unit, for example, an apple for a needs unit.

The purpose is for students to be exposed to a print-rich environment that supports their science and literacy experiences.

Organise the words on the wall in a variety of ways. Place them alphabetically, or put them in word groups or groups suggested by the unit topic, for example, words for a plant unit might be organised under headings such as, ‘Plant parts’, ‘Needs of plants’ and ‘Needs of animals’.

***Weather in my world* word wall**

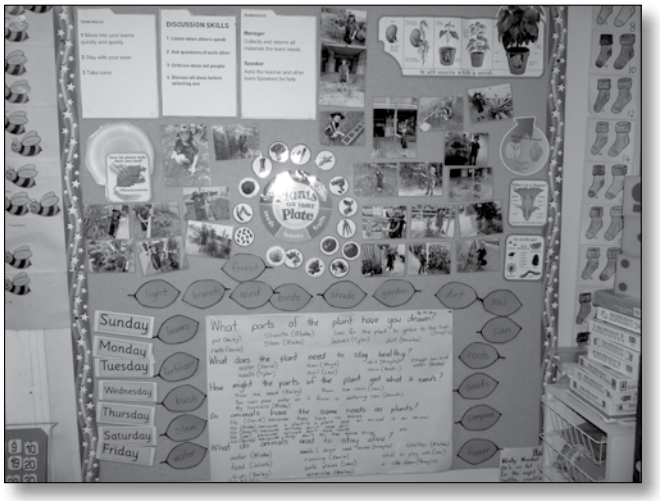


***On the move* word wall**

Invite students to contribute words from different languages to the word wall. Group words about the same thing, for example, different names of the same piece of clothing on the word wall so that students can make the connections. Identify the different languages used, for example, by using different-coloured cards or pens to record the words.

Using a word wall

1. Limit the number of words to those needed to support the science and literacy experiences in the classroom.
2. Add words gradually, and include images where possible, such as drawings, diagrams or photographs. Build up the number of words on the word wall as students are introduced to the scientific vocabulary of the unit.
3. Encourage students to interact with the word wall. Practise using the words with students by reading them and playing word games. Refer to the words during science and literacy experiences and direct students to the wall when they need a word for writing. Encourage students to use the word wall to spell words correctly.
4. Use the word wall with the whole class, small groups and individual students during literacy experiences. Organise multi-level activities to cater for the individual needs of students.



***Growing well* word wall**

Appendix 4
How to facilitate evidence-based discussions

Introduction

Argumentation is at the heart of what scientists do; they pose questions, make claims, collect evidence, debate with other scientists and compare their ideas with others in the field.

In the primary science classroom, argumentation is about students:

- articulating and communicating their thinking and understanding to others
- sharing information and insights
- presenting their ideas and evidence
- receiving feedback (and giving feedback to others)
- finding flaws in their own and others' reasoning
- reflecting on how their ideas have changed.

It is through articulating, communicating and debating their ideas and arguments that students are able to develop a deep understanding of science content.

Establish norms

Introduce norms before starting a science discussion activity. For example:

- Listen when others speak.
- Ask questions of each other.
- Criticise ideas not people.
- Listen to and discuss all ideas before selecting one.

Question, Claim, Evidence and Reasoning

In science, arguments that make claims are supported by evidence. Sophisticated arguments follow the **QCER** process:

Q What **question** are you trying to answer? For example, 'What do pets need to stay alive?'

C The **claim**. For example, 'Pets need food, water and somewhere to sleep'.

E The **evidence**. For example, 'We investigated what each of our pets needs to stay alive. We found out that all of our pets need the same things to stay alive'.

R The **reasoning**. Saying how the evidence supports the claim. Not required at Foundation Year.

Students need to be encouraged to move from making claims only to citing evidence to support their claims. Older students develop full conclusions that include a claim, evidence and reasoning. This is an important characteristic of the nature of science and an aspect of scientific literacy. Using 'Science question starters' (see below) helps to promote evidence-based discussion in the classroom.

Science question starters

Science question starters can be used to model the way to discuss a claim and evidence for students. Teachers encourage team members to ask these questions of each other when preparing their claim and evidence. They might also be used by audience members when a team is presenting its results. (See Primary**Connections** 5Es video, *Elaborate*).

Science question starters

Question type	Question starter
Asking for evidence	I have a question about _____. How does your evidence support your claim_____ ? What other evidence do you have to support your claim _____ ?
Agreeing	I agree with _____ because _____.
Disagreeing	I disagree with _____ because _____. One difference between my idea and yours is _____.
Questioning further	I wonder what would happen if _____? I have a question about _____ . I wonder why _____? What caused _____? How would it be different if _____? What do you think will happen if _____?
Clarifying	I'm not sure what you meant there. Could you explain your thinking to me again?

DISCUSSION SKILLS

1 Listen when others speak

2 Ask questions of each other

3 Criticise ideas not people

4 Discuss all ideas before selecting one

Appendix 5
Growing well equipment list

EQUIPMENT ITEM	QUANTITIES	LESSON	1	2	2	3	4	5	6	6	7
		SESSION		1	2				1	2	
Equipment and materials											
celery	2 stalks per class						●				
class pet	1 per class								●	●	●
collage materials for plant drawing	per class										●
container, clear, strong	per class						●				
container for watering (eg, yoghurt container)	1 per team						●				
food colouring, blue or red	per class						●				
gloves, disposable *optional*	1 per team					●					
glue, PVA	1 bottle per team							●			
image of a tree including the roots, large (see 'Preparation')	1 per class						●				
labels, large self-adhesive	8 per class			●							
labels, large self-adhesive	2 per team			●							
magnifying glass	1 per team					●					
marking pen	1 per team			●	●	●	●	●			
measuring cup or water mister	1 per class			●							
measuring popsticks from each week	per team							●			
newspaper to cover desks	per class					●					
paintbrush, small	1 per class					●					
paintbrush, small	1 per team					●					
paper, A4	1 per student										●
photos of plants taken throughout investigations *optional*	1 per class							●			
plant tags	per class										●
popsticks	2 per team				●	●	●	●			
potted seedling (see 'Preparation')	2 per class		●								
potted seedling (see 'Preparation')	2 per team			●	●	●	●	●			
potted seedling (see 'Preparation')	1 per class					●					
potted seedling (see 'Preparation')	1 per team					●					
potting mixture (or nutrient-rich soil)	1 small bag per class			●							

EQUIPMENT ITEM	QUANTITIES	LESSON	1	2	2	3	4	5	6	6	7
		SESSION		1	2				1	2	
Equipment and materials (Continued)											
sand	1 bucket per class			●							
trays, large potting or storage	8 per class			●							
Yes and No signs (see 'Preparation')	1 per class									●	
Resource sheets											
'Our plant predictions' (RS1)	1 per team member				●			●			
'Our plant predictions' (RS1), enlarged	1 per class				●						
'Take a look' (RS2)	1 per team member					●					
'Take a look' (RS2), enlarged	1 per class					●					
'Where does it go?' (RS3)	1 per team member						●				
'Where does it go?' (RS3), enlarged	1 per class						●				
'Which grew tallest?' (RS4)	2 per team member							●			
'Which grew tallest?' (RS4), enlarged	1 per class							●			
'Information note for families' (RS5)	1 per student								●		
'Information note for families' (RS5), enlarged	1 per class								●		
'My animal' (RS6)	1 per student								●	●	
'My animal' (RS6), enlarged	1 per class								●		
'Care tag' (RS7)	1 per student										●
'Care tag' (RS7), enlarged	1 per class										●
Teaching tools											
class science journal	1 per class		●	●	●	●	●	●	●	●	●
role wristbands or badges for Manager and Speaker	1 set per team			●	●	●	●	●			
student science journal	1 per student		●	●	●	●	●	●		●	●
team roles chart	1 per class			●	●	●	●	●			
team skills chart	1 per class			●	●	●	●	●			
word wall	1 per class		●	●	●	●	●	●	●	●	●
Multimedia											
digital camera *optional*	1 per class		●	●	●	●	●	●			

Appendix 6
Growing well unit overview

		SCIENCE OUTCOMES*	LITERACY OUTCOMES*	LESSON SUMMARY	ASSESSMENT OPPORTUNITIES
		Students will be able to represent their current understanding as they:	Students will be able to:	Students:	
ENGAGE	**Lesson 1** Plant spotters	• identify plants in the school grounds • discuss the basic needs of plants and animals • label a drawing of a healthy plant.	• contribute to a discussion about the needs of plants and animals • draw a plant and label what it needs to grow.	• participate in a school grounds walk • discuss the basic needs of plants and animals • record their ideas about what plants need to grow and stay healthy.	**Diagnostic assessment** • Science journal entries • Class discussions • Plant drawing
EXPLORE	**Lesson 2** Planting investigations ***Session 1*** Getting ready to grow ***Session 2*** How tall?	• discuss what things might affect plant growth • use their senses to observe and measure plant growth.	• discuss how to measure plant growth • contribute to class discussions • record observations using a drawing.	***Session 1*** Getting ready to grow • choose an investigation question • work in teams to set up the investigation. ***Session 2*** How tall? • discuss how to record plant growth • work in teams to take initial records of their plants.	**Formative assessment** • Science journal entries • Class discussions • 'Our plant predictions' (Resource sheet 1) • Observations and measurements of their plant investigation

*For information on how the lessons align with the relevant descriptions of the Australian Curriculum, see page xi for Science, xii for English and xiv Mathematics.

		SCIENCE OUTCOMES*	LITERACY OUTCOMES*	LESSON SUMMARY	ASSESSMENT OPPORTUNITIES
		Students will be able to:	Students will be able to:	Students:	
EXPLORE	**Lesson 3** Plant parts	• observe and draw the features of a plant • compare their observations with their predictions • discuss how different parts of the plant contribute to helping it grow and stay healthy.	• create an annotated drawing of a plant • contribute to class discussions on the different parts of plants.	• record what they think they know about the parts of a plant • closely observe all parts of a plant and compare with predictions.	**Formative assessment** • Science journal entries • Class discussions • 'Take a look' (Resource sheet 2) • Observations and measurements of their plant investigation
EXPLORE	**Lesson 4** Going up	• discuss where the water poured onto a plant goes • record ideas about roots taking water up to stems and leaves.	• participate in discussions about plants and their roots • use drawings to represent watered plants.	• water plants and observe where the water goes • discuss the role of plant roots.	**Formative assessment** • Science journal entries • Class discussions • Observations and measurements of their plant investigation

*For information on how the lessons align with the relevant descriptions of the Australian Curriculum, see page xi for Science, xii for English and xiv Mathematics.

		SCIENCE OUTCOMES*	LITERACY OUTCOMES*	LESSON SUMMARY	ASSESSMENT OPPORTUNITIES
		Students will be able to:	Students will be able to:	Students:	
EXPLAIN	**Lesson 5** What do plants need?	• compare results of the investigations with predictions • discuss popstick measurements and compare results • explain the basic needs for plant growth.	• present information in a graph • contribute to discussions about what plants need to grow.	• create a graph of each plant's growth • discuss the findings of each investigation.	**Formative assessment** • Science journal entries • Class discussions • 'Which grew tallest? (Resource sheet 4) • Observations and measurements of their plant investigation
ELABORATE	**Lesson 6** What do animals need? ***Session 1*** Looking at an animal ***Session 2*** Yes or no?	• discuss the needs of animals • identify similarities and differences between plant and animal needs.	• draw and label the needs of an animal • participate in class discussion comparing plant and animal needs • participate in a Yes/No activity to present their information.	***Session 1*** Looking at an animal • survey the needs of a chosen animal • record their findings. ***Session 2*** Yes or no? • share their observations • participate in a Yes/No activity about their animal's needs.	**Summative assessment** of Science Inquiry Skills • Science journal entries • Class discussions • 'My animal' (Resource sheet 6)

*For information on how the lessons align with the relevant descriptions of the Australian Curriculum, see page xi for Science, xii for English and xiv Mathematics.

		SCIENCE OUTCOMES*	LITERACY OUTCOMES*	LESSON SUMMARY	ASSESSMENT OPPORTUNITIES
		Students will be able to:	Students will be able to:	Students:	
EVALUATE	**Lesson 7** Care for them all	• identify common features of a plant such as leaves and roots • describe the use of plant parts for particular purposes such as making food and obtaining water • explain the basic needs of plants and animals.	• contribute to discussion about the needs of plants and animals • create a collage of a plant and its parts • create a care tag to communicate plant needs • reflect on their learning during the unit.	• construct a virtual class garden • write a care tag with plant care information • reflect on their learning during the unit.	**Summative assessment** of Science Understanding • Science journal entries • Class discussions • 'Care tag' (Resource sheet 7)

*For information on how the lessons align with the relevant descriptions of the Australian Curriculum, see page xi for Science, xii for English and xiv Mathematics.

PrimaryConnections®
Linking science with literacy

PrimaryConnections Units

Year	Biological sciences	Chemical sciences	Earth and space sciences	Physical sciences
F	*Staying alive*	*That's my hat!*	*Weather in my world*	*On the move*
	Growing well	*What's it made of?*		
1	*Schoolyard safari*	*Spot the difference*	*Changes all around*	*Look! Listen!*
	Dinosaurs and more	*Bend it! Stretch it!*	*Up, down and all around*	
2	*Watch it grow!*	*All mixed up*	*Water works*	*Machine makers*
				Push-pull
3	*Feathers, fur or leaves?*	*Melting moments*	*Night and day*	*Heating up*
4	*Plants in action*	*Material world*	*Beneath our feet*	*Magnetic moves*
	Friends or foes?			
	Among the gum trees	*Package it better*		*Smooth moves*
5	*Desert survivors*	*What's the matter?*	*Earth's place in space*	*Light shows*
6	*Marvellous micro-organisms*	*Change detectives*	*Creators and destroyers*	*Circuits and switches*
	Rising salt		*Earthquake explorers*	*Essential energy*