PrimaryConnections®

Australian Academy of Science

Fully aligned with the Australian Curriculum

Changes all around

Year 1

Earth and space sciences

About this unit Changes all around

Changes to the land and sky occur all the time. Some changes are so gradual that we barely notice them, like the erosion of stones. Others are rapid, such as the felling of a tree. Some changes are minuscule, such as ants building a nest. Others are massive, such as the formation of mountains or development of thunderclouds. Some changes are very predictable, such as the time of the sunrise, and others we are still seeking to better predict, such as earthquakes. No matter how great or small, rapid or gradual, these changes impact our lives. Studying these changes helps us to predict and prepare for them.

The *Changes all around* unit is an ideal way to link science with literacy in the classroom. Through hands-on activities students explore the natural, constructed and managed changes that they see in the sky and landscape around them.

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Trial schools: Franklin Early Childhood School, ACT; O'Connor Cooperative School, ACT; The Assumption School Bathurst, NSW; Newbridge Heights Public School, NSW; Nowra Christian School, NSW; Randwick Public School, NSW; Riverwood Public School, NSW; Wauchope Public School, NSW; Logan Reserve State School, QLD; Freshwater Christian College, QLD; St Mary's Primary School, QLD; Prospect Primary School, SA; Saint Mary's Memorial School, SA; Morang South Primary School, VIC; Murrayville Community College, VIC; Red Cliffs East Primary School, VIC; Greenwood Primary School, WA; Immaculate Heart College, WA; Pegs Creek Primary School, WA; Tom Price Primary School, WA

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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.

Primary**Connections** 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 explanation	**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' (ACARA 2020).

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 including how current knowledge has developed over time through the actions of many people
Use and influence of scienc	How science knowledge, and applications affect people's lives, including their work, 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 about 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 this 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

AC 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** units 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, Mathematics and Design and Technologies. Detailed information about its alignment with the Australian Curriculum is provided in each unit.

Unit at a glance — *Changes all around*

Phase	Lesson	At a glance
ENGAGE	**Lesson 1** Do you see what I see? ***Session 1*** Changes over time ***Session 2*** Our school changes	To capture students' interest and find out what they think they know about observable changes that occur in the sky and landscape. To elicit students' questions about changes that they see in their daily lives.
EXPLORE	**Lesson 2** It's all natural ***Session 1*** A natural assortment ***Session 2*** Our natural changes	To provide students with hands-on, shared experiences of observable natural changes, how long they take to occur and what those changes tell us.
	Lesson 3 Built by humans	To provide students with hands-on, shared experiences of observable changes in the landscape that are built by humans.
	Lesson 4 Slippery surfaces	To provide students with hands-on, shared experiences of how changes to paths can affect their safety.
EXPLAIN	**Lesson 5** What changes?	To support students to represent and explain their understanding of observable changes that occur in the sky and landscape. To introduce current scientific views about managing changes.
ELABORATE	**Lesson 2** Keep off the grass ***Session 1*** Stomp on it! ***Session 2*** Stomp results	To support students to plan and conduct an investigation of a change to the landscape that is caused, and then managed, by humans.
EVALUATE	**Lesson 7** Thinking about changes	To provide opportunities for students to represent what they know about observable changes that occur in the sky and landscape, and to reflect on their learning during the unit.

A unit overview can be found in Appendix 6, page 74.

Changes all around—Alignment with the Australian Curriculum

Changes all around is written to align to the Year 1 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 Earth and space sciences sub-strand.

Year 1 Science Understanding for the Earth and Space Sciences:	Observable changes occur in the sky and landscape (AUSSSU019)
Guiding questions that inform the inquiry in *Changes all around*:	• What changes happen naturally? • What changes are made by humans? • How often do changes occur? How long do they take? • What do changes tell us about what we need to do? • Why do we make changes?

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

Year 1 Achievement Standard

The Australian Curriculum: Science Year 1 achievement standard indicates the quality of learning that students should demonstrate by the end of Year 1.

By the end of Year 1, students describe objects and events that they encounter in their everyday lives, and the effects of interacting with materials and objects. **They describe changes in their local environment** and how different places meet the needs of living things.

Students respond to questions, make predictions, and participate in guided investigations of everyday phenomena. They follow instructions to record and sort their observations and share them with others.

The sections relevant to *Changes all around* 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.

Changes all around—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 *Changes all around*.

Key idea	Representation in *Changes all around*
Patterns, order and organisation	Students identify changes in their local environment that occur over different timescales. They recognise that some changes occur at regular intervals, such as daily or seasonally. They classify changes as made, or not made, by humans.
Form and function	Students observe the functions of living and non-living objects in their environment and how they bring about change to their form. Students make simple inferences about how the change in an object's form might affect its function
Stability and change	Students identify features of their environment that remain relatively stable and those that change. They discuss how changes can occur at different timescales, and that even seemingly stable features, for example, hills, gradually change.
Scale and measurement	Students use their everyday experience to quantify change associated with change events. They use relative language to describe and compare rates of change, such as 'every night' or 'faster'. They describe duration of change in terms of hours, days, weeks, months and years.
Matter and energy	Students observe changes to objects and make simple inferences as to the phenomena that brought about the changes. They observe the impact of walking on grass and discuss materials that might be less affected by those forces.
Systems	Students identify the observable components of a clearly identified 'whole', such as features of plants or structures in their local environments.

Incorporating the key ideas

According to the Australian Curriculum: Science 'from Foundation to Year 2, students learn that observations can be organised to reveal patterns, and that these patterns can be used to make predictions about phenomena'.

> In Year 1, students infer simple cause-and-effect relationships from their observations and experiences, and begin to link events and phenomena with observable effects and to ask questions. They observe changes that can be large or small and happen quickly or slowly. Students explore the properties of familiar objects and phenomena, identifying similarities and differences. Students begin to value counting as a means of comparing observations, and are introduced to ways of organising their observations.

In *Changes all around* students observe changes in their local environment. They observe changes that can be large or small, such as the building of a school or of a simple spider web, and changes that happen quickly or slowly, such as the movement of clouds or the growth of a tree. They classify changes as natural, built by humans (constructed), made by humans looking after something (managed) or other. Students investigate the impact of people walking on grass and infer simple cause-and-effect relationships between the frequency of stomps and the formation of paths.

Students compare features of objects before and after a change and record their observations in drawings or photographs. They describe duration of changes in terms of

hours, days, weeks or years. They observe patterns and discuss how they can be used to make predictions about the occurrence of future changes. They organise observations in provided tables and create simple time-lapses.

Changes all around—Australian Curriculum: Science

Changes all around embeds all three strands of the Australian Curriculum: Science. For ease of reference, the table below outlines the sub-strands covered in *Changes all around*, the content descriptions for Year 1 and the aligned lessons.

Strand	Sub-strand	Code	Year 1 content descriptions	Lessons
Science Understanding	Earth and space sciences	ACSSU019	Observable changes occur in the sky and landscape	1–7
Science as a Human Endeavour	Nature and development of science	ACSHE021	Science involves observing, asking questions about, and describing changes in, objects and events	1–7
	Use and influence of science	ACSHE022	People use science in their daily lives, including when caring for their environment and living things	1–7
Science Inquiry Skills	Questioning and predicting	ACSIS024	Pose and respond to questions, and make predictions about familiar objects and events	1–4, 6
	Planning and conducting	ACSIS025	Participate in guided investigations to explore and answer questions	2–4, 6
		ACSIS026	Use informal measurements to collect and record observations, using digital technologies as appropriate	4, 6
	Processing and analysing data and information	ACSIS027	Use a range of methods to sort information, including drawings and provided tables and through discussion, compare observations with predictions	1–7
	Evaluating	ACSIS213	Compare observations with those of others	2–4, 6
	Communicating	ACSIS029	Represent and communicate observations and ideas in a variety of ways	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.

Changes all around—Australian Curriculum: General capabilities

General capabilities	Australian Curriculum description	*Changes all around* examples
Literacy	Students develop a broader literacy capability as they explore and investigate their world. By learning the literacy of science, students understand that language varies according to context and they increase their ability to use language flexibly.	In *Changes all around* the literacy focuses are: • science journals • science chat-boards • word walls • factual texts • drawings • tables • annotated drawings.
Numeracy	Many elements of numeracy are particularly evident in Science Inquiry Skills. These include practical measurement and the collection, representation and interpretation of data from investigations.	Students: • describe duration using months, weeks, days and hours.
Information and Communication Technology (ICT) capability	Students develop ICT capability when they research science concepts and applications, investigate scientific phenomena and communicate their scientific understandings. In particular, they use their ICT capability to access information; collect, analyse and represent data; model and interpret concepts and relationships; and communicate science ideas, processes and information.	Students are given opportunities to: • view and discuss relevant videos • use ICT to take photographs of a feature over time to create a simple time-lapse video on how it changes.
Critical and creative thinking	Students develop capability in critical and creative thinking as they learn to generate and evaluate knowledge, ideas and possibilities, and use them when seeking new pathways or solutions.	Students: • ask and answer questions, describe and explain their ideas, make suggestions and join in discussions • make predictions.
Personal and social capability	Students develop personal and social capability as they engage in science inquiry, learn how scientific knowledge informs and is applied in their daily lives, and explore how scientific debate provides a means of contributing to their communities.	Students: • participate in discussions • work collaboratively in teams • listen to and follow instructions to safely complete investigations.
Ethical understanding	Students develop the capacity to form and make ethical judgements in relation to experimental science, codes of practice, and the use of scientific information and science applications.	Students: • ask questions of others, respecting each other's point of view.
Intercultural understanding	Students learn to appreciate the contribution that diverse cultural perspectives have made to the development, breadth and diversity of science knowledge and applications.	• 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

Changes all around—Australian Curriculum: English

Strand	Sub-strand	Code	Year 1 content descriptions	Lessons
Language	**Text structure and organisation**	ACELA1447	Understand that the purposes texts serve shape their structure in predictable ways	2
		ACELA1448	Understand patterns of repetition and contrast in simple texts	2
Literacy	**Interacting with others**	ACELY1656	Engage in conversations and discussions, using active listening behaviours, showing interest, and contributing ideas, information and questions	1–7
		ACELY1788	Use interaction skills including turn-taking, recognising the contributions of others, speaking clearly and using appropriate volume and pace	1–7
	Creating texts	ACELY1661	Create short imaginative and informative texts that show emerging use of appropriate text structure, sentence-level grammar, word choice, spelling, punctuation and appropriate multimodal elements, for example illustrations and diagrams	1–7

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

Changes all around—Australian Curriculum: Mathematics

Strand	Sub-strand	Code	Year 1 content descriptions	Lessons
Number and Algebra	**Number and place value**	ACMNA012	Develop confidence with number sequences to and from 100 by ones from any starting point. Skip count by twos, fives and tens starting from zero	6
Measurement and Geometry	**Using units of measurement**	ACMMG021	Describe duration using months, weeks, days and hours	1–3, 6

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

Changes all around—Australian Curriculum: Design and Technologies

Strand	Code	Foundation – Year 2 content descriptions	Lessons
Knowledge and Understanding	ACTDEK001	Identify how people design and produce familiar products, services and environments and consider sustainability to meet personal and local community needs	6
	ACTDEK004	Explore the characteristics and properties of materials and components that are used to produce designed solutions	4, 6

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

Changes all around—Australian Curriculum: Humanities and Social Sciences (HASS)

Strand	Sub-strand	Code	Year 1 content descriptions	Lessons
Inquiry and skills	**Questioning**	ACHASSI018	Pose questions about past and present objects, people, places and events	1, 7
	Researching	ACHASSI021	Sequence familiar objects and events	1–7
	Analysing	ACHASSI023	Compare objects from the past with those from the present and consider how places have changed over time	1
		ACHASSI024	Interpret data and information displayed in pictures and texts and on maps	1, 7
	Evaluating and reflecting	ACHASSI025	Draw simple conclusions based on discussions, observations and information displayed in pictures and texts and on maps	1, 7
	Communicating	ACHASSI027	Present narratives, information and findings in oral, graphic and written forms using simple terms to denote the passing of time and to describe direction and location	1–7
Knowledge and Understanding	**History**	ACHASSK029	How the present, past and future are signified by terms indicating time, as well as by dates and changes that may have personal significance, such as birthdays, celebrations and seasons	1, 2, 7
	Geography	ACHASSK031	The natural, managed and constructed features of places, their location, how they change and how they can be cared for	1–7

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

Changes all around—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 *Changes all around*, 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

Changes all around focuses on the Western science method of identifying changes in the landscape and sky, and making evidence-based claims about why the changes occurred, over what period of time and how features may change in the future.

Aboriginal and Torres Strait Islander Peoples might have other explanations for changes to the landscape and sky and the time frames in which these occur. Traditional stories sometimes include explanations of the formation of landscapes, for example, many groups have legends about the Rainbow Serpent, an immense serpent that created mountains and gorges. These stories can be specific to a particular people or communities or can be shared across different groups.

Several Indigenous groups identify different seasons. These seasons are usually characterised by natural changes in the environment that have significance to their people

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.

Sustainability

The *Changes all around* unit provides opportunities for students to develop an understanding of how human activity can affect their environment. They identify not only changes that humans have built (constructed) but also identify natural changes that are caused due to human intervention, including managed changes, such as planting certain species and weeding others.

Students investigate how an individual choice, for example, taking a shortcut across grass, can have cumulative effects that create changes, for example, creating of paths. They discuss solutions to mitigate negative impacts, such as constructing durable paths or redirecting walkways to protect grassed areas. This provides students with opportunities to develop an understanding of some of the relationships between human activity and surrounding ecosystems. This connection assists students to develop knowledge, skills and values for making decisions about individual and community actions that contribute to sustainable patterns of use of the Earth's 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 observable changes to the sky and landscape

Features in our environment, both land and sky, are constantly changing. These changes occur over varying periods of time, from very short to extremely long. Some changes are due to natural processes, such as the weather, and some are due to human activity, such as building and construction, or land management.

Examples of changes and their approximate corresponding lengths of time are:

Changes due to natural and human activity	Approximate time periods
Felling of a tree by lightning or humans Changing cloud formations	Seconds to minutes
Grass growing and mowing Sun tracking in the sky Spider spinning a web	Hours, days
Trees and shrubs growing Establishing a garden Moon phases changing Building houses	Weeks, months, years
Eroding of river courses Weathering of rocks Star patterns changing in the night sky Building roads and cities	Years, decades, hundreds to thousands of years
Mountains forming and eroding Stars forming and dying	Millions of years

If you take a photograph from your window and another one minute later, the two images might seem to be the same but there will be subtle differences. The Sun, Moon or clouds will appear in a slightly different position in the sky. A flower on a tree might have begun to open, wind might have blown a pile of leaves around, or a bird might have added an extra twig to its developing nest.

Take another photograph in the early evening and the apparent movements of the Sun or Moon in relation to the Earth will be obvious. The flowers might begin to close for the night, the pile of leaves might have disappeared from view and the bird's nest might be completely constructed.

If you study the environment over longer periods, patterns will begin to emerge. These patterns might include trees blossoming at certain times or the presence of certain animals such as baby birds in spring. These patterns are often tied to weather cycles or day lengths and are indicative of the changing seasons.

Understanding the patterns and precursor events can help prepare us for change. Indigenous peoples have long used changing features in the environment as indicators for fishing seasons or to prepare for harvest. For example, the Nauiyu people know that the presence of dragonflies tells them it is a good time to fish for Barramundi.

The skill of observing

From an early age, students use their senses to explore the diverse nature of the world around them. They do so mainly through observation, a skill that is fundamental to science and technology. Observation involves the use of the five senses: touch, taste hearing, sight and smell. Each sense provides different information about what we are observing.

Learning to observe scientifically also involves learning to communicate observations to others, by representation or description. This is an important skill, as without accurate descriptions no-one could replicate an investigation or build an identical structure.

Students might need practice and assistance through questioning to distinguish between observations and assumptions or inferences about changes to features. For example, 'The tree has no leaves' is an observation, but 'The tree is dying' is an inference.

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 their experiences in everyday life and might hold more than one idea about an event or phenomenon.

Young students need to develop an understanding of time and appreciate observable daily, weekly and seasonal changes before being able to understand more complex changes, such as the causes of day and night or the way the Moon appears to change shape.

Understanding long-term changes, especially those over very long periods, might be difficult for some students who expect changes to always occur quickly. Some features in the environment change so gradually that students assume that they never change. Only through direct observation do students begin to appreciate the relationship between subtle change and time.

Students' conceptions of the outside world are often tied to imagery they have seen in books, movies or other media. For example, students might think that the Moon only appears in the sky at night because they have only seen it drawn that way. The Moon will rise and set at varying times during the day or night as a result of its relative position to the Sun and Earth, as the Earth and Moon both spin on their axes and the Moon revolves around the Earth.

Some students might also hold conceptions that seasons suddenly happen and that, like the backdrop of a play, all features in the environment will adopt the typical look for that season, such as all trees flowering in spring or leaves falling from deciduous trees in autumn.

Some students might hold concepts that mountains, valleys, rivers and other major landscape features have always existed and always will exist as they are today without appreciating that subtle changes, such as weathering, erosion and deposition, are constantly occurring. They might believe that phenomena, such as volcanic activity, tsunamis, storms or earthquakes, resulting in rapid changes are 'natural disasters' that are not related to slower and more subtle forms of change in the environment.

Note: Students might benefit from studying this unit after or alongside a maths unit where students describe duration using months, weeks, days and hours (ACMMG021).

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 Do you see what I see?

AT A GLANCE

To capture students' interest and find out what they think they know about observable changes that occur in the sky and landscape.

To elicit students' questions about changes that they see in their daily lives.

Session 1 Changes over time

Students:

- watch time-lapse videos of changes in the landscape and sky
- identify changes that have occurred in a school over time.

Session 2 Our school changes

Students:

- draw how selected features around the school might change after a period of time.

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:

- observable changes that occur in the sky and landscape.

You will also monitor their developing Science Inquiry Skills (see page xi).

Key lesson outcomes

Science

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

- identify different types of observable changes
- discuss their ideas about why changes occur.

Literacy

Students will be able to:

- engage in discussions about observable changes
- represent their ideas about changes using drawings and written language.

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

Teacher background information

Changes caused by humans or not

School environments comprise a range of natural and constructed features that are constantly changing. Humans are responsible for many changes in school environments, but natural agents such as plants, animals and the weather can also bring about changes.

Humans construct features such as buildings, shade areas and play equipment. Humans also play active roles in bringing about other changes, such as pruning plants, painting structures, and some less desirable changes such as littering. Humans can also cause unintentional changes as a result of their movements, such as eroding pathways when walking or running, or breaking objects.

Some common features that change in school environments include:

Changes made by humans	Changes not made by humans
• Presence/absence of 'children walking' signs	• Animals building a nest
• Constructing a new building	• Plants growing
• Resurfacing a road	• Flowers opening and closing
• Painting a fence	• Clouds shifting position in the sky
• Planting new plants	• Sun or Moon changing position in the sky
• Removal of plants (e.g. weeding)	• Presence/absence of clouds or rain
• Raising or lowering a fla	• Development of fruit
• Mowing the lawn	• Wind blowing structures over or litter around
• Littering	• Leaves falling
• Sweeping	• Plants being eaten
• Building playground structures	• Droppings left by animals
• Painting lines on ovals or courts	• Presence/absence of puddles
• Adding solar panels to a roof	• Shadows changing position and size
• Turning sprinklers/lights on/off	

Time-lapse videos

Time-lapse videos are created by a series of still photographs taken at regular intervals over a long period of time and replayed at a faster speed so that a slow action (such as the opening of a flower bud) appears to happen quickly. Typically, the photographs are taken from the exact same location to focus on the features changing over time.

Production of time-lapse videos requires a rough knowledge of the duration of the change, so you can plan photographs to be taken at regular time increments between the first and last photograph. A rudimentary time-lapse can consist of 3–6 images and play on a slide show. More sophisticated time-lapses can consist of thousands of images and are often programmed using dedicated software.

Students' conceptions

Some students might not hold concepts of change in their local environments, particularly subtle changes that take longer periods of time to observe. They might think that the natural and constructed features of their environment have always been there and always will be there. Detailed observations and records of change help students understand that change is constantly occurring even when we do not notice it.

Students might think time-lapse videos display real time and develop alternative concepts about time. Care should be taken to explain that time-lapse videos depict changes in fast forward, and to discuss the time frame over which the change would normally occur. When first introducing time-lapse videos to students, consider selecting videos with:

- Slow frame rates or jerky transitions, as they are less likely to be perceived as real time videos than those with seamless transitions.
- Durations and content familiar to students, such as familiar features that change over minutes, hours or days. For example, a flower opening and closing over a day and night, with a clear transition from light to dark.
- People or animal movements that are sped up (highlighting that the video is sped up), for example, a spider building a web.

Note: As this unit is about observable changes in the sky and landscape, choose time-lapse videos that represent those changes rather than showing animals/people changing over time.

Session 1 Changes over time

Equipment

FOR THE CLASS

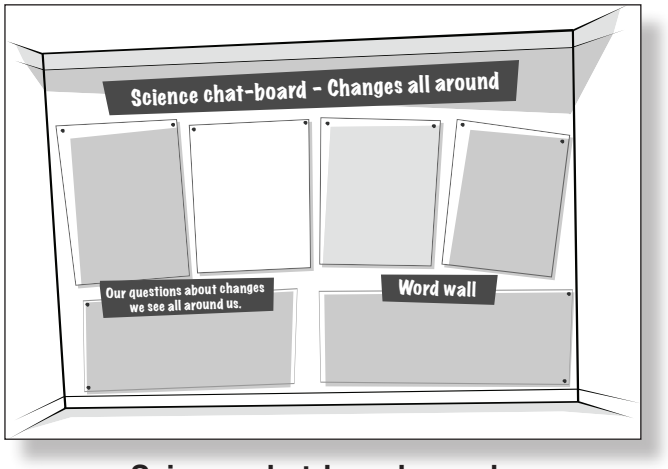
- class science journal
- word wall
- science chat-board
- 1 enlarged copy of 'A changing school' (Resource sheet 1)
- 1 red pencil
- 1 green pencil
- time-lapse videos of natural and constructed changes (see 'Preparation')
- equipment to play a video
- *optional:* enlarged 'Before' and 'After' photographs of your school (see 'Preparation')

FOR EACH STUDENT

- science journal
- 1 copy of 'A changing school' (Resource sheet 1)
- 1 red pencil
- 1 green pencil

Preparation

- Read 'How to use a science journal' (Appendix 2).
- Read 'How to use a word wall' (Appendix 3).
- Prepare a place in the classroom for the class science chat-board. Include a section titled 'Our questions about changes we see all around us'.



Science chat-board sample

- Prepare a table in the class science journal as follows. Use a red pencil for 'Changes we think were made by humans' and a green pencil for 'Changes we think were not made by humans'.

Changes we think were made by humans	Changes we think were not made by humans

- Source time-lapse videos of natural and constructed changes. For example,
  - Sky changing from night to day. See 'March 12 Farm Sunset Timelapse': https://www.youtube.com/watch?v=UxYJkxx3NuU
  - A construction site. See: 'Construction Time-Lapse: Single Family Home Built in 5 Months': https://www.youtube.com/watch?v=CMrpeNaNh84
  - Tree changing with the seasons. See; 'One year in 2 minutes': https://www.youtube.com/watch?v=KkY3JGDqMT8
  - Ants building a nest. See 'Busy Ants Timelapse': https://www.youtube.com/watch?v=gYq8a3dXw80
  - Spider building a web. See: 'Spider Net Building Timelapse': https://www.youtube.com/watch?v=L284iD585rQ&t=23s
  - Flower unfurling. See: 'Time lapse Dandelion flower to seed head' https://www.youtube.com/watch?v=UQ_QqtXoyQw

- *Optional:* Source an old photograph of your school, preferably showing the front of the school building. Take a photograph of the school from the same location. Prepare enlarged versions to show to the class.

Lesson steps

1 Show students the time-lapse videos of different changes (see 'Preparation').

2 Discuss the videos with students, asking questions such as:

- What did you see happening?
- What changed? Why did the changes happen?
- How do you think the videos were made?
- Which of the videos showed changes made by humans?
- Which of the videos showed changes that were not made by humans?

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

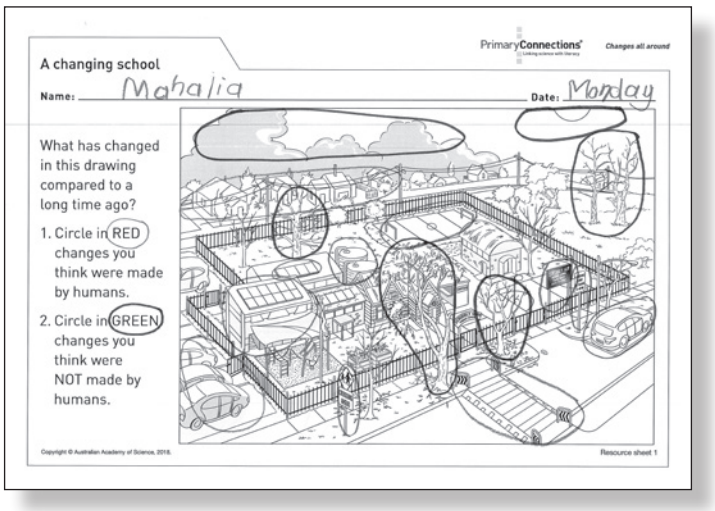
3 *Optional:* Introduce an old photograph of the students' school (see 'Preparation'). Ask students if they think the photograph was taken a long time ago or recently and why they think that. Take students out to the exact location where the photograph was taken. Ask students to identify changes that have occurred.

4 Introduce the enlarged copy of 'A changing school' (Resource sheet 1). Explain that these are two drawings of a school at different times. Ask students which image shows the school from a long time ago and why they think that.

5 Explain that students will identify things that have changed from the older image of the school to the newer image. Model how to circle features on the enlarged copy of 'A changing school' (Resource sheet 1):

- Ask students to find one feature in the newer image that has changed from the older image, and was made or built by a human. Circle the feature in the newer image with a red pencil.
- Ask students to find one feature that has changed that they think was not made by a human. Circle the feature in the second image with a green pencil.

6 Allow time for students to complete their copies of 'A changing school' (Resource sheet 1). Ask students to share their ideas with a partner.


A changing school

Name: Mahalia Date: Monday

What has changed in this drawing compared to a long time ago?

1. Circle in RED changes you think were made by humans.
2. Circle in GREEN changes you think were NOT made by humans.

Work sample of 'A changing school' (Resource sheet 1)

7 Show students the prepared table in the class science journal. Discuss the purpose and features of a science journal.

Literacy focus

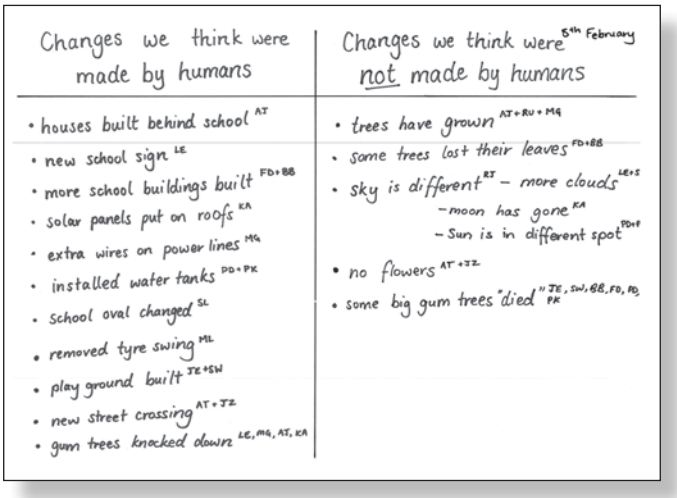
Why do we use a science journal?

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

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.

8 Ask students to share with the class one change that they identified and to explain if they think it was a change made by humans or a change not made by humans. Write the change in the appropriate column in the table.



Changes we think were made by humans	Changes we think were 5th February not made by humans
• houses built behind school AT	• trees have grown AT+RU+MG
• new school sign LE	• some trees lost their leaves FD+BB
• more school buildings built FD+BB	• sky is different RT – more clouds LE+S
• solar panels put on roofs KA	– moon has gone KA
• extra wires on power lines MG	– Sun is in different spot FD+P
• installed water tanks PD+PK	• no flowers AT+JZ
• School oval changed SL	• some big gum trees "died" JE, SW, BB, FD, PD, PK
• removed tyre swing ML	
• play ground built JE+SW	
• new street crossing AT+JZ	
• gum trees knocked down LE, MG, AT, KA	

Work sample of a completed table in a class science journal

9 Introduce the science chat-board and explain that the class will be adding to the board as they learn more about changes they see all around them. Discuss the purpose and features of a science chat-board.

Literacy focus

Why do we use a science chat-board?
A **science chat-board** is a display area where we share our changing questions, ideas, thoughts and findings about a science topic

What does a science chat-board include?
A **science chat-board** might include a title, words, pictures, questions, ideas and reflections with dates.

Add the enlarged copy of 'A changing school' (Resource sheet 1) to the science chat-board.

10 Ask students what words from today's lesson they would like added to the word wall. Invite students to contribute words from different languages to the word wall, including local Indigenous names of objects and actions if possible, and discuss different communication systems of different languages.

11 Introduce the 'Our questions' section of the science chat-board. Ask students if they have any questions about changes they see all around them and record them on the page.

12 Introduce the word wall section of the science chat-board and discuss its purpose and features.

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.

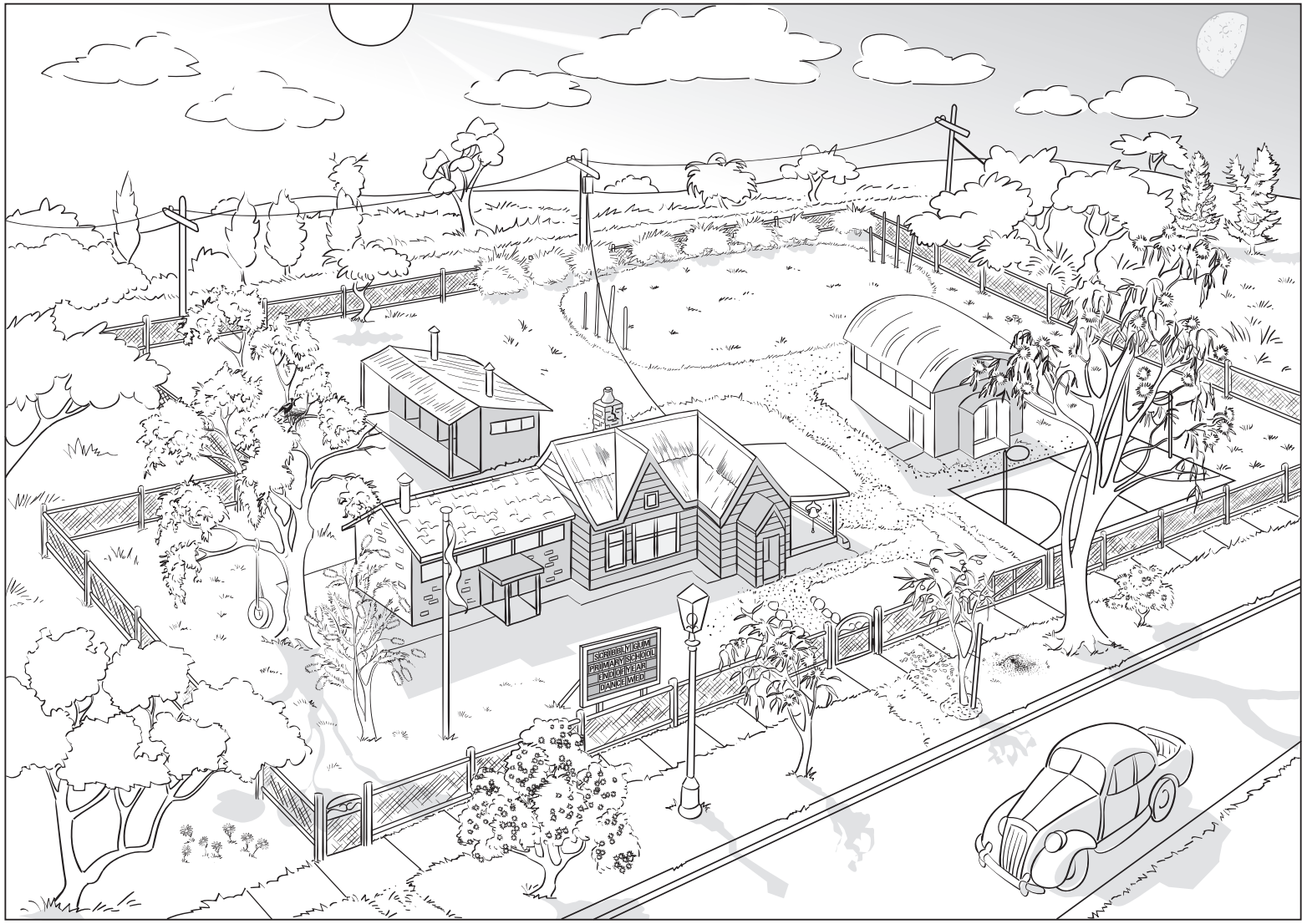
What does a word wall include?
A **word wall** includes a topic title or picture and words that we have seen or heard about the topic.

A changing school

Name: _____ **Date:** _____

This drawing shows what a school looked like a long time ago.

The next drawing shows what it looks like now.

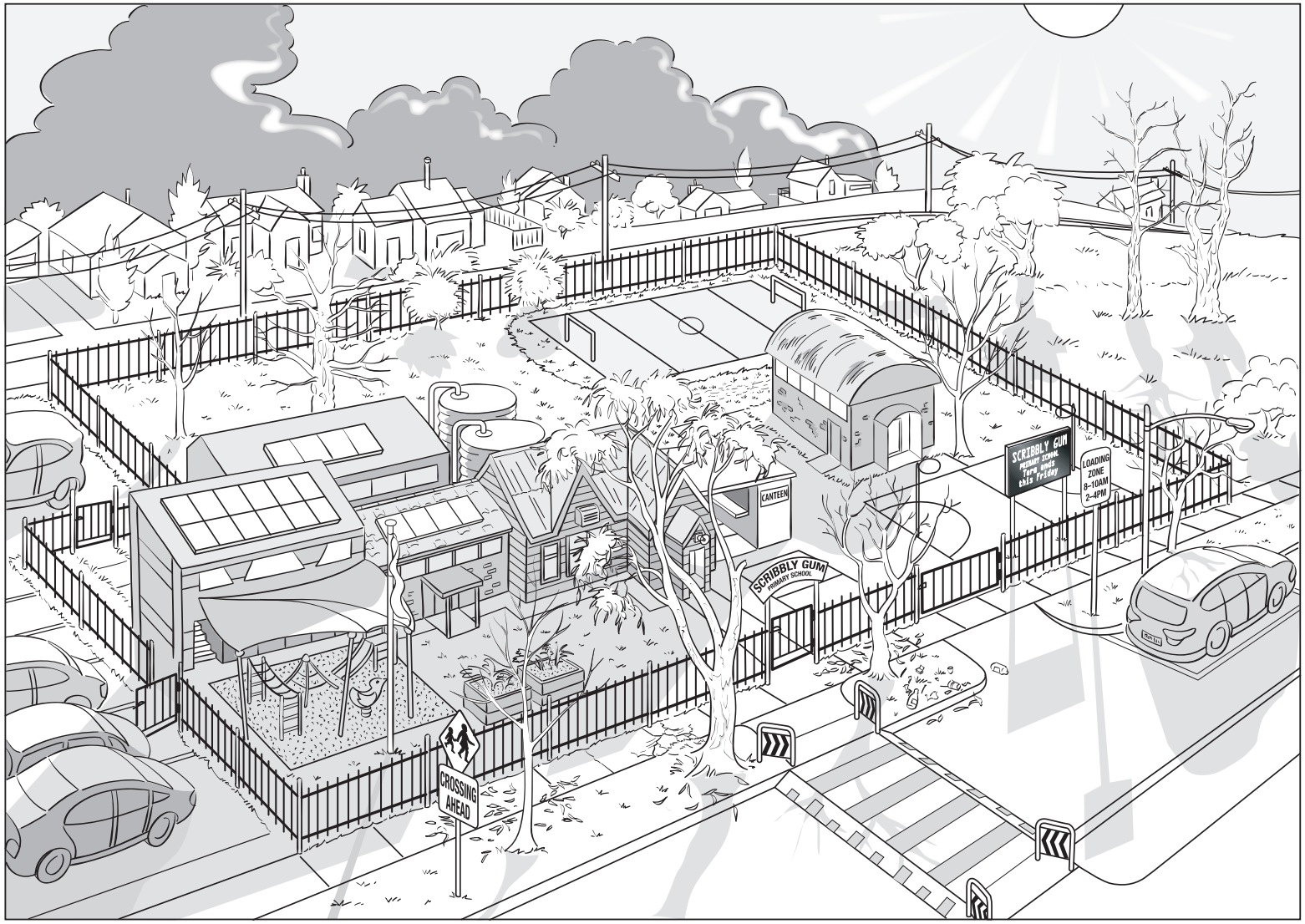


A changing school

Name: _____ **Date:** _____

What has changed in this drawing compared to a long time ago?

1. Circle in RED changes you think were made by humans.
2. Circle in GREEN changes you think were NOT made by humans.



Session 2 Our school changes

ENGAGE

Equipment

FOR THE CLASS

- class science journal
- word wall
- science chat-board
- 1 enlarged copy of 'Looking for changes' (Resource sheet 2)
- 2 photographs of features found around the school (see 'Preparation')
- 1 camera (see 'Preparation')
- *optional:* 1 enlarged copy of 'Information note for families' (Resource sheet 3)
- *optional:* 1 enlarged copy of 'Looking for changes at home' (Resource sheet 4)

FOR EACH STUDENT

- science journal
- 1 copy of 'Looking for changes' (Resource sheet 2)
- *optional:* 1 copy of 'Information note for families' (Resource sheet 3)
- *optional:* 1 copy of 'Looking for changes at home' (Resource sheet 4)

Preparation

- Take two photographs of different features around the school that you think will change in some way over the next few weeks. If possible, photograph features that change over different length periods (hours, days and weeks). Choose one feature from the following two categories that you expect will change over time:
  - Changes not made by humans (natural changes); such as a plant coming into flower, a flower that is opening or closing according to the sunlight, ants building a nest, a snail eating a leaf, a patch of sky (with top of tree/building for reference).
  - Changes built by humans; such as a building being built in the school grounds, an area of garden being fenced off, a worm farm being added to the ga den; or changes made by humans such as roses pruned, lawns mown, paths swept, flowers planted

  Note: These features will be revisited regularly to photograph to make a simple time-lapse record (3–6 photographs). Make a note of the exact location where you took each photograph.

  Optional: Consider whether your class has the time and resources available to create time-lapse videos. It will give students a greater understanding of time-lapse photography and the timescales of changes. However, it is more time intensive to take a much greater number of photographs and input them into a program to display them. Some computer applications make this process quicker and simpler for young students.
- Prepare an enlarged copy of 'Looking for changes' (Resource sheet 2). In the first column, paste two of the photographs of features that you took or draw the key features before making A4 copies for the class.

Lesson steps

1 Review the previous session, focusing on how the class identified changes made by humans and changes not made by humans.

2 Introduce the photographs of diffedent features around the school (see 'Preparation'). Ask students where they think the photographs were taken.

3 Take students outside to each location and take a photograph of each feature. Ensure students know the exact place where each photograph was taken.

4 Explain that the class will take more photographs of the features over time to create a simple time-lapse of each feature. Ask students questions such as:

- Why do we need to take a photo from the exact same spot each time?
- What changes do you think we will see next time we photograph this feature?

Record students' thoughts in the class science journal.

Optional: If students will be taking the photographs of the selected features set up a roster and display it in the classroom.

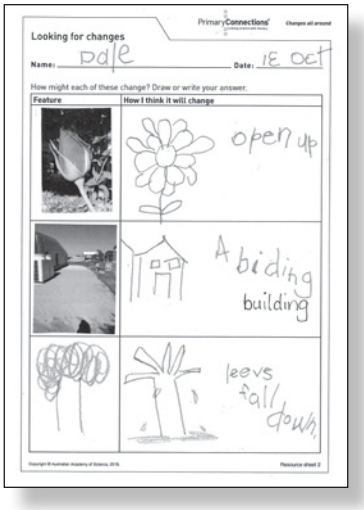
5 Introduce the enlarged copy of 'Looking for changes' (Resource sheet 2) and explain that these are copies of the first photographs that you have taken of the two different features around the school. Explain that students will write or draw how they think each feature might change. Ask students to leave the last row and that you will explain what to do in that row after they have completed the first two rows.

6 Allow time for students to complete the first two rows. Ask students to share their responses with a partner.

7 Ask students to think of another feature in the school grounds that is not made by humans that they predict will change in some way. Explain that students will draw what the feature looks like now in the first column of the last row, and to write or draw how they think it will change in the second column.

Optional: Take a photograph of the feature that each student chooses.

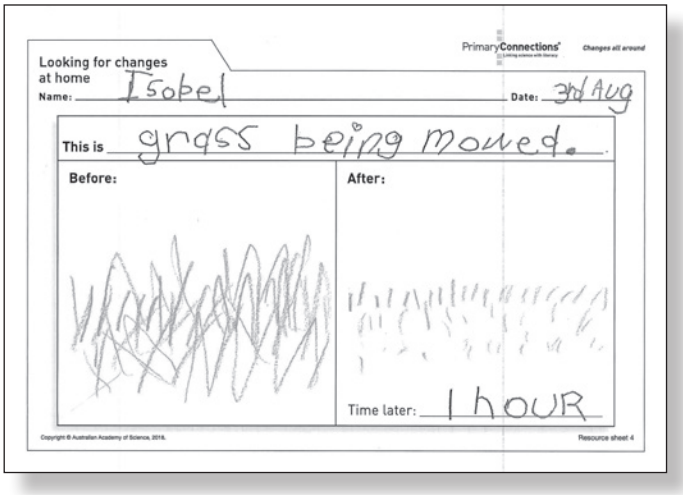
8 Allow time for students to complete the last row. Ask students to share their responses with a partner.



Work sample of 'Looking for changes' (Resource sheet 2)

9 *Optional:* Explain that students are going to look for changes at home:

- Introduce the enlarged copy of 'Information note for families' (Resource sheet 3). Discuss when students are to complete their copy of 'Looking for changes at home' (Resource sheet 4) and model writing the date in the space provided on 'Information note for families' (Resource sheet 3).
- Model completing an entry on the enlarged copy of 'Looking for changes at home' (Resource sheet 4).



Work sample of 'Looking for changes at home' (Resource sheet 4)

10 Update the science chat-board and word wall with words and images.

Curriculum links

Mathematics

- Ask students to predict the duration of each change using months, weeks, days and hours.
- Ask students to give or follow directions for how to get from their classroom to the features that were photographed in the school grounds.

History/Geography

- Invite a parent or grandparent to talk about changes to the school and differences and similarities between the school day from when they went to school and now.

Looking for changes

Name: _____ **Date:** _____

How might each of these change? Draw or write your answer.

Feature	How I think it will change

Information note for families

Name: _____ **Date:** _____

Introducing the 'Looking for changes at home' task

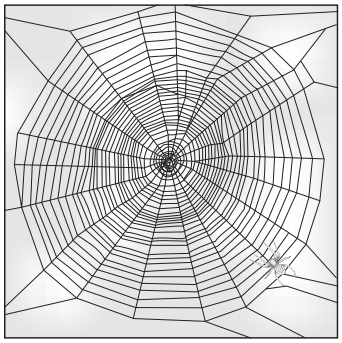
This term, our class is observing changes that occur in the sky and landscape as part of the science unit, *Changes all around*.

We will be looking at natural changes that occur around us, such as clouds moving across the sky, weeds appearing in a crack in the path, ants building a nest or flowers closing at night.

We will also explore changes made by humans, such as a building being built, an area of garden fenced off, a worm farm added to the garden, roses being pruned or lawns mown.

Students are asked to draw (or photograph) a feature that they think might change and then draw (or photograph) it again after a period of time when a change has been observed. Students might also include the period of time between the first and second photo.

This is a spider building a web .

Before:	**After:**
	 **Time later:** a few hours

Students are asked to complete and return this activity to school by:

_____

Class teacher

Looking for changes at home

Name: _____ **Date:** _____

This is _____ .

Before:	**After:**
	Time later: _____

Lesson 2 It's all natural

EXPLORE

AT A GLANCE

To provide students with hands-on, shared experiences of observable natural changes, how long they take to occur and what those changes tell us.

Session 1 A natural assortment

Students:

- sort cards showing natural changes into different groups
- watch a video about changes that signal that rain is coming.

Session 2 Our natural changes

Students:

- create their own natural change card.

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:

- observable changes that occur in the sky and landscape.

You will also monitor their developing Science Inquiry Skills (see page xi).

Key lesson outcomes

Science

Students will be able to:

- identify and sort natural changes into groups
- list changes or signs that tell us that rain is coming.

Literacy

Students will be able to:

- contribute to discussions about examples of natural changes
- make a drawing of a natural change.

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

Teacher background information

Natural changes in our environment

Natural features are those found 'in nature', such as plants, animals, water courses, soil and hills. Humans are natural beings, but for the purposes of this unit, natural changes are being defined as something that is not made or caused by humans. This definition encompasses features constructed by animals, such as birds' or ants' nests, wombat burrows or bee hives.

Natural changes occur over different durations, see 'Natural change cards' (Resource sheet 5), and frequencies. Observations of these changes over time often reveal patterns and help us determine their root cause. Some natural changes are unpredictable, such as an earthquake or certain weather events, but further study of these events might bring us closer to predicting their occurrence. Most natural changes are predictable and cyclical, and brought about by the regular movements of objects in our Solar System, such as day and night, the phases of the Moon and seasons. These recurring patterns have resulted in, and continue to result in, many changes in the environment.

Seasons can vary and are largely influenced by the tilt of the Earth's axis and our position on Earth, which have an effect on the angle of the Sun's rays as the Earth revolves around it. Different places and cultures in Australia observe different seasons. Being such a large country, with locations close to the equator in the north and closer to Antarctica in the south, many locations in Australia experience the seasons differently.

Some people in northern tropical areas of Australia identify two seasons: the wet and the dry. Others, such as the Nunggubuyu people, identify five seasons. In the south of Australia people commonly identify four seasons, each lasting approximately three months: spring, summer, autumn and winter.

We often identify seasonal changes as characteristics of the landscape and sky, but they depend on the environment. For example, only deciduous trees lose leaves in autumn, and coastal towns are less likely to experience snow or frost.

Students' conceptions

Students might not have an understanding of day and night or the seasons as phenomena related to the Earth's revolution and orbit around the Sun, nor the tilt of the Earth's axis. These are concepts for older students. However, through observation and evidence-based discussion, they can appreciate that day and night and the seasons are recurring phenomena characterised by changing environmental features and differing behaviours of plants and animals, including human beings. For example, students might observe that flowers open in daylight hours and close at night, or that more flowers tend to bloom in spring.

Students might not have experienced an investigative exercise requiring detailed observations of change in a before/after scenario, such as the investigation in this lesson, and might require guidance to 'look closely' at features that have changed beyond the obvious ones.

Session 1 A natural assortment

Equipment

FOR THE CLASS

- class science journal
- word wall
- science chat-board
- team roles chart
- team skills chart
- enlarged cards from 'Natural changes' (Resource sheet 5) (see 'Preparation')
- 1 set of A4 signs: 'Yes', 'No', 'I'm not sure'
- video about knowing when rain is coming (see 'Preparation')
- equipment to play a video

FOR EACH TEAM

- each team member's science journal
- role wristbands or badges for Manager and Speaker

Preparation

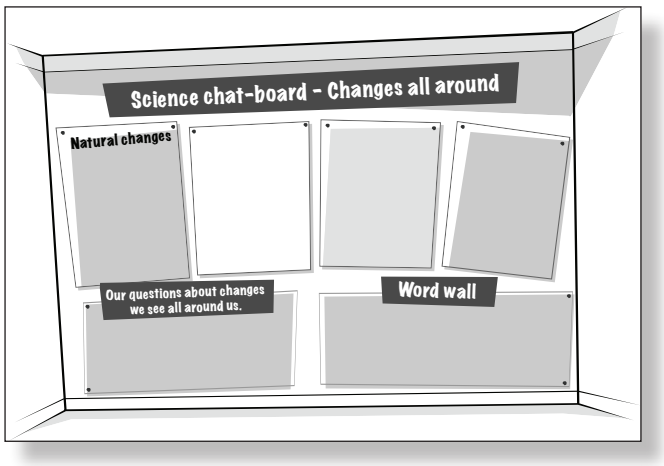
- Read 'How to organise collaborative learning teams (F–Year 2)' (Appendix 1).
- Read 'How to facilitate evidence-based discussions' (Appendix 4).
- Prepare an enlarged copy of 'Natural changes' (Resource sheet 5) and cut out enough cards for each team to have one.

  Note: You do not have to use all the provided cards. Select examples that are relevant to your class, and an appropriate number for the time available.
- Prepare a label, 'Natural changes', for the first section of the science chat-board.
- Prepare signs 'Yes, 'No' and 'I'm not sure' on A4 paper and place them in separate parts of the room for students to stand under.
- Source the video, 'How do you know when rain is coming?'. See: **https://education.abc.net.au/home#!/media/30177/how-do-you-know-when-rain-is-coming-**
- Check that the photographs of two features from the previous lesson have been taken for the time-lapse activity.

Lesson steps

1 Review the previous lesson, focusing students' attention on changes they identified as not made by humans. Ask students for suggestions of what such changes could be called.

2 Explain that a change that has not been made by humans can be called a natural change. Discuss that this means it was caused naturally, such as by the wind, rain or the growth of living things. Add the label 'Natural changes' to the first section of the science chat-board.



Sample of science chat-board with 'Natural changes' added

3 Introduce the enlarged cards from 'Natural changes' (Resource sheet 5) (see 'Preparation'). Read and briefly discuss each card, including the natural change (before and after), and how long it takes for the change to happen. Explain that students will work in collaborative learning teams to answer questions about one of the cards.

4 Explain that the cards are factual texts. Discuss the purpose and features of a factual text.

Literacy focus

Why do we use a factual text?

We use a **factual text** to inform, teach or persuade someone reading it. We can read a **factual text** to collect information.

What does a factual text include?

A **factual text** includes a title, text and pictures. It might include labels, diagrams, maps and photographs.

5 Form pairs and allocate roles. Ask Managers to collect one enlarged natural change card. Allow time for teams to read and discuss their card.

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 wear role wristbands or badges to help them (and you) know which role each team member should be doing.

6 Introduce the signs 'Yes, 'No' and 'I'm not sure' (see 'Preparation'). Ask a question, for example, 'Does your card show a change that takes minutes to happen?' Ask teams to stand in front of the label that matches their answer.

7 Ask students to compare their change cards with those of other students standing in front of the sign. With students standing in front of the 'I'm not sure sign', discuss their cards to help them decide if they should move to the 'Yes' or 'No' sign.

8 Ask some Speakers standing in front of the 'Yes' sign what their natural change card shows.

9 Repeat lesson step 6 with the following questions:

- Does your change take minutes to happen?
- Does your change take hours to happen?
- Does your change take days to happen?
- Does your change take weeks or years to happen?
- Does your change happen in the sky?
- Does your change happen because of things animals do?
- Does your change happen because of things plants do?
- Does your change happen in our school?

Optional: Encourage students to come up with their own questions about the natural change cards.

10 Display the cards in the 'Natural changes' section of the science chat-board.

Optional: Group cards according to how long the change takes.

11 Discuss why it might be important to know how long a natural change takes, for example, knowing how quickly rain clouds can develop might help to prepare for wet weather.

12 Show students the video 'How do you know when rain is coming? (see 'Preparation'). After viewing ask students:

- Which types of clouds tell you that rain is on the way?
- What did the four people say about how they know rain is coming? Have you noticed any of these things yourself?
- Which animals change their behaviour (what they do) when it is going to rain?

Record students' responses in the class science journal.

13 Discuss what other natural changes might give people useful information and/or whether predicting them would be helpful.

14 Review the photographs that have been taken so far of features around the school. Discuss the changes that have happened. Ask students which of these simple time-lapse photographs can be added to the 'Natural changes' section of the science chat-board.

15 Update the science chat-board and word wall with words and images.

EXPLORE

Curriculum links

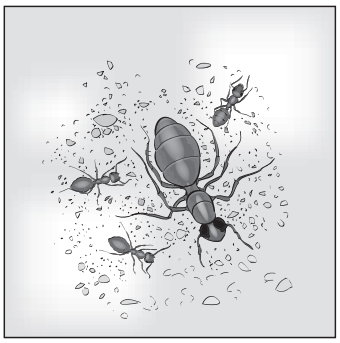
Science

- If it is a day with clouds in the sky, take students to an area where they can observe the clouds. Ask students if they think the clouds are the same ones on the video that tell us that rain is on the way. How are they the same or different?
- See how wombats make their warrens and change the surface of the ground because of their digging. Watch 'Day in the life of a wombat'. See: **https://education.abc.net.au/home#!/media/2520856/day-in-the-life-of-a-wombat**

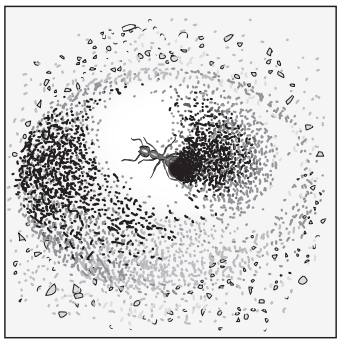
Natural changes 1

These are ants building a nest on a path.

Before:



After:



Time later: a few days or weeks

This is a magpie building a nest.

Before:

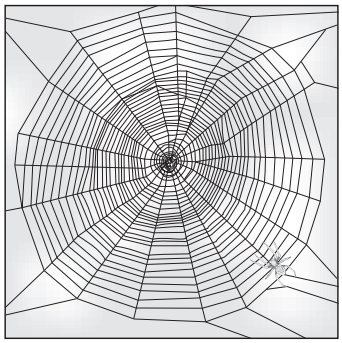
After:

Time later: a few days

This is a spider building a web.

Before:

After:



Time later: a few hours

Natural changes 2

This a tree blooming.

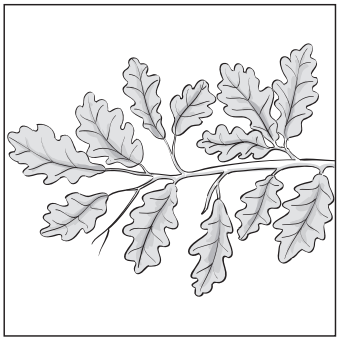
Before:

After:

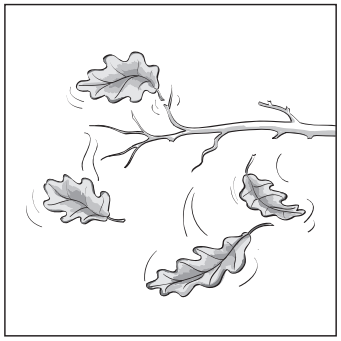
Time later: a few days

These are leaves falling from an oak tree.

Before:



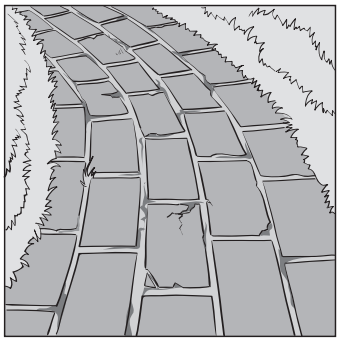
After:



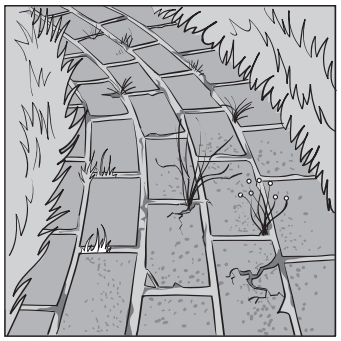
Time later: a few weeks

This is grass growing in cracks in a path.

Before:



After:



Time later: many days

Natural changes 3

These are daisy flowers closing.

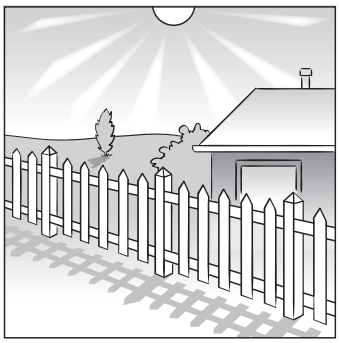
Before:

After:

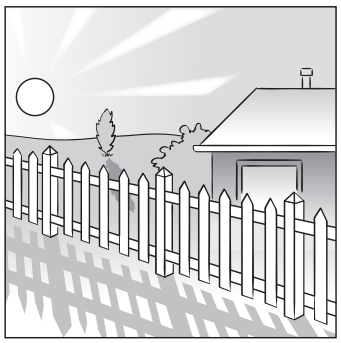
Time later: a few hours

This is the changing shadow of a fence.

Before:



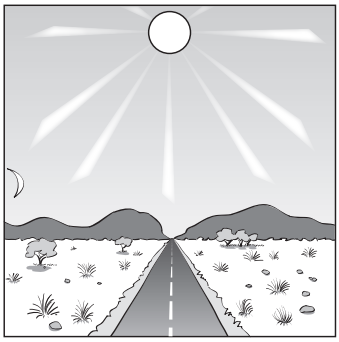
After:



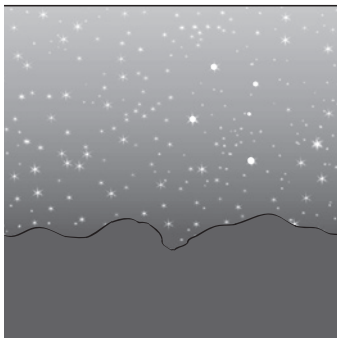
Time later: a few hours

This is day turning into night.

Before:



After:



Time later: many hours

Natural changes 4

These are lots of clouds appearing.

Before:

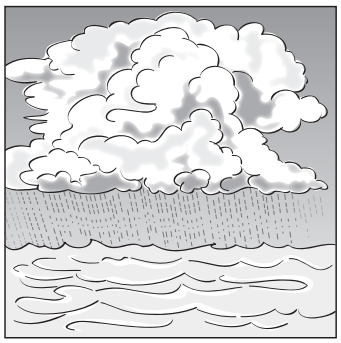
After:

Time later: a few hours

These are storm clouds appearing.

Before:

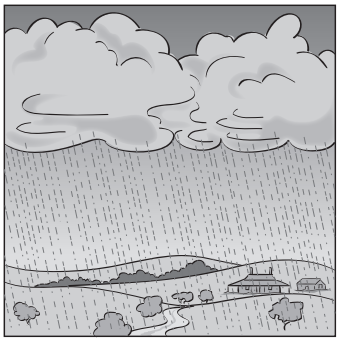
After:



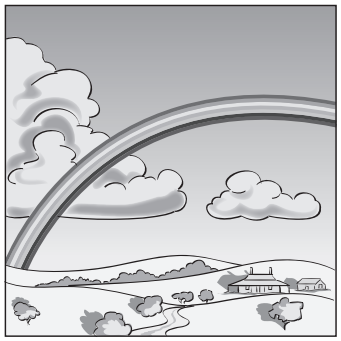
Time later: a few hours

This is a rainbow appearing in the sky after rain.

Before:



After:

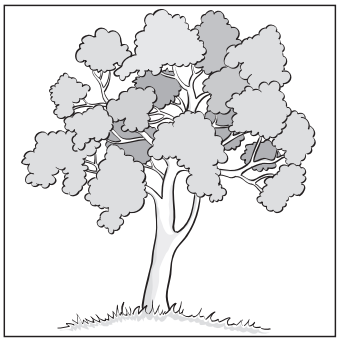


Time later: many minutes or hours

Natural changes 5

This is a eucalypt tree growing old.

Before:

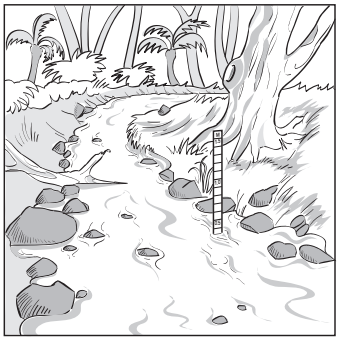


After:

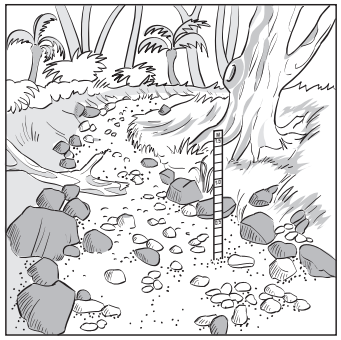
Time later: many years

This is a creek drying up.

Before:



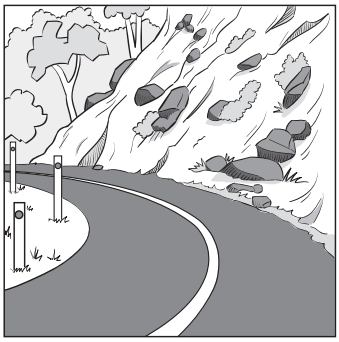
After:



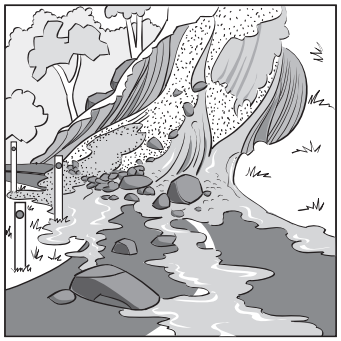
Time later: many months or years

This is a landslide.

Before:



After:



Time later: a few minutes

Session 2 Our natural changes

Equipment

FOR THE CLASS

- class science journal
- word wall
- science chat-board
- team roles chart
- team skills chart
- 1 enlarged copy of 'My natural change card' (Resource sheet 6)

FOR EACH TEAM

- each team member's science journal
- role wristbands or badges for Manager and Speaker
- 1 copy of 'My natural change card' (Resource sheet 6) per team member

Preparation

- Ensure that at least one more photo of each of the two selected school features has been taken, (see Lesson 1, Session 2) to create the time-lapse (see lesson step 4).

Lesson steps

1 Review the previous session by looking at the natural change cards. Focus students' attention on the features of the cards, such as the line drawing of the natural feature, the title and the time it takes for the change to occur.

2 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.

3 Introduce the enlarged copy of 'My natural change card' (Resource sheet 6). Explain that students will be working in collaborative learning teams to create their own natural change card.

4 Show students the photographs taken so far of the two features around the school to create a simple time-lapse. Discuss how each feature has (or has not) changed since the first photograph was taken. Discuss which one of the two features is a change not made by humans (a natural change).

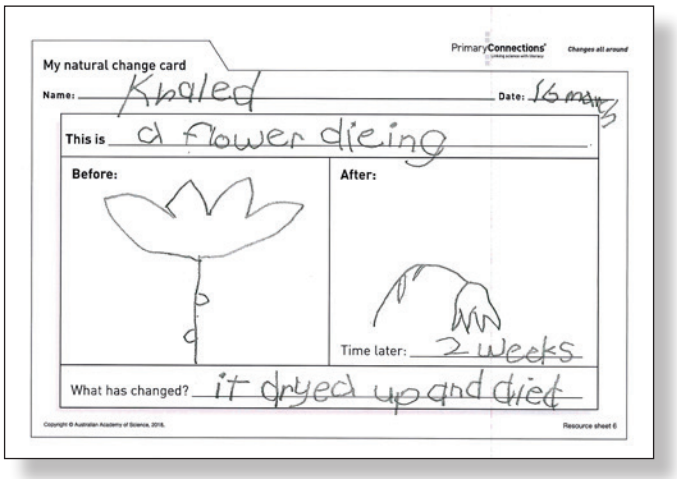
5 Explain that teams will draw the feature in the school grounds that they predicted would change on their copy of 'Looking for changes' (Resource sheet 2) in Lesson 1, Session 2. Discuss how long it has been since Lesson 1, Session 2, and model completing the 'Time later' section on the enlarged copy of 'My natural change card' (Resource sheet 6).

6 Take teams to the outside area to observe the natural feature and whether it has changed according to their predictions. Discuss why things did or did not change according to students' predictions.

It might be helpful to provide students with guidelines for their observations, such as:

- Is the feature in the same place?
- Has the feature changed colour?
- Has the feature changed size/shape/position?
- Has the feature grown or have things grown on it?

7 Back in class, allow time for teams to complete their copies of 'My natural change card' (Resource sheet 6). If teams chose to draw other natural changes, support them to record the timescale for the change.



Student sample of 'My natural change card' (Resource sheet 6)

8 Ask students what they have learned about natural changes in this lesson. For example:

- Natural changes are changes that happen in nature. They are not made by humans.
- Natural changes happen all around us.
- Natural changes can take a few hours, a few days, a few weeks or years to happen.
- Natural changes can happen at different times, and some happen during particular seasons.

9 Review the 'Our questions' page in the class science journal to see if any questions have been answered.

10 Update the science chat-board and word wall with words and images.

Curriculum links

Indigenous perspectives

- Visit an interactive Indigenous seasonal calendar to explore the different natural changes that happen at different times of the year. See: **https://www.csiro.au/en/Research/Environment/Land-management/Indigenous/Indigenous-calendars**
- Read the book 'Ernie dances to the didgeridoo' by Alison Lester (ISBN 0733613624) and discuss how the land changes in the different seasons and how this impacts on the activities the children do.
  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.

My natural change card

Name: _____ **Date:** _____

This is _____ .

Before:

After:

Time later: _____

What has changed? _____

Lesson 3 Built by humans

AT A GLANCE

To provide students with hands-on, shared experiences of observable changes in the landscape that are built by humans.

Students:

- explore examples of changes built by humans
- survey the materials that different surfaces, such as paths, are made of.

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:

- observable changes that occur in the sky and landscape.

You will also monitor their developing Science Inquiry Skills (see page xi).

Key lesson outcomes

Science

Students will be able to:

- describe changes to the landscape that are built by humans (constructed)
- identify materials that different surfaces are made of.

Literacy

Students will be able to:

- complete a survey using a table
- engage in, and contribute to, discussions about constructed changes.

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

Teacher background information

Constructed changes in our environment

Features constructed by humans, such as buildings, roads, tunnels, drains, lighting fixtures, fences and art installations, dominate our urban environments. Some constructions are made from natural materials, for example, wood, while others are made from manufactured materials, for example, plastic. Others are made from composites of natural and manufactured materials, for example, a wooden garden seat with metal brackets.

Humans build features for a variety of purposes, such as safety, shelter, accessibility and aesthetics. Each purpose informs the design and materials chosen to construct the feature. Material choices for roads and walking paths are often influenced by factors such as frequency of use, cost, safety and available materials. For instance, asphalt is usually used for road surfaces instead of concrete because it is cheaper to construct and maintain. Asphalt is also made from a more flexible binding agent (bitumen) allowing it to accommodate changing underlying surfaces (for instance a growing tree root pushing up) compared to concrete, which will crack more easily. Features are rebuilt or adapted over time as their use increases or decreases. For example, a dirt road can be changed to asphalt and then widened to more lanes as traffic increases.

Construction materials are often scientifically tested to measure if the feature is safe, durable and fit for purpose. Brick, asphalt and concrete paths rank high on durability, but can hurt a great deal if you fall. Softer surfaces, such as grass, sand, gravel or dirt, are often less durable as they are more subject to erosion. This can cause their surface to become uneven, and plants can grow on them, making for unsafe trip hazards. Flat smooth surfaces, such as concrete, tiles or flat pavers, are often desirable for safe walking until they become wet or covered in materials, such as a squishy fruit, making slip hazards. During this lesson, students will investigate paths made from different materials for slip hazard safety.

Students' conceptions

The word 'material' is often used in everyday situations to refer to fabric or cloth. In this unit, what an object is made of is called a 'material', such as wood, metal, brick, sand, asphalt or stone.

Equipment

FOR THE CLASS

- class science journal
- word wall
- science chat-board
- team roles chart
- team skills chart
- 1 enlarged copy of 'Materials we walk on' (Resource sheet 7)
- time-lapse videos of constructed changes (see 'Preparation')
- equipment to play a video
- 1 camera, *optional*

FOR EACH TEAM

- each team member's science journal
- role wristbands or badges for Manager and Speaker
- 1 copy of 'Materials we walk on' (Resource sheet 7) per team member
- 1 clipboard per team member

Preparation

- Prepare a label, 'Changes built by humans', for the second section of the science chat-board.
- Source time-lapse videos of constructed changes, including a video of path or road construction. For example:
  - New home build. See: https://www.youtube.com/watch?v=E4yzBjN4HXw
  - Road construction in Shire of Moora in Western Australia. See: https://www.youtube.com/watch?v=pSdFGcT1kRc
  - Laying a concrete path. See: https://www.youtube.com/watch?v=T_dveO_-BPw
- Source images of surfaces that have changed over time due to natural causes (see lesson step 12). For example:
  - Path cracked from tree roots. See: https://img-aws.ehowcdn.com/877x500p/photos.demandstudios.com/getty/article/181/242/481989807.jpg
  - Weeds growing between pavers. See: https://cimg3.ibsrv.net/cimg/www.doityourself.com/660x300_100-1/295/weeds-old-patio-170295.jpg
- Check that the photographs of features from Lesson 1, Session 2 have been taken.

Lesson steps

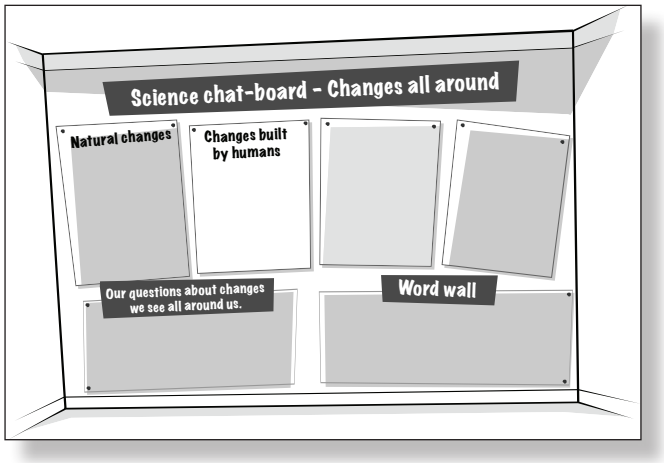
1 *Optional:* Ask some students to share a change that they observed at home. If their change card shows a natural change, add it to the 'Natural changes' section of the science chat-board.

2 Review what a natural change is using the science chat-board.

3 Show students time-lapse videos of a house, road and path being constructed (see 'Preparation').

4 Discuss the videos and the changes that the students observed, and how the changes in these videos are different from the natural change videos from the last lesson. Ask students what name they think could be given to changes that are not natural.

5 Add the label 'Changes built by humans' to the next section of the science chat-board. Add 'building houses' and 'building roads' labels to this section of the science chat-board.



Sample of science chat-board with 'Changes built by humans' added

6 Ask students questions about the construction of the road, such as:

- What materials were used to build the path or the road? (e.g. concrete, stones or bitumen)
- Why do you think those materials were used?
- What things do people need to think of when choosing materials?

Record students' thoughts in the class science journal.

7 Discuss how both paths and roads go from one place to another and are built by humans, and how you can tell the difference, for example, roads are wide and intended for cars, trucks and other vehicles to drive on.

8 Introduce the enlarged copy of 'Materials we walk on' (Resource sheet 7). Discuss the purpose and features of a table.

Literacy focus

Why do we use a table?

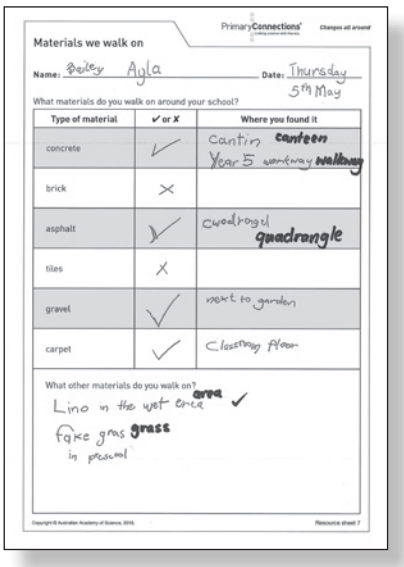
We use a **table** to organise information so that we can understand it more easily.

What does a table include?

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

9 Explain that students will be working in collaborative learning teams to survey paths and surfaces around the school to determine what materials they are made of. Model how to complete one row of the resource sheet.

EXPLORE



Materials we walk on

Name: Bailey Ayla Date: Thursday 5th May

What materials do you walk on around your school?

Type of material	✔ or ✗	Where you found it
concrete	✓	Cantin canteen Year 5 walkway walkway
brick	✗	
asphalt	✓	cwadrogul quadrangle
tiles	✗	
gravel	✓	next to garden
carpet	✓	Classroom floor

What other materials do you walk on?

Lino in the wet area area ✓

fake grass grass in preschool

Work sample of 'Materials we walk on' (Resource sheet 7)

EXPLORE

10 Form pairs and allocate roles. Ask Managers to collect team equipment.

11 Take teams for a walk around the school grounds to observe and complete their resource sheets.

Optional: Take photographs of the different surfaces found.

12 Back in the classroom ask students about what they observed. Ask students to use their resource sheets to answer the following questions:

- What types of materials did we find?
- Why do you think those materials were used?
- Do you think other schools would use different materials? Why or why not?

Record students' thoughts in the class science journal.

13 Ask students how the different surfaces they have observed might change over many years.

14 Introduce the images of paths with cracks, with weeds growing in them or lifted by trees (see 'Preparation'). Discuss how there can be 'natural changes' to things that humans have built.

15 Add the simple time-lapse photographs of changes built by humans to the science chat-board.

16 Review the 'Our questions' page in the class science journal to see if any questions have been answered.

17 Update the science chat-board and word wall with words and images.

Curriculum links

Literacy

- Read *The three little pigs*. Discuss the materials that the three houses were made from and why bricks were the best material to use in this story.

Materials we walk on

Name: _____ **Date:** _____

What materials do you walk on around your school?

Type of material	✔ or ✘	Where you found it
concrete		
brick		
asphalt		
tiles		
gravel		
carpet		

What other materials do you walk on?

Lesson 4 Slippery surfaces

EXPLORE

AT A GLANCE

To provide students with hands-on, shared experiences of how changes to paths can affect their safet .

Students:

- work in terms to investigate the slipperiness of different paths in the school grounds with plant material on them
- discuss management of paths to keep them safe.

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:

- observable changes that occur in the sky and landscape.

You will also monitor their developing Science Inquiry Skills (see page xi).

Key lesson outcomes

Science

Students will be able to:

- make a claim about the relative safety of different types of paths built around the school in different conditions
- use evidence from their investigation to support their claim
- identify other changes that occur when humans look after a feature.

Literacy

Students will be able to:

- complete a table as evidence is collected
- engage in, and contribute to, discussions about the safety of different types of paths.

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

Teacher background information

Managed changes in our environment

Both natural and constructed features in our environment are subjected to the weather elements of rain, wind, hail, sunshine, snow and temperature changes. These elements can bring about sudden changes, such as hail dimpling panels on a car, severe winds knocking down trees and floods sweeping features away. More gradually, they might cause colours to fade, paint to peel or rocks to break down.

Weather elements can also promote growth and development of some living natural features. This includes plant growth; seed germination; flower and fruit production; and the build-up of moss, algal and fungal growth in soils or on constructed features such as paths, garden seats and ornaments.

With this constant change comes the need to manage our environment to ensure it is safe, accessible and useful for our needs. Aboriginal and Torres Strait Islander Peoples have a long history of observing natural changes and using this knowledge to manage the land: from harvesting food to fire-stick farming.

School grounds require a lot of maintenance. If left unmanaged, the ovals would become overgrown, the buildings would suffer wear and tear, and the paths would become blocked by debris or plants. Some consequences for the school grounds would be that they become very unsafe, difficult to work in and unsightly. The size of a school and the number of people that frequent the school can influence the amount of wear and tear the school and its grounds receive. The weather and the climate also affect what needs to be managed and how often, for example, the weeding and mowing might need to take place more often after rainy weather.

This lesson focuses on a common management issue in most school and urban environments: slippery paths. To walk safely on a path, you need friction between the sole of your shoe and the ground. When a flat, smooth surface (for example, the sole of your shoe) comes into contact with a wet, flat, smooth surface (for example, wet concrete pavement) that water does not have anywhere to go and you end up hydroplaning (sliding on the water). This is one of the reasons why car tires have grooves in them; they channel water away from the contact surfaces, thus increasing friction. The same applies for wet leaves and other slimy plant materials, but they provide another layer of flat, wet or slimy surface for slipping and tend to clog any grooves in footwear or paths, reducing friction between them. Paths with rougher, bumpier surfaces, such as gravel or asphalt have more channels for the water or slimy material to go, leaving some bumpy peaks for the sole of your shoe to grip as you walk. This issue can be managed through regular clearing of plant debris and pools of water from paths, and through behavioural changes such as taking care to walk slower and wearing footwear with a large tread.

Students' conceptions

Students might not understand the cause and effect relationship between weather elements and changes in environmental features. They might think that things just 'get old' over time regardless of the weather. They might not understand that some materials, for example, certain plastic, remain intact and show little change over long periods of time while others break down readily when subject to weather.

Equipment

FOR THE CLASS

- class science journal
- word wall
- science chat-board
- team roles chart
- team skills chart
- 1 enlarged copy of 'A changing school' (Resource sheet 1) from Lesson 1, Session 1
- 1 enlarged copy of 'Slippery paths' (Resource sheet 8)

FOR EACH TEAM

- each team member's science journal
- role wristbands or badges for Manager and Speaker
- 1 copy of 'Slippery paths' (Resource sheet 8) per team member (see 'Preparation')
- 1 clipboard per team member
- wet leaves

Preparation

- Choose up to four types of paths around the school for students to investigate. These might include asphalt, concrete, brick, grass, sand or gravel.

  Optional: To save time, complete the question and the name of the path materials that your class will be investigating on the resource sheet before copying 'Slippery paths' (Resource sheet 8) to hand out to students.
- Check that the photographs of features from Lesson 1, Session 2 have been taken.
- Prepare a label, 'Other changes', for the last section of the science chat-board.

Lesson steps

1. *Optional:* Ask some students to share a change built by humans that they observed at home. Add their change card to the 'Changes built by humans' section of the science chat-board.
2. Review the previous lesson on surfaces built by humans, drawing students' attention to their thoughts on why different materials might have been chosen.
3. Explain that safety is one of the things people need to consider when choosing materials to build outside paths. Discuss the video from the previous lesson showing a path being built. Discuss how the builder made the smooth surface a bit rougher to make the path safer to walk on.

4 Review the two school images in 'A changing school' (Resource sheet 1) from Lesson 1, Session 1 and focus on the paths that were built. Ask students to identify features intended to keep people safe while walking on the paths and any safety hazards on the paths, such as leaves, grass clippings, water, flower blossoms, fruit, weeds growing in the path, cracks in the path and litter.

5 Explain that students will be working in collaborative learning teams to find out which constructed path would be the safest to walk on if the path was wet or if they accidentally trod on plant material that was on the path, such as leaves, flower blossoms or fruit.

6 Discuss how the main hazard of stepping on plant material is slipping and falling over. Explain that students will investigate the question 'Which type of path is the safest to walk on when there is water (or wet leaves) on the path?'.

Note: Other plant materials may be used, such as banana skins.

7 Introduce the enlarged copy of 'Slippery paths' (Resource sheet 8) and read through with students. Discuss with students what 'slippery' means and what happens when you slip on something.

8 Ask two students to model how to test the slipperiness of the path (see image on 'Slippery paths' (Resource sheet 8)). Ask one student to act as a support, holding an arm of the other student. Ask the supported student to place one foot on the path whilst pushing the other foot along the path covered with wet leaves (or other material being used for the investigation).

9 Explain that each team member will have a turn at testing the slipperiness, and then together the team will decide if the path was 'Not slippery', 'A little bit slippery' or 'Very slippery'. Model how to record the findings on the enlarged copy of 'Slippery paths' (Resource sheet 8) by writing the material the path was made of and then ticking the sentence that matches the findings

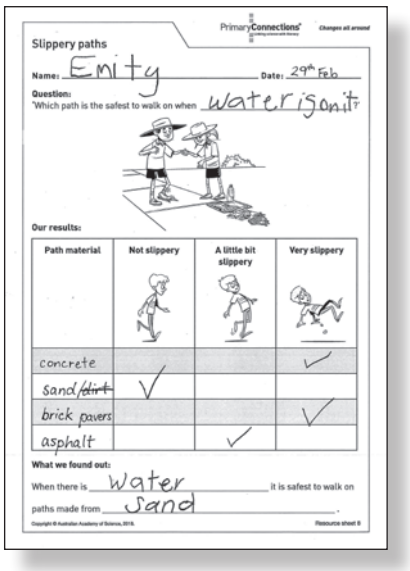
10 Form pairs and allocate roles. Ask Managers to collect team equipment. Take teams out to the first path (see 'Preparation').

Allow time for teams to complete the activity.

11 Ask Speakers to share their teams' results. Encourage students to agree or disagree with each team using the 'Science question starters' in Appendix 4.

Optional: Rank the different paths from slipperiest to least slippery.

12 Discuss what claim students can make from their investigation. Ask students to complete the sentence (claim) at the end of the resource sheet. 'When there (are wet leaves) it is safest to walk on paths made from _____ '. Ask students to provide reasons and evidence for their claims.



Slippery paths

Name: Emily Date: 29th Feb

Question:
"Which path is the safest to walk on when water is on it?

Our results:

Path material	Not slippery	A little bit slippery	Very slippery
concrete			✓
sand/dirt	✓		
brick pavers			✓
asphalt		✓	

What we found out:

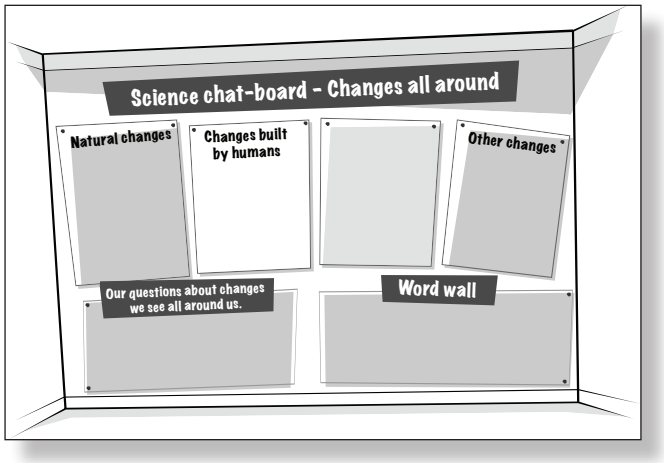
When there is water it is safest to walk on paths made from sand.

Student sample of 'Slippery paths' (Resource sheet 8)

EXPLORE

13 Ask students what else can be done to keep people safe from slipping on paths because of plant material, such as sweeping paths or not planting fruit trees along paths. Discuss how often those changes need to occur, for example, sweeping needs to happen every day when trees are flowering or dropping fruit.

14 Explain that sweeping away materials or picking up fallen fruit from a path are also changes. Add the label 'Other changes' to the last section of the science chat-board. Add words and images to this section.



Sample of science chat-board with 'Other changes' added

15 Review students' questions on the 'Our questions' page of the class science journal to see if any have been answered.

16 Update the science chat-board and word wall with words and images.

Curriculum links

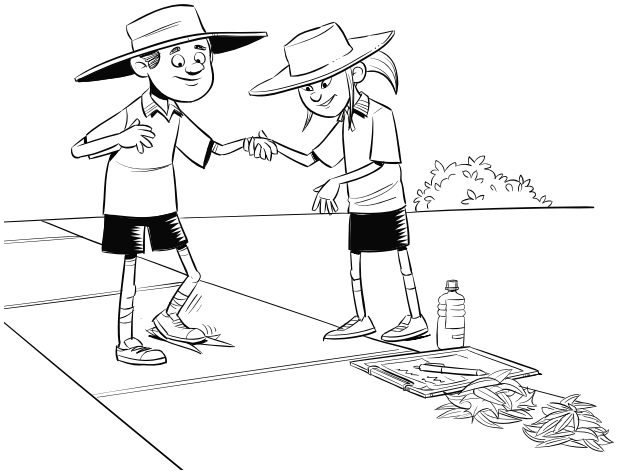
Science

- Investigate the difference between different types of footwear to answer the question 'Which footwear is the safest on paths made from _____?'.

Slippery paths

Name: _____ **Date:** _____

Question:
'Which path is the safest to walk on when _____ ?'



Our results:

Path material	Not slippery	A little bit slippery	Very slippery

What we found out:

When there _____ it is safest to walk on

paths made from _____ .

Lesson 5 What changes?

AT A GLANCE

To support students to represent and explain their understanding of observable changes that occur in the sky and landscape.

To introduce current scientific views about managing changes

Students:

- match cards that show a change and classify them into groups
- watch and discuss time-lapse videos of managed changes.

Lesson focus

In 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.

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:

- observable changes that occur in the sky and landscape.

You will also monitor their developing Science Inquiry Skills (see page xi).

Key lesson outcomes

Science

Students will be able to:

- identify examples of natural, constructed and managed changes.

Literacy

Students will be able to:

- sort images into matching groups
- contribute to discussions about classification of changes

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

Teacher background information

Changes in the environment are constantly occurring and can take different amounts of time. Some changes happen over short periods, such as seconds, minutes, hours or days. Other changes take much longer, such as weeks, months, years, decades or centuries.

Changes can be grouped by the agents that cause them and by their purpose:

- Natural changes are those made by natural agents, such as plants, animals and weather elements.
- Changes built by humans (constructed) include roads, buildings and art sculptures.
- Other changes made by humans are:
  - Managed changes made by humans looking after features in the environment, such as gardening, painting, sweeping or creating fire breaks
  - Changes caused by humans that affect the environment, such as littering, soil erosion due to walking or bushfires caused by inattention.

Humans play a large role in shaping their environment. Even natural environments, for example, national parks, require management to ensure invasive species of both animals and plants do not take over, and access is maintained for fire trucks and tourists. There are very few wilderness areas on Earth that have not been affected by humans

Urban environments change as governments plan and develop urban spaces depending on their purpose. Buildings are demolished and constructed. Roads, bridges, tunnels and houses create a vast constructed landscape as urban areas are developed and re-developed. Sometimes natural phenomena, such as fires or storms, can change these landscapes quickly and dramatically, affecting all living things

Equipment

FOR THE CLASS

- class science journal
- word wall
- science chat-board
- team roles chart
- team skills chart
- 1 enlarged copy of 'Sorting changes' (Resource sheet 9)
- time-lapse videos of changes made by humans looking after something (see 'Preparation')
- equipment to play a video

FOR EACH TEAM

- each team member's science journal
- role wristbands or badges for Manager and Speaker
- 1 copy of 'Sorting changes' (Resource sheet 9) (see 'Preparation')
- 1 x A3 sheet of paper
- glue

Preparation

- Cut out a set of pictures and labels from 'Sorting changes' (Resource sheet 9) for each team.

  Optional: If time permits, ask students to cut the images and labels out themselves.

- Source time-lapse videos of changes made by humans looking after something (not built), such as:
  - Pruning a tree. See: 'Apple Tree Pruning Time-lapse': https://www.youtube.com/watch?v=71pK0uu1dbo
  - Whipper snipping grass. See: 'Brush cutting Time Lapse': https://www.youtube.com/watch?v=alaNHwMEF_A
  - Lawn mowing. See: 'The Spiral Cut': https://www.youtube.com/watch?v=T5hRiGT18aw

Lesson steps

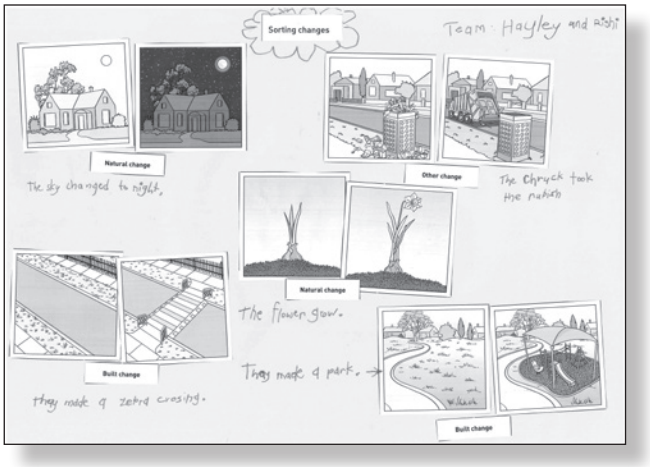
1 Review the previous lessons using the class science journal and science chat-board, focussing students' attention on the different types of changes they have explored.

2 Introduce the enlarged copy of 'Sorting changes' (Resource sheet 9). Explain that students will be working in collaborative learning teams to match the images as pairs that represent 'Before' and 'After' a change. Ask teams to glue their pairs onto their A3 sheet of paper.

3 Draw students' attention to the labels 'Natural change', 'Built change' and 'Other change'. Explain that students will label each pair with the label that best describes the change that they show.

Optional: Ask students to write labels and descriptions of the change depicted by the pair of images.

4 Form pairs and allocate roles. Allow time for teams to complete the activity.



Student sample of 'Sorting changes' (Resource sheet 9) on an A3 sheet of paper

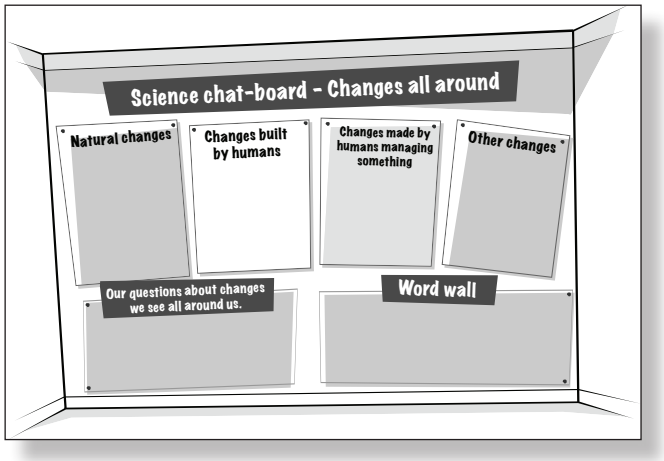
5 Ask teams to pair up with another team and discuss their labelling of the images and whether they agree or disagree.

6 Show students time-lapse videos of changes made by humans looking after something (see 'Preparation'). Ask students questions, such as:

- Which of the three groups do you think each of these videos or photographs would go in?
- What is the same about each of the videos/photographs?
- Are there other changes that you would group with those videos/photographs? Why?

7 Explain that 'Changes made by humans looking after something (managing)' is another type of change. Ask students what changes that might include.

8 Add the label 'Changes made by humans looking after something (managing)' to the science chat-board. Discuss which changes in 'Other changes' can be moved to that section. Ask students for ideas of what else could be included and record them on the science chat-board.



Sample of science chat-board with all labels added

9 Review the simple time-lapse photographs of school features that were started in Lesson 1, Session 2. Ask students where they would place each time-lapse on the science chat-board. Encourage students to provide reasons for their choice of classification

10 Review 'Our questions' in the class science journal to see if any can be answered.

11 Update the science chat-board and word wall with words and images.

Curriculum links

Science/English

- Make a set of cards showing before and after changes explored in this unit. Play the card game 'Concentration' using the cards, where students need to find before and after cards that go together.

Sorting changes

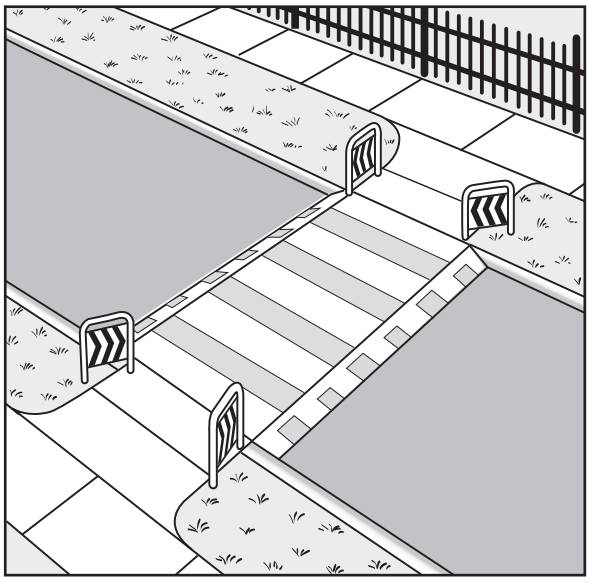
1. Cut out the pictures and labels.

2. Match pictures that show a change.

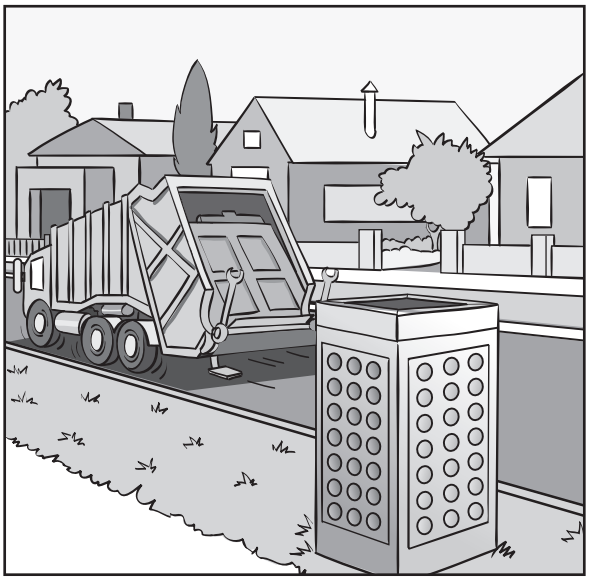
3. Glue the pictures next to each other on an A3 sheet of paper.

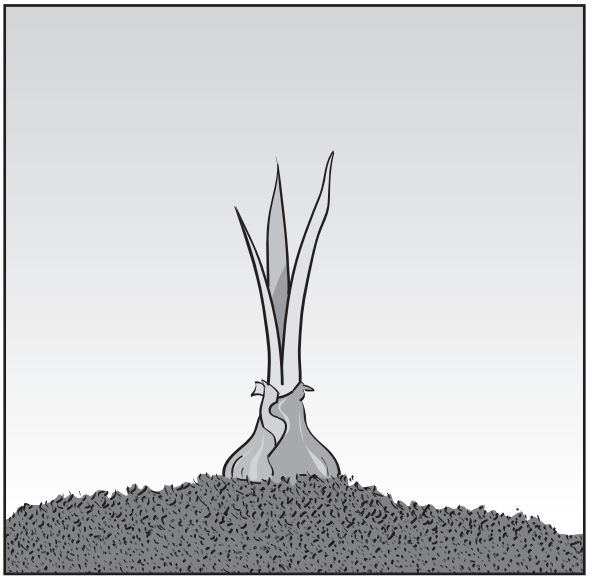
4. Glue a label under the pictures to show what kind of change it is.

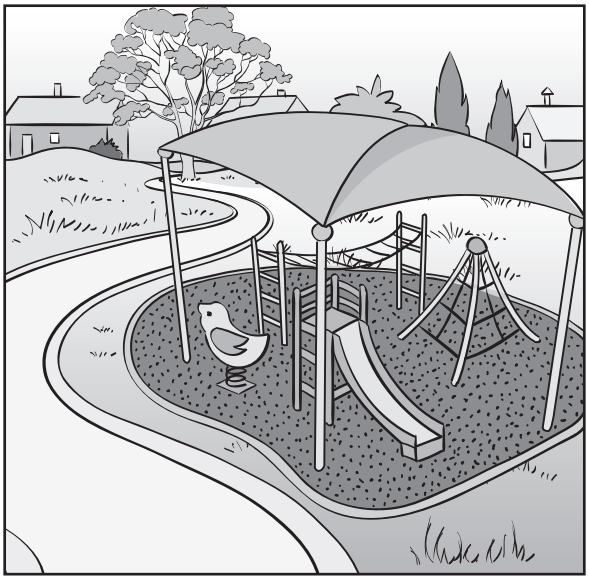
Natural change	**Built change**	**Other change**
Natural change	**Built change**	**Other change**
Natural change	**Built change**	**Other change**

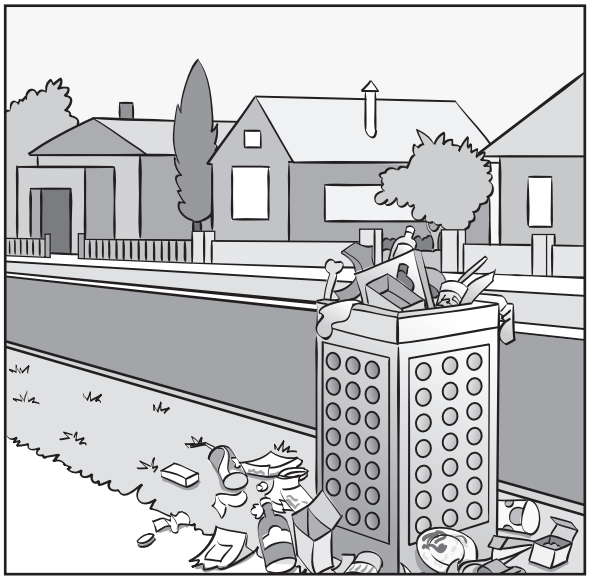


Sorting changes









Lesson 6 Keep off the grass!

AT A GLANCE

To support students to plan and conduct an investigation of a change to the landscape that is caused, and then managed, by humans.

Session 1 Stomp on it!

Students:

- investigate how the growth of grass is affected by people walking on it

Session 2 Stomp results

Students:

- analyse the results of the investigation.

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.

ELABORATE

Assessment focus

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

Key lesson outcomes

Science

Students will be able to:

- make predictions about how grass will grow after being stomped on
- identify how to keep the investigation fair
- record their observations and compare them with their predictions.

Literacy

Students will be able to:

- participate in discussions about how paths are made in grass
- use annotated drawings to record their predictions and observations.

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

Teacher background information

Grass is a common feature in most school environments, particularly sports ovals. To maintain a healthy oval with flat ground and full coverage of low-clipped grass, which is fit for sporting events, the grass needs regular watering, mowing, fertilising, soil aerating and reseeding. The extent of maintenance required can depend on several factors, such as the frequency of use, the species of grass and the climate.

Grasses have meristems (growth tissue) at the base of their leaf blades, which is why we can mow grass and it keeps on growing. Walking or driving on grass with enough force can harm the plants directly, but a greater issue is the compaction of soil underneath. Compaction can reduce the amount of air and water available to the plants, often killing them. This is why frequent walking, running, riding or driving over grass forms paths or patches. Many ovals are constructed by sowing grass seeds on a bed of sand or very sandy soil to improve drainage and reduce the chance of compaction.

Students' conceptions

Some students might think that the direct damage to plants is the only reason paths appear, whereas the compaction of the soil limiting the access of air and water to the plant is the greater issue. Furthermore, students might not hold concepts about the critical need for water, air and sunshine for plant growth, thinking that plants will simply grow if they are planted in soil.

Session 1 Stomp on it!

Equipment

FOR THE CLASS

- class science journal
- word wall
- science chat-board
- team roles chart
- team skills chart
- 1 enlarged copy of 'A changing school' (Resource sheet 1)
- 1 enlarged copy of 'Stomp on it!' (Resource sheet 10)
- 1 enlarged copy of 'Recording results' (Resource sheet 11)
- 4 pots with grass, chives or wheatgrass, all approximately the same height
- 4 labels
- 1 marking pen
- 1 small shoe (no wider than the plant pot)
- 1 camera
- images of paths or trails made by animals (see 'Preparation')

FOR EACH TEAM

- each team member's science journal
- role wristbands or badges for Manager and Speaker
- 1 copy of 'Recording results' (Resource sheet 11) per team member

Preparation

- Source images of paths or trails made by animals. For example:
  - Sheep: https://farm1.staticflickr.com/596/22340377635_f5abae8d29_h.jpg
  - Wild dogs: http://www.abc.net.au/news/image/4033688-3x2-700x467.jpg
- Source four pots with grass, chives or wheatgrass, and label as per 'Stomp on it!' (Resource sheet 10).

Lesson steps

1. Review the enlarged copy of 'A changing school' (Resource sheet 1), focusing students' attention on the paths. Ask questions, such as:
   - Which paths were built by humans?
   - Are there paths that were not built?
   - Why do paths appear in grass?

   Record students' thoughts in the class science journal.
2. Introduce the pictures of trails made by animals (see 'Preparation'). Discuss how the trails are made by animals taking the same route each time they move from one place to another, and how humans can also make those trails, for example, by taking shortcuts across grassy areas.

3. Ask students how often they think people need to walk on grass in order for a path to appear, for example, a few times, many times or lots and lots of times. Record thoughts in the class science journal.
4. Explain that the class will investigate the question: 'What will happen to how well grass grows the more you stomp on it?'.
5. Introduce the enlarged copy of 'Stomp on it!' (Resource sheet 10) and read through with students. Display in the classroom, for example, on the science chat-board.
6. Show students the equipment table with the prepared pots. Explain that instead of walking on the pots, which will damage them, students will 'stomp' on the grass using a small shoe.
7. Model how to 'stomp' a plant, by pushing the shoe right down to the layer of the soil.
8. Read the labels and discuss how many times each pot will be 'stomped'. Discuss why one pot has no stomps (as a control, to see what would happen if no-one walked there).
9. Introduce the enlarged copy of 'Recording results' (Resource sheet 11). Explain that students will be working in collaborative learning teams to discuss their predictions of what the grass in each pot will look like after a week. Ask students to draw an annotated drawing of their prediction in the top pot of each column. 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 object.

What does an annotated drawing include?

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

10 Form pairs and allocate roles. Ask Managers to collect team equipment. Allow time for teams to complete their predictions. Remind students to only draw in the pots at the top of the columns since they will record their results in the pots below.

11 Ask Speakers to present their teams' predictions.

12 Begin the investigation by taking a photograph of the pots with their labels clearly visible and a label marking 'Day 0'. Alternatively, draw and write descriptions of the grass in the pots in the class science journal.

13 Select students to 'stomp' on the grass with the shoe the number of times shown on the label, and then take another photograph of, or draw, the pots with a label marking 'Day 1'. As a class, discuss what the grass looks like for each pot and write a description under each photograph or drawing.

14 Discuss what the plants need over the next week, such as watering and sunlight. Ask students if the test would be fair if:

- the plants got different amounts of water each day
- the plants were put in different places, for example, some placed in sunlight and some in shadow.

15 Create a roster of students to water and 'stomp' on the grass in the pots over the next week.

Optional: Record the changes in the plants over the course of the week in the class science journal, using photographs or drawings.

16 Update the science chat-board and word wall with words and images.

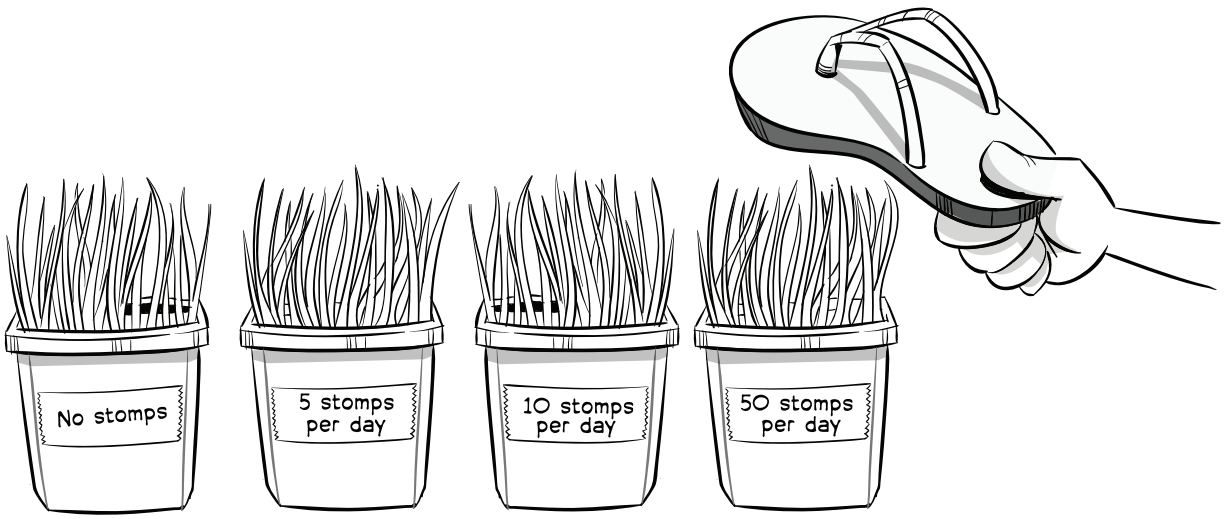
Stomp on it!

Question: What will happen to how well grass grows the more you stomp on it?

Equipment:

- 4 pots with grass, chives or wheatgrass, all approximately the same height
- 4 labels
- 1 marking pen
- 1 thong or shoe

What we will do:
Every day for one week we will 'stomp' on the grass in each of the pots.



What we found out (circle one)
Our claim is:

1 The more the grass was stomped on the more it grew.

2 The more the grass was stomped on the less it grew.

3 Nothing happens when grass is stomped on.

Recording results

Name: _____ **Date:** _____

Pot 1: No stomps	**Pot 2:** 5 stomps per day	**Pot 3:** 10 stomps per day	**Pot 4:** 50 stomps per day
What I think will happen: 	What I think will happen: 	What I think will happen: 	What I think will happen: 
What happened: 	What happened: 	What happened: 	What happened: 

Session 2 Stomp results

Equipment

FOR THE CLASS

- class science journal
- word wall
- science chat-board
- team roles chart
- team skills chart
- enlarged copy of 'Stomp on it!' (Resource sheet 10) from Session 1
- enlarged copy of 'Recording results' (Resource sheet 11) from Session 1

FOR EACH TEAM

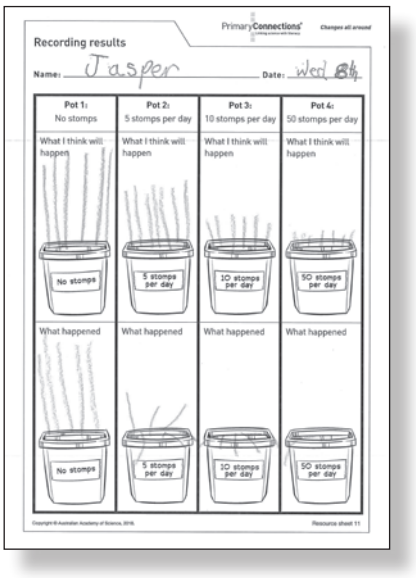
- each team member's science journal
- role wristbands or badges for Manager and Speaker
- copy of 'Recording results' (Resource sheet 11) from Session 1, per team member

Lesson steps

1 Review the previous session using the enlarged copy of 'Stomp on it!' (Resource sheet 10). Discuss what has changed compared to the initial pots.

2 Introduce the enlarged copy of 'Recording results' (Resource sheet 11) from Session 1. Explain that students will be working in collaborative learning teams to record their observations of each pot. Review the features and purpose of an annotated drawing.

3 Model completing the enlarged copy of 'Recording results' (Resource sheet 11). Ask students to compare their predictions with their final observations.



Student sample of 'Recording results' (Resource sheet 11)

4 Form pairs and allocate roles. Ask Managers to collect team equipment. Allow time for teams to complete their copies of 'Recording results' (Resource sheet 11).

ELABORATE

5 Ask Speakers to present their teams' conclusions and reflections. Ask questions, such as

- What did you think the grass pots would look like after a week of stomping?
- Did your results match your predictions? Why or why not?

6 Introduce the enlarged copy of 'Stomp on it' (Resource sheet 10) from Session 1. Read through the claims and circle which one best meets the class results.

7 Discuss what students have learned during the investigation. Ask students questions such as 'What can we do to avoid making paths in the grass?'.

8 Discuss how the number of 'stomps' to make a path depends on variables such as the types of grass or plants being walked on and the type of soil.

9 Update the science chat-board and word wall with words and images.

Curriculum links

Design and Technology

- Ask students to design a solution to stop people from taking shortcuts across a grassed area, for example, so that it looks nicer for a school open day.

Science

- After the investigation, continue to grow and care for the plants (without any more stomping) to observe if they recover.

Indigenous perspectives

- Make the tracks of Australian animals and discuss which animals might disturb the most soil or sand with their movements. See: 'Learning Noongar culture, Animal tracks': https://www.youtube.com/watch?v=QunW3_7OFfU&feature=youtu.be

  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.

Lesson 7 Thinking about changes

AT A GLANCE

To provide opportunities for students to represent what they know about observable changes that occur in the sky and landscape, and to reflect on their learning during the unit.

Students:

- identify and describe different types of changes
- 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:

- observable changes that occur in the sky and landscape.

Key lesson outcomes

Science

Students will be able to:

- identify and describe three different types of observable changes.

Literacy

Students will be able to:

- use oral and written language to show their understanding and reflect on their experiences.

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

Equipment

FOR THE CLASS

- class science journal
- word wall
- science chat-board
- 1 enlarged copy of 'A changing school' (Resource sheet 1)
- 1 enlarged copy of 'What I know about changes' (Resource sheet 12)
- coloured pencils

FOR EACH STUDENT

- science journal
- 1 copy of 'What I know about changes' (Resource sheet 12)
- *optional:* 1 copy of 'A changing school' (Resource sheet 1)
- *optional:* coloured pencils

Preparation

- Prepare a new enlarged copy of 'A changing school' (Resource sheet 1).

Lesson steps

1 Review the previous lessons using the class science journal and science chat-board. Draw students' attention to their original thoughts about the enlarged copy of 'A changing school' (Resource sheet 1).

2 Introduce the new enlarged copy of 'A changing school' (Resource sheet 1). Ask students what types of changes they might circle now. Write the types of changes in different coloured pencils and circle them as a class.

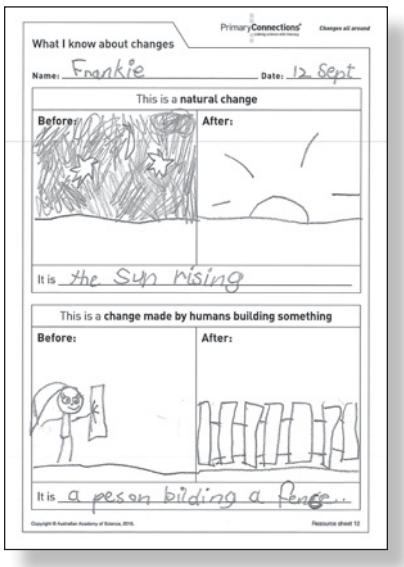
Optional: Ask students to complete the task individually using their own fresh copy of 'A changing school' (Resource sheet 1).

3 Introduce the enlarged copy of 'What I know about changes' (Resource sheet 12). Explain that students will choose three types of changes that they have learned about and will draw each one. Encourage students to look at the science journal and science chat-board while making their choices.

4 Model how to complete one entry on the enlarged copy of 'What I know about changes' (Resource sheet 12). Ask students to describe the change they drew using the 'It is' sentence starter.

5 Allow time for students to complete the activity. Ask students to share their ideas with a partner.

EVALUATE



Student sample of 'What I know about changes' (Resource sheet 12)

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

- What was the most interesting thing that you learned about changes all around us?
- What are some things that you have learned that you did not know before?
- Which activity helped you learn something new?
- Which activity did you like best?
- What are you still wondering about?

EVALUATE

What I know about changes

Name: _____ **Date:** _____

This is a **natural change**	
Before:	**After:**
It is _____	

This is a **change made by humans building something**	
Before:	**After:**
It is _____	

What I know about changes

Name: _____ **Date:** _____

This is a **change made by humans looking after something**	
Before:	**After:**
It is _____	

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 colour-coded 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

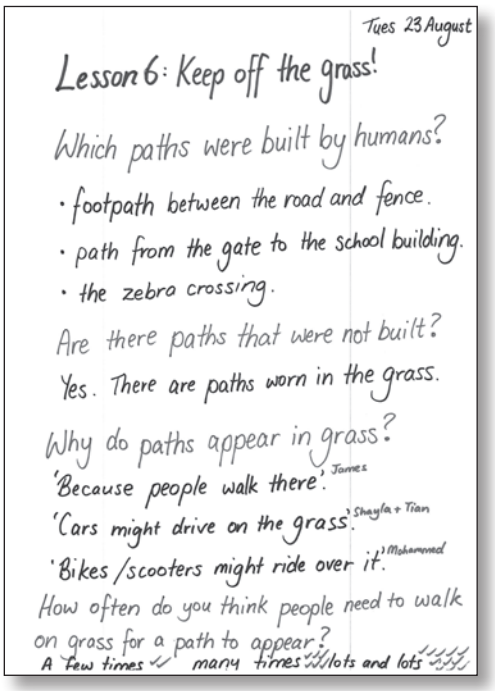
1. At the start of the year, or before starting a science unit, provide each student with a notebook or exercise book for their science journal or use an electronic format. Tailor the type of journal to fit the needs of your classroom. Explain to students that they will use their journals to keep a record 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.


Tues 23 August

Lesson 6: Keep off the grass!

Which paths were built by humans?

- footpath between the road and fence.
- path from the gate to the school building.
- the zebra crossing.

Are there paths that were not built?

Yes. There are paths worn in the grass.

Why do paths appear in grass?

'Because people walk there.' James

'Cars might drive on the grass.' Shayla + Tian

'Bikes/scooters might ride over it.' Mohammed

How often do you think people need to walk on grass for a path to appear?

A few times ✓✓ many times ✓✓✓ lots and lots ✓✓✓✓✓

***Changes all around* 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

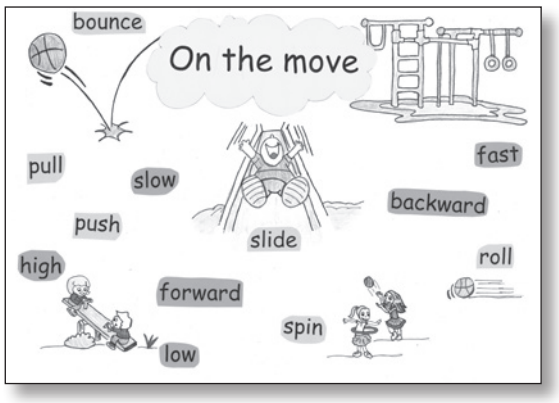
Position the word wall so that students have easy access to the words. They need to be able to see, remove and return word cards to the wall. A classroom could have one main word wall and two or three smaller ones, each with a different focus, for example, high-frequency words.

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 unit about observable changes in the sky and landscape might be arranged under the headings ‘Natural changes’, ‘Constructed changes’ and ‘Managed changes’.

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

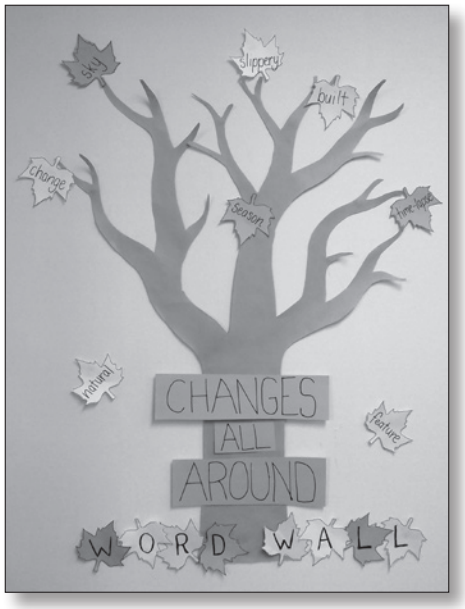


***On the move* word wall**

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.



***Changes all around* 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:

- We claim that the objects made of plastic were better for decorating rainy day hats.

We claim that the plastic objects are better for decorating rainy day hats because raincoats are made from plastic.

Q What **question** are you trying to answer? For example, 'What will happen to how well grass grows the more you stomp on it?'

C The **claim**. For example, 'The grass grows better with less stomps.'

E The **evidence**. For example, 'When we observed the grasses after five days, the grass that had 50 stomps per day looked flat, patchy and brown, the grass with 20 stomps per day was flat but still mostly green, and the grass with no stomps was green and had grown taller.'

R The **reasoning**. How the evidence supports the claim. (Not required at Year 1 level, but in this case: 'We think that the more the grass was stomped on the more damaged the grass was and that the grass didn't have time to recover and grow. The stomps might have also made the ground more difficult for the grass to grow in.')

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 next section) 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 Listen to and discuss all ideas before selecting one

Appendix 5
Changes all around equipment list

EQUIPMENT ITEM	QUANTITIES	LESSON	1	1	2	2	3	4	5	6	6	7
		SESSION	1	2	1	2				1	2	
Equipment and materials												
A3 sheet of paper	1 per team								●			
A4 signs: 'Yes', 'No', 'I'm not sure'	1 set per class				●							
clipboard	1 per student						●	●				
enlarged cards from 'Natural changes' (Resource sheet 5)	1 set per class				●							
glue	per team								●			
labels	4 per class									●		
marking pen	1 per class									●		
pencils, red and green	1 set per class		●									●
pencils, red and green	1 set per student		●									
pencils, coloured	per class											●
pencils, coloured *optional*	per student											●
pots with grass, chives or wheatgrass, all approximately the same height	4 per class									●		
shoe (no wider than the plant pot), small	1 per class									●		
wet leaves	per team							●				
Resource sheets												
'A changing school' (RS1)	1 per student		●									
'A changing school' (RS1), enlarged	1 per class		●					●		●		●
'A changing school' (RS1) *optional*	1 per student											●
'Looking for changes' (RS2)	1 per student			●								
'Looking for changes' (RS2), enlarged	1 per class			●								
'Information note for families' (RS3) *optional*	1 per student			●								
'Information note for families' (RS3), enlarged *optional*	1 per class			●								
'Looking for changes at home' (RS4) *optional*	1 per student			●								
'Looking for changes at home' (RS4), enlarged *optional*	1 per class			●								
'My natural change card' (RS6)	1 per student					●						
'My natural change card' (RS6), enlarged	1 per class					●						

EQUIPMENT ITEM	QUANTITIES	LESSON	1	1	2	2	3	4	5	6	6	7
		SESSION	1	2	1	2				1	2	
Resource sheets												
'My natural change card' (RS6)	1 per student					●						
'My natural change card' (RS6), enlarged	1 per class					●						
'Materials we walk on' (RS7)	1 per student						●					
'Materials we walk on' (RS7), enlarged	1 per class						●					
'Slippery paths' (RS8)	1 per student							●				
'Slippery paths' (RS8), enlarged	1 per class							●				
'Sorting changes' (RS9)	1 per team								●			
'Sorting changes' (RS9), enlarged	1 per class								●			
'Stomp on it!' (RS10), enlarged	1 per class									●	●	
'Recording results' (RS11)	1 per student									●	●	
'Recording results' (RS11), enlarged	1 per class									●	●	
'What I know about changes' (RS12)	1 per student											●
'What I know about changes' (RS12), 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		●	●	●	●	●	●	●	●	●	●
science chat-board	1 per class		●	●	●	●	●	●	●	●	●	●
team roles chart	1 per class				●	●	●	●	●	●	●	
team skills chart	1 per class				●	●	●	●	●	●	●	
word wall	1 per class		●	●	●	●	●	●	●	●	●	●
Multimedia												
'Before' and 'After' photographs of your school, enlarged *optional*	1 per class		●									
camera	1 per class			●					●	●		
camera *optional*	1 per class						●					
equipment to play a video	1 per class		●		●		●		●			
images of paths or trails made by animals	1 per class									●		
photographs of two features found around the school	1 per class			●								
time-lapse videos of changes made by humans looking after something	1 per class								●			
time-lapse videos of constructed changes	1 per class						●					
time-lapse videos of natural and constructed changes	1 per class		●									
video about knowing when rain is coming	1 per class				●							

Appendix 6
Changes all around 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** Do you see what I see? ***Session 1*** Changes over time ***Session 2*** Our school changes	• identify different types of observable changes • discuss their ideas about why changes occur.	• engage in discussions about observable changes • represent their ideas about changes using drawings and written language.	***Session 1*** **Changes over time** • watch time-lapse videos of changes in the landscape and sky • identify changes that have occurred in a school over time. ***Session 2*** **Our school changes** • draw how selected features around the school might change after a period of time.	**Diagnostic assessment** • Science journal entries • Class discussions • 'A changing school' (Resource sheet 1) • 'Looking for changes' (Resource sheet 2) • 'Looking for changes at home' (Resource sheet 4), *optional*

*These lesson outcomes are aligned to relevant descriptions of the Australian Curriculum. See page xi for Science, page xiii for English and Mathematics and page xiv for Design and Technologies and Humanities and Social Sciences (HASS).

		SCIENCE OUTCOMES*	LITERACY OUTCOMES*	LESSON SUMMARY	ASSESSMENT OPPORTUNITIES
		Students will be able to:	Students will be able to:	Students:	
EXPLORE	**Lesson 2** It's all natural ***Session 1*** A natural assortment ***Session 2*** Our natural changes	• identify and sort natural changes into groups • list changes or signs that tell us that rain is coming.	• contribute to discussions about examples of natural changes • make a drawing of a natural change.	***Session 1*** **A natural assortment** • sort cards showing natural changes into different groups • watch a video about changes that signal that rain is coming. ***Session 2*** **Our natural changes** • create their own natural change card.	**Formative assessment** • Science journal entries • Class discussions • 'Natural changes' (Resource sheet 5) • 'My natural change card' (Resource sheet 6)
EXPLORE	**Lesson 3** Built by humans	• describe changes to the landscape that are built by humans (constructed) • identify materials that different surfaces are made of.	• complete a survey using a table • engage in, and contribute to, discussions about constructed changes.	• explore examples of changes built by humans • survey the materials that different surfaces, such as paths, are made of.	**Formative assessment** • Science journal entries • Class discussions • 'Materials we walk on' (Resource sheet 7)

*These lesson outcomes are aligned to relevant descriptions of the Australian Curriculum. See page xi for Science, page xiii for English and Mathematics and page xiv for Design and Technologies and Humanities and Social Sciences (HASS).

		SCIENCE OUTCOMES*	LITERACY OUTCOMES*	LESSON SUMMARY	ASSESSMENT OPPORTUNITIES
		Students will be able to:	Students will be able to:	Students:	
EXPLORE	**Lesson 4** Slippery surfaces	• make a claim about the relative safety of different types of paths built around the school in different conditions • use evidence from their investigation to support their claim • identify other changes that occur when humans look after a feature.	• complete a table as evidence is collected • engage in, and contribute to, discussions about the safety of different types of paths.	• work in terms to investigate the slipperiness of different paths in the school grounds with plant material on them • discuss management of paths to keep them safe.	**Formative assessment** • Science journal entries • Class discussions • 'Slippery paths' (Resource sheet 8)
EXPLAIN	**Lesson 5** What changes?	• identify examples of natural, constructed and managed changes.	• sort images into matching groups • contribute to discussions about classification of changes.	• match cards that show a change and classify them into groups • watch and discuss time-lapse videos of managed changes.	**Formative assessment** • Science journal entries • Class discussions • 'Sorting changes' (Resource sheet 9)

*These lesson outcomes are aligned to relevant descriptions of the Australian Curriculum. See page xi for Science, page xiii for English and Mathematics and page xiv for Design and Technologies and Humanities and Social Sciences (HASS).

		SCIENCE OUTCOMES*	LITERACY OUTCOMES*	LESSON SUMMARY	ASSESSMENT OPPORTUNITIES
		Students will be able to:	Students will be able to:	Students:	
ELABORATE	**Lesson 6** Keep off the grass! ***Session 1*** Stomp on it! ***Session 2*** Stomp results	• make predictions about how grass will grow after being stomped on • identify how to keep the investigation fair • record their observations and compare them with their predictions.	• participate in discussions about how paths are made in grass • use annotated drawings to record their predictions and observations.	***Session 1*** Stomp on it! • investigate how the growth of grass is affecte by people walking on it. ***Session 2*** Stomp results • analyse the results of the investigation.	**Summative assessment** of Science Inquiry Skills • Science journal entries • Class discussions • 'Recording results' (Resource sheet 11)
EVALUATE	**Lesson 7** Thinking about changes	• identify and describe three different types of observable changes.	• use oral and written language to show their understanding and reflect on their experiences.	• identify and describe different types of changes • reflect on their learning during the unit.	**Summative assessment** of Science Understanding • Science journal entries • Class discussions • 'What I know about changes' (Resource sheet 12) • 'A changing school' (Resource sheet 1), *optional*

*These lesson outcomes are aligned to relevant descriptions of the Australian Curriculum. See page xi for Science, page xiii for English and Mathematics and page xiv for Design and Technologies and Humanities and Social Sciences (HASS).

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*