

Fully aligned  
with the Australian  
Curriculum

# Bend it! Stretch it!

Year 1

***Chemical sciences***



## About this unit Bend it! Stretch it!

Changes are happening all around us. We observe change as we watch trees lose their leaves, smell bread cooking, feel a footpath become slippery with the rain or watch the sun set slowly over the horizon. We cause changes to the shapes of things around us as we wring a towel out to dry, stretch a watchband to fit our wrist, bend a straw towards our mouth to drink or scrunch up a piece of paper before throwing it away.

The *Bend it! Stretch it!* unit is an ideal way to link science with literacy in the classroom. It provides opportunities for students to explore how we use twisting, stretching and bending to physically change the shape of everyday materials. Through hands-on activities, students investigate the effect of heat on the ability to shape playdough.

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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 PrimaryConnections to you and wish you well in your teaching.

**Professor John Shine, AC Pres AA**

President (2018–2022)

Australian Academy of Science

# The PrimaryConnections teaching and learning approach

PrimaryConnections 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:

PrimaryConnections 5Es teaching and learning model

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

More information on PrimaryConnections 5Es teaching and learning model can be found at:  
[www.primaryconnections.org.au](http://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 PrimaryConnections 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

PrimaryConnections 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.

PrimaryConnections develops the literacies of science that students need to learn and to represent their understanding of science concepts, processes and skills. Representations in PrimaryConnections 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 PrimaryConnections 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](http://www.primaryconnections.org.au)



## Safety

Learning to use materials and equipment safely is central to working scientifically. It is important, however, for teachers to review each lesson before teaching to identify and manage safety issues specific to a group of students. A safety icon  is included in lessons where there is a need to pay particular attention to potential safety hazards. The following guidelines will help minimise risks:

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



## Teaching to the Australian Curriculum: Science

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

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

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

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

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

## Unit at a glance

*Bend it! Stretch it!*

Phase	Lesson	At a glance
<b>ENGAGE</b>	<b>Lesson 1</b> Is it possible?	To capture students' interest and find out what they think they know about physical changes to objects and how everyday materials can be physically changed in a variety of ways.  To elicit students' questions about physically changing objects made from different materials.
	<b>Lesson 2</b> Bend it!	To provide students with hands-on, shared experiences of how the ability to physically change an object through bending or folding depends on the material it is made of and its initial shape.
<b>EXPLORE</b>	<b>Lesson 3</b> Stretching snakes	To provide students with hands-on, shared experiences of how the ability to physically change an object through stretching depends on the material it is made of, and that stretching can physically change the material itself.
	<b>Lesson 4</b> All scrunched up	To provide students with hands-on, shared experiences of how the shapes of objects made of different materials can be physically changed by scrunching, and that the change may not be lasting.
<b>EXPLAIN</b>	<b>Lesson 5</b> Changes everywhere <b>Session 1</b> Looking for changes <b>Session 2</b> Presenting changes	To support students to represent and explain their understanding of how objects made from everyday materials can be physically changed in a variety of ways.  To introduce current scientific views about physical changes to materials.
	<b>Lesson 6</b> All dried up	To support students to plan and conduct an investigation of how the properties of a material (playdough) change as it dries out.
<b>EVALUATE</b>	<b>Lesson 7</b> Change stories	To provide opportunities for students to represent what they know about physical changes to objects, and how everyday materials can be physically changed in a variety of ways.  To provide opportunities for students to reflect on their learning journey during the unit.

A unit overview can be found in Appendix 8, page 60.



## Bend it! Stretch it!—Alignment with the Australian Curriculum

*Bend it! Stretch it!* 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 xii for further details). This unit focuses on the Chemical sciences sub-strand.

Year 1 Science Understanding for the Chemical Sciences:	Everyday materials can be physically changed in a variety of ways (ACSSU018)
Incorporation in <i>Bend it! Stretch it!</i> :	Students use their senses to explore physical changes in their everyday lives, including ones they are responsible for through the actions of bending, stretching and scrunching. They discuss how their actions physically change everyday objects and materials. They explore the effect that drying out has on the ability of objects made of playdough to change their shape.

 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 identify a range of habitats. They describe changes to things in their local environment and suggest how science helps people care for environments.

**Students make predictions, and investigate everyday phenomena. They follow instructions to record and sort their observations and share their observations with others.**

The sections relevant to *Bend it! Stretch it!* 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. To assist teachers in making these judgements, assessment rubrics and work samples are provided on the Primary**Connections** website: [www.primaryconnections.org.au](http://www.primaryconnections.org.au)

## ***Bend it! Stretch it!*—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 *Bend it! Stretch it!*

Overarching idea	Incorporation in <i>Bend it! Stretch it!</i>
<b>Patterns, order and organisation</b>	Students predict and explore how similar actions affect objects made of different materials, or different objects made of the same material. This provides opportunities to observe and describe patterns, for example, the number of times a piece of paper can be folded is limited less by its length than by its thickness.
<b>Form and function</b>	Students investigate how changing the form of an object can change its use, for example, cutting a sheet of paper can change it to a loop which can be worn around the neck.
<b>Stability and change</b>	Students identify and describe how changes are more or less stable. For example, elastic materials regain their shape after being stretched whereas plastic materials are deformed by the same action.
<b>Scale and measurement</b>	Students measure and compare the elasticity of jelly snakes by measuring the length of the snake before, during and after it has been stretched.
<b>Matter and energy</b>	Students explore how the change in the material of playdough (loss of water) can affect its properties, namely its plasticity (ability to be shaped).
<b>Systems</b>	Students identify that objects are composed of one or more different materials.

## Bend it! Stretch it!—Australian Curriculum: Science

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

Strand	Sub-strand	Code	Year 1 content descriptions	Lessons
<b>Science Understanding</b>	<b>Chemical sciences</b>	ACSSU018	Everyday materials can be physically changed in a variety of ways <sup>1</sup>	1–7
<b>Science as a Human Endeavour</b>	<b>Nature and development of science</b>	ACSHE021	Science involves observing, asking questions about, and describing changes in, objects and events	1–7
	<b>Use and influence of science</b>	ACSHE022	People use science in their daily lives, including when caring for their environment and living things	1–7
<b>Science Inquiry Skills</b>	<b>Questioning and predicting</b>	AC SIS024	Pose and respond to questions, and make predictions about familiar objects and events	1–7
	<b>Planning and conducting</b>	AC SIS025	Participate in guided investigations to explore and answer questions	2–6
		AC SIS026	Use informal measurements to collect and record observations, using digital technologies as appropriate	3, 4, 6
	<b>Processing and analysing data and information</b>	AC SIS027	Use a range of methods to sort information, including drawings and provided tables and through discussion, compare observations with predictions	1–7
		AC SIS212	Through discussion, compare observations with predictions	2–6
	<b>Evaluating</b>	AC SIS213	Compare observations with those of others	2–6
	<b>Communicating</b>	AC SIS029	Represent and communicate observations and ideas in a variety of ways	1–7

 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](http://www.australiancurriculum.edu.au)

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

<sup>1</sup> This unit also addresses how physical changes affect everyday objects made of different materials, aligning with the Elaboration: 'Predicting and comparing how the shapes of objects made from different materials can be physically changed through actions such as bending, stretching and twisting'.

## ***Bend it! Stretch it!*—Australian Curriculum general capabilities**


General capabilities	Australian Curriculum description	<i>Bend it! Stretch it!</i> examples
<b>Literacy</b>	Literacy knowledge specific to the study of science develops along with scientific understanding and skills  PrimaryConnections learning activities explicitly introduce literacy focuses and provide students with the opportunity to use them as they think about, reason and represent their understanding of science.	In <i>Bend it! Stretch it!</i> the literacy focuses are: <ul style="list-style-type: none"> <li>• science journals</li> <li>• word walls</li> <li>• tables</li> <li>• annotated drawings</li> <li>• flow charts</li> </ul>
 <b>Numeracy</b>	Elements of numeracy are particularly evident in Science Inquiry Skills. These include practical measurement and the collection, representation and interpretation of data.	Students: <ul style="list-style-type: none"> <li>• collaboratively use tables to organise data</li> <li>• interpret tables to compare observed changes</li> <li>• measure and compare the elasticity of jelly snakes.</li> </ul>
<b>Information and communication technology (ICT) competence</b>	ICT competence is particularly evident in Science Inquiry Skills. Students use digital technologies to investigate, create, communicate and share ideas and results.	Students are given optional opportunities to: <ul style="list-style-type: none"> <li>• use interactive resource technology to view, record and analyse information.</li> </ul>
 <b>Critical and creative thinking</b>	Students develop critical and creative thinking as they speculate and solve problems through investigations, make evidence-based decisions, and analyse and evaluate information sources to draw conclusions. They develop creative questions and suggest novel solutions.	Students: <ul style="list-style-type: none"> <li>• formulate, pose and respond to questions about ways to change everyday materials</li> <li>• give reasons to justify their responses to questions.</li> </ul>
<b>Ethical behaviour</b>	Students develop ethical behaviour as they explore principles and guidelines in gathering evidence, and consider the implications of their investigations on others and the environment.	Students: <ul style="list-style-type: none"> <li>• ask questions respecting each other's point of view</li> <li>• consider the health and safety of others.</li> </ul>
 <b>Personal and social competence</b>	Students develop personal and social competence as they work effectively in teams, develop collaborative methods of inquiry, work safely, and use their scientific knowledge to make informed choices.	Students: <ul style="list-style-type: none"> <li>• work collaboratively in teams</li> <li>• participate in discussions</li> <li>• follow directions to work safely.</li> </ul>
 <b>Intercultural understanding</b>	Intercultural understanding is particularly evident in Science as a Human Endeavour. Students learn about the influence of people from a variety of cultures on the development of scientific understanding.	<ul style="list-style-type: none"> <li>• 'Cultural perspectives' opportunities are highlighted.</li> <li>• Important contributions made to science by people from a range of cultures are highlighted.</li> </ul>



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


**Bend it! Stretch it!—Australian Curriculum: English**

Strand	Sub-strand	Code	Year 1 content descriptions	Lessons
<b>Language</b>	<b>Language for interaction</b>	ACELA1444	Understand that language is used in combination with other means of communication, for example facial expressions and gestures to interact with others	1–7
		ACELA1446	Understand that there are different ways of asking for information, making offers and giving command	1–7
	<b>Expressing and developing ideas</b>	ACELA1451	Identify the parts of a simple sentence that represent ‘What’s happening?’, ‘What state is being described?’, ‘Who or what is involved?’ and the surrounding circumstances	1–7
		ACELA1454	Understand the use of vocabulary in everyday contexts as well as a growing number of school contexts, including appropriate use of formal and informal terms of address in different contexts	1–7
<b>Literacy</b>	<b>Interacting with others</b>	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
		ACELY1657	Make short presentations using some introduced text structures and language, for example opening statements	2–7

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

**Bend it! Stretch it!—Australian Curriculum: Mathematics**

Strand	Sub-strand	Code	Year 1 content descriptions	Lessons
<b>Number and Algebra</b>	<b>Fractions and decimals</b>	ACMNA016	Recognise and describe one-half as one of two equal parts of a whole	2
<b>Measurement and Geometry</b>	<b>Using units of measurement</b>	ACMMG019	Measure and compare the lengths and capacities of pairs of objects using uniform informal units	2, 3, 6
		ACMMG021	Describe duration using months, weeks, days and hours	6

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

## Cross-curriculum priorities

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

Aboriginal and Torres Strait Islander histories and cultures

- Asia and Australia's engagement with Asia
- Sustainability.

Two of these are embedded within *Bend it! Stretch it!*, as described below.



### Aboriginal and Torres Strait Islander histories and cultures

The PrimaryConnections 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](http://www.primaryconnections.org.au)

*Bend it! Stretch it!* focuses on the Western science method of using evidence-based claims to explain how everyday materials and objects can be physically changed in a variety of ways. For example, scientists may claim that the deformation of some jelly snakes is due to both the properties of the material (for example, its elasticity) and the sum of the forces acting upon it. They would back this claim with evidence and reasoning as to why that evidence supports their claim. Indigenous cultures might have other frames of reference to examine similar events and for explaining the underlying process causing changes in objects and materials.

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

### Sustainability

In the *Bend it! Stretch it!* unit students discuss how sheets of kitchen material are scrunched into small balls before being thrown away. Students investigate how different materials make balls of different sizes, and how permanent the change is. This provides a basis for understanding how human activities might impact the environment around them, for example, in waste management such as recycling and landfills



## 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 objects and materials

All matter is made up of very small particles called atoms. These atoms can join with other atoms to form molecules. Water is made up of water molecules; a combination of hydrogen and oxygen atoms.

There are a number of meanings for the word 'material', such as fabric or written information. In this unit 'material' refers to what objects or products are made of, for example, a soft drink bottle (object) is made from plastic (material). Composite materials are made of several different substances or materials. For example, foam rubber is made of polyurethane which is wrapped around pockets of air.

Materials have properties that can be used to describe and classify them. The term 'property' refers to qualities or attributes in this unit, rather than land, real estate or possessions.

### Properties of objects and materials

Objects are described according to their properties. Properties are the physical characteristics or attributes of objects, including colour, hardness, flexibility, density, shape and size. Some of the properties of an object depend on the materials it is made of, for example, density and flexibility, while others are specific to the object itself. A chocolate bunny and a chocolate drop are both made of chocolate and therefore have properties in common, but the objects have different properties, for example, size and shape.

Some properties of materials include:

- **Elasticity:** *Will it return to its original shape after being stretched, bent or compressed?*  
Objects made from elastic materials will stretch or compress under tension and then return to their original shape or size when the force is removed. However, even elastic materials have limits as to how much force they can withstand before they are stretched irreversibly and do not go back to their original shape (their elastic limit).
- **Plasticity/Malleability:** *How easily does the material change shape under pressure?*  
Plasticity is the ability to change shape without breaking. Malleability is similar but generally applies specifically to metals, and indicates that they can be hammered, pressed or rolled into thin sheets without breaking. The plasticity of a material depends on factors such as temperature. For example, glass becomes easier to shape and mold at high temperatures.

Students might not be able to differentiate between meanings of different words, such as 'hard' or 'strong'. Students might also associate 'weak' with 'light' and 'heavy' with 'strong'.

As students' language is context specific, it is important that students develop appropriate language to describe and compare the properties of materials. Most students are able to distinguish between an object and the material from which it is made. They may, however, have difficulty distinguishing between the properties of an object, such as size and shape and the properties of the material used to make the object, such as strength and elasticity.

### Introduction to changes

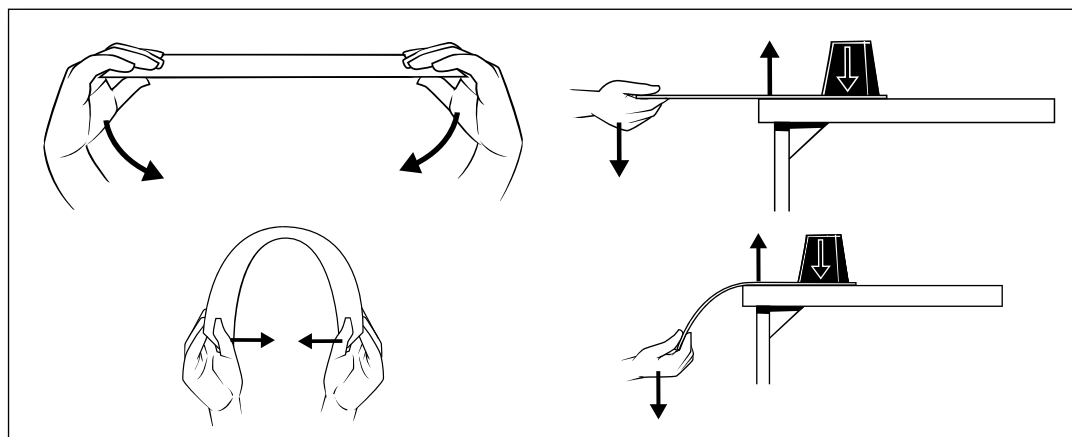
Changes occur to materials and objects around us every day. These changes occur because of an input or removal of energy, such as removing heat energy to freeze water or adding mechanical energy to knead dough. Some changes are easily reversible, for example, a melted ice pole can be re-frozen. Others are difficult or impossible to reverse, for example, a cake cannot be uncooked.

Physical change is a change to the physical properties of an object or material where the substances remain the same. The object itself might not remain the same, for example, a rock could be ground to powder or a mug be smashed to pieces, but the substances are still present. There is still rock and porcelain. Physical changes affect some of the properties of an object, for example, stretching a hair tie changes its shape but not necessarily its colour. Physical changes can also change the properties of the material the object is made of, for example hair ties often become larger over time as they no longer bounce back to their original shape after many periods of stretching (the material has lost elasticity). Scrunching and folding may change the physical shape of an object but not change the material at all.

A chemical change is where a substance is transformed into a new substance (or substances) at the molecular level. When you burn a piece of toast, the bread changes into charcoal, carbon dioxide and water. Other examples of chemical change include rusting and mixing sodium bicarbonate with acid, such as citric or tartaric, in water to create carbon dioxide and water.

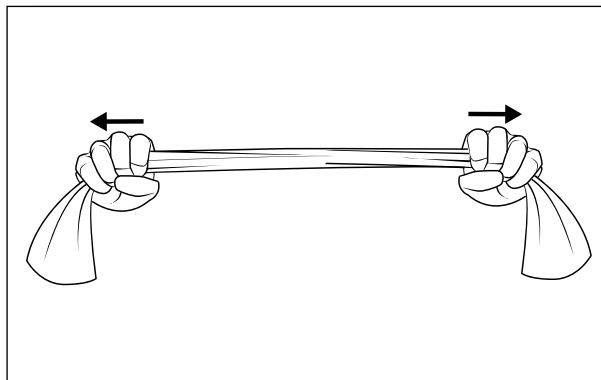
In this unit, students study whether different actions (combinations of forces) change the shape of objects, and whether these physical changes affect the material the objects are made of. The actions include:

- **Bending:** causing an object, such as a wire or a pipe cleaner, to become curved. Bending involves parts of the object being pushed or pulled towards each other, for example pushing your two hands together, or pushing down on a sheet of cardboard that is held on a table by a heavy object:



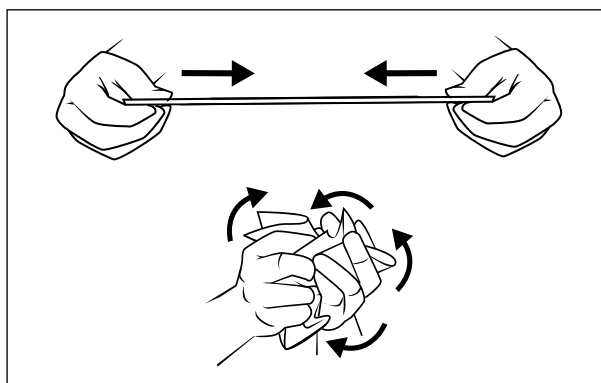
**Force-arrow diagrams bending**

- **Stretching:** making an object wider or longer by having two opposing forces pulling it.



**Force-arrow diagram for stretching**

- **Scrunching:** crunching, crushing or crumpling the object by pushing it towards itself.



**Force-arrow diagram of a sheet of material being scrunched**

Bending, stretching and scrunching will often cause an object to change shape. Different objects will be changed in different ways depending on their shape, the materials they are made of and the strength and location of the forces applied. For example, rubber bands will return to their original shape and size after being stretched, thin copper wire can be bent and keeps its shape, and a sheet of glass might break if twisted. These are all examples of physical changes. Some physical changes are reversible, such as bending a paper clip. Other physical changes, for example, snapping a popstick, are not reversible.

## Students' conceptions

Taking into account students' existing ideas is important in planning effective teaching approaches which 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.

Some students might believe that all physical changes are reversible. Many physical changes are easily reversed, for example, ice is melted and refrozen, however, some physical changes are not easily reversed such as breaking rocks or cracking an egg.

To access more in-depth science information in the form of text, diagrams and animations, refer to the PrimaryConnections Science Background Resource available on the PrimaryConnections website ([www.primaryconnections.org.au](http://www.primaryconnections.org.au)).



# Lesson 1 Is it possible?

## AT A GLANCE

To capture students' interest and find out what they think they know about physical changes to objects made from different materials.

To elicit students' questions about physically changing objects made from different materials.

Students:

- brainstorm ways to change a piece of paper
- observe how cutting a piece of paper can create a larger shape
- explore physically changing objects made from different materials.

## 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:

- physical changes and their effect on everyday materials and objects.

## Key lesson outcomes

### Science

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

- list ways to physically change a piece of paper
- discuss whether changes to objects result in changes to the material it is made of
- discuss why we make physical changes to objects
- list ways to change the properties of materials.

### Literacy

Students will be able to:

- understand the purpose and features of a science journal
- understand the purpose and features of a word wall
- contribute to discussions about physical changes to objects.

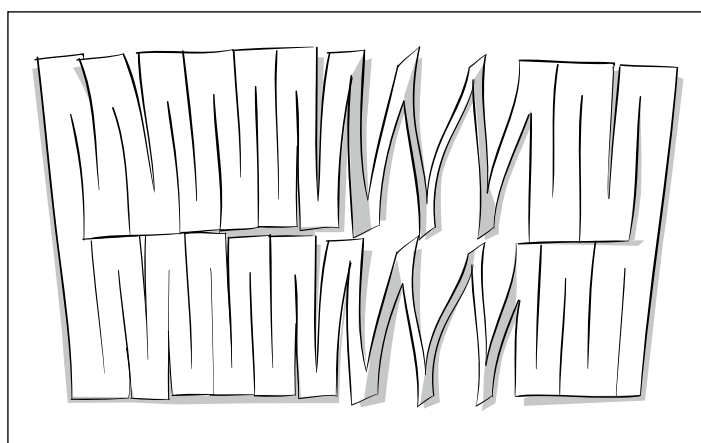
This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

## Teacher background information

### Paper over the head activity

In this lesson students are challenged to physically change an A5 piece of paper to fit over their heads by cutting it. By using the template and folding and cutting on the dotted lines, the challenge can be achieved.

This activity works because cutting the paper increases the paper's perimeter whilst the surface area remains the same. The greater the number of cuts the greater the size of the hole. When the perimeter is long enough and stretched out it might even be possible to walk through the hole in the paper.



**A piece of paper after being cut**

This is an example of a physical change; while the shape of the object has changed the material it is made of is still the same (the paper is still paper). During a chemical change the substance the material is made of changes, for example a piece of paper undergoes a chemical change when it burns, as the substances it is made of become water, carbon dioxide and ash.



## Equipment

### FOR THE CLASS

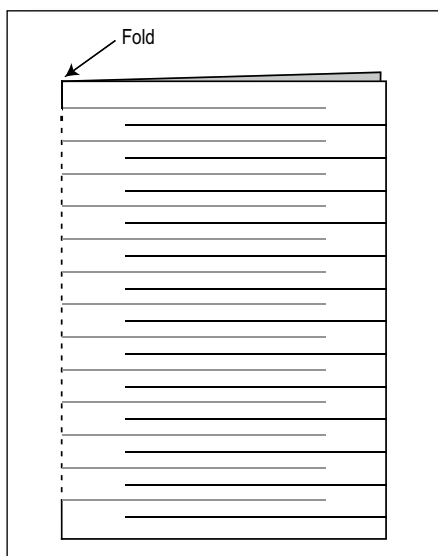
- class science journal
- word wall
- 1 A5 piece of paper
- 1 box of objects made from different materials that students can physically change (see 'Preparation')
- 1 enlarged copy of 'Change it!' (Resource sheet 1)
- *optional*: digital camera

### FOR EACH STUDENT

- science journal
- 1 copy of 'Change it!' (Resource sheet 1)
- *optional*: 1 box of objects made from different materials that students can physically change (see 'Preparation') per two students

## Preparation

- Read 'How to use a science journal' (Appendix 2).
- Read 'How to use a word wall' (Appendix 3).
- Practise cutting an A5 piece of paper to make a large loop using the image and instructions below as a guide:



- Fold the paper in half
- Cut in from the fold (grey lines)
- Cut in from the other side (black lines)
- Cut along the fold (dotted lines)

- Prepare a box containing one each of a variety of objects made from different materials such as, paper, paperclips, pipe cleaners, florist wire, foil, metal spoons, plastic straws, plastic spoons, rubber bands, balloons, popsticks, marbles, wool, cotton wool balls, squares of cloth, kitchen sponges and stress balls.
- **Note:** These will form the bulk of materials that teams will explore throughout the unit. Prepare a page in the class science journal with the heading 'Our questions'. Prepare an enlarged copy of 'Change it!' (Resource sheet 1)
- *Optional*: Display the class science journal, word wall and 'Change it!' (Resource sheet 2) in a digital format.

## Lesson steps

- 1 Introduce the box of objects (see 'Preparation'). Explain that the box contains objects made of different materials for the students to explore.



- 2 Draw out a sheet of A5 paper from the box. Ask students to brainstorm how to change the piece of paper.

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

- 3 Introduce the class science journal. Discuss its purpose and features.

### Literacy focus

#### Why do we use a science journal?

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

#### What does a science journal include?

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

Record students' responses in the class science journal.

- 4 Discuss the changes that students have brainstormed. Explain that in this unit students will not look at changes that modify what the object is made of. Review students' ideas and highlight the changes where the piece of paper is still made of paper at the end of the change.
- 5 Introduce and discuss the purpose and features of a word wall.

### Literacy focus

#### Why do we use a word wall?

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

#### What does a word wall include?

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

Add words to describe physical changes to the word wall.



- 6 Challenge students to think of how the A5 piece of paper could be changed to fit over a student's head.

*Optional:* Allow students to test their ideas.



- 7 Cut the paper so that it makes a large loop and put the loop over the head of a student (see 'Preparation'). Ask students questions such as:

- What has changed? (its shape)
- How was it changed? (it was cut)
- What has not changed? (its colour, what it is made of, its weight).

- 8 Introduce the enlarged copy of 'Change it!' (Resource sheet 1). Read through and discuss.
- 9 Explain to students that they will:
  - choose one object from the box
  - write the name of the object on the line
  - write what it is made out of
  - physically change it in some way.



Ask students not to apply excessive force to objects. Breaking them could create sharp edges.

- 10 Explain that after students have finished with one object, they will return it to the box and repeat the process with a different object.
- 11 Add words to the word wall that students may need to complete the activity.
- 12 Allow time for students to complete the activity.



### Work sample of 'Change it!' (Resource sheet 1)



- 13 Ask students to share their ideas with the rest of the class. Ask students questions such as:
  - Which object did you chose?
  - What is the object made of?
  - How did you change it?
  - What was it like before the change?
  - What was it like after the change?
  - What stayed the same?



- 14 Ask students what questions they have about how objects made of different materials can be physically changed. Record students' responses on the 'Our questions' page in the class science journal (see 'Preparation').
- 15 Ask students what words they would like to be added to the word wall from today's lesson.

## Curriculum links

### Science

- Change a piece of paper into a loop big enough to walk through.  
See: [https://blog.doublehelix.csiro.au/climb-through-a-hole-](https://blog.doublehelix.csiro.au/climb-through-a-hole-in-a-sheet-of-paper/)

### Art

- Create an art piece using coloured strips of paper which have been changed in some way such as, bending, twisting, scrunching.

# Change it!

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

<p>What is it?</p> <p>_____</p> <p>Before:</p>          <p>It is made out of</p> <p>_____ .</p>	<p>How will you change it?</p> <p>_____</p> <p>After:</p>          <p>It is made out of</p> <p>_____ .</p>
<p>What is it?</p> <p>_____</p> <p>Before:</p>          <p>It is made out of</p> <p>_____ .</p>	<p>How will you change it?</p> <p>_____</p> <p>After:</p>          <p>It is made out of</p> <p>_____ .</p>

# Lesson 2 Bend it!

## AT A GLANCE

To provide students with hands-on, shared experiences of how the ability to physically change an object through bending or folding depends on the material it is made of and its initial shape.

Students:

- identify objects made from different materials that can be bent or folded
- discuss how different materials and/or shapes affect whether an object can be bent or folded
- investigate how many times sheets of different types of paper can be folded.

## Lesson focus

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

## Assessment focus



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

In this lesson you will monitor students' developing understanding of how:

- objects made from some everyday materials can be physically changed by bending and folding, depending on their shape.

## Key lesson outcomes

### Science

Students will be able to:

- identify some materials that can be folded
- discuss how the size and thickness of the piece of paper changes with each fold, affecting whether it can be folded

### Literacy

Students will be able to:

- understand the purpose and features of a table
- record results in a table
- contribute to discussions on bending objects made of different materials.



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

## Teacher background information

Some people claim it is not possible to fold a piece of paper in half more than seven times. Every time you fold a piece of paper in half, its area is halved and its thickness is doubled. A standard sheet of A4 paper is 300 mm long and about 0.05 mm thick. When you have folded it seven times it is only 2.5 mm long and 6.4 mm thick! The properties of the material itself have not changed, but the new shape makes folding it a challenge.

In 2001, a high school student named Britney Gallivan proved it was possible to fold paper more than ten times. She used an equation to work out the relationships between the number (and type) of folds possible and the paper's initial size and thickness. She had to find a special roll of toilet paper that was 1.2 kilometres long, and then spent hours folding it because it was so long. After 11 folds she had folded it into a slab 80 cm wide and 40 cm high which she folded again to make twelve folds. Of course, toilet paper is thinner than regular A4 paper, but she still needed a very long piece to make the folding possible. More recently a school used over 16 kilometres of toilet paper in order to break this record and fold it 13 times.

## Students' conceptions

Students might believe that the larger a sheet of paper the more times it can be folded. This is because they think size is the limiting factor not the thickness of the sheet. Generally, a sheet of paper, no matter its size or thickness can only be folded around seven times.

Some students might think that objects that have been folded will return to their original shape when they have been released. Materials that are elastic will return to their original shape after being bent or folded. A material with high plasticity or malleability changes shape when bent or folded, but won't return to its original shape after the force is removed. For example, bread dough is a material with high plasticity.

# Equipment

## FOR THE CLASS

- class science journal
- word wall
- team roles chart
- team skills chart
- 1 box of objects made from different materials (see 'Preparation')
- 1 enlarged copy of 'Folding and folding' (Resource sheet 2)
- 1 sheet each of A3 and A4 paper
- 1 sheet of A4 tissue paper
- *optional*: 1 roll of thin toilet paper
- *optional*: digital camera

## FOR EACH TEAM

- each team member's science journal
- role wristbands or badges for Manager and Speaker
- each team member's completed copy of 'Change it!' (Resource sheet 1) from Lesson 1
- 1 copy of 'Folding and folding' (Resource sheet 2)
- 1 sheet each of A3 and A4 paper per team member
- 1 sheet of A4 tissue paper per team member
- *optional*: 1 box of objects made from different materials (see 'Preparation')

## Preparation

- Review the box of objects made from different materials that students can physically change (see Lesson 1, 'Preparation'). Ensure it has objects made from the following materials:
  - metal: a paperclip, a pipe cleaner, florist wire, alfoil, a metal spoon
  - plastic: a plastic straw, a plastic spoon
  - rubber: a rubber band, a balloon
  - wood: a popstick, a stick, a wooden ruler
  - paper: crepe, cardboard, paper towel
  - glass: a marble
  - other: a ball of playdough, a ball of wool, a stone or rock, cotton wool, a piece of cloth, a length of dressmaker's elastic, a piece of sponge.

*Optional*: Create a box with those materials for each team.

- Prepare an 'Observation table' in the class science journal as follows:

Observation table

Object	What is it made of?	Can you bend it?		

**Note:** The extra columns will be used in following lessons

- Prepare an enlarged copy of 'Folding and folding' (Resource sheet 2).
- *Optional*: Display the 'Folding and folding' (Resource sheet 2) and the 'Observation table' in the class science journal in a digital format.

## Lesson steps

- 1 Revise previous lesson using the class science journal and word wall. Discuss students' suggestions of physical changes that could be made to objects made of different materials.



- 2 Ask students to stand up and move parts of their body to demonstrate bending. Ask questions such as:

- What can you bend on your body?
- Can you bend it back again?
- Why do you think that we are able to bend our knees and elbows?
- What words can you think of to describe 'bending'?

Record students' responses in the class science journal.

- 3 Show students the 'Observation table' in the class science journal (see 'Preparation'). 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.



- 4 Ask students to give examples of objects that can be bent from their completed copies of 'Change it' (Resource sheet 1). Record students' answers to the questions in each column of the prepared table in the class science journal (see 'Preparation').



- 5 Draw students' attention to the box of objects. Discuss other objects in it and whether students think they can be bent. Ask students to explore bending those objects and add their findings to the 'Observation table' (see 'Preparation').



SAFETY

Remind students not to apply excessive force to objects. Breaking them could create sharp edges.

Object	What is it made of?	Can you bend it?		
Straw	Plastic	Yes, easily		
Lid	Plastic	Yes, a little		
Lid	Metal	Not really		

Work sample of the 'Observation table' in progress



- 6 Discuss the table in the class science journal, asking questions such as:
  - What happens to objects when you bend them?
  - Why do you think some objects bend more easily than others?
  - Are objects made of \_\_\_\_\_ more likely to bend than others? Why do you think that is?
  - Does being made of \_\_\_\_\_ definitely mean an object is easy to bend? Why do you think that?

- What happened when you stopped bending an object made of \_\_\_\_\_?

Record students' answers in the class science journal.



- 7** Explain that students will be working in collaborative learning teams to investigate how many times different pieces of paper can be folded in half. Discuss and model what 'folding in half' means in the context of this activity.



- 8** Introduce the equipment table and the different pieces of paper that they will be investigating. Ask questions such as:

- How many times do you think the A4 piece of paper can be folded in half?
- Do you think that the A3 piece of paper can be folded in half more, less or the same number of times as the A4 paper? Why do you think that?
- Do you think that the A4 piece of tissue paper can be folded in half more, less or the same number of times as the A4 piece of standard paper? Why do you think that?

Record students' predictions in the class science journal.

- 9** Introduce the enlarged copy of 'Folding and folding' (Resource sheet 3). Explain that one team member will cut the sheet in half so that each team member has a table to complete. Model how to complete the table using a small piece of paper.



- 10** Form teams and allocate roles. Ask Managers to collect team equipment. If students are using collaborative learning teams for the first time, introduce and explain the teams' 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 has.

Allow time for teams to complete the activity.


Folding and folding		
Name: <u>Aly</u> Date: <u>Fri 3rd</u>		
How many times can you fold a piece of paper in half?		
Paper	What I predict	What I found out
Big A3	100	6
Medium A4	50	6
Small A5	7	6


**Work sample of 'Folding and folding' (Resource sheet 2)**



- 11** Ask Speakers to present their team's results. Ask questions such as:
- Did your results match your predictions? Why or Why not?
  - What surprised you when you did the investigation?

Record each team's results in the class science journal.

-  **12** As a class, review the investigation. Ask questions such as:
- How many times did each team fold each of the papers?
  - Were the results of each team the same? If not, why do you think that happened?
  - Why do you think it got harder and harder to fold the piece of paper?
  - What happened to the shape of the paper as you folded it? (it got smaller and thicker).

-  **13** Introduce the claim 'A piece of paper can only be folded about seven times because after that the paper is too thick to fold'. Discuss with students whether their results (evidence) supports that claim.

*Optional:* Use a roll of toilet paper to test the claim or view online videos about the claim: [www.sciencekids.co.nz/videos/experiments/foldingpaper.html](http://www.sciencekids.co.nz/videos/experiments/foldingpaper.html).

- 14** Explain that people have managed to fold paper more than seven times but they used very thin paper in special shapes. Other materials such as gold can be made into much thinner sheets that are easier to fold more than seven times.
- 15** Update the word wall with words and images.

## Curriculum links

### Asia and Australia's engagement with Asia

- Create origami shapes. Read the story of Sadako and the 1000 paper cranes.

### Mathematics

- Explore concepts of 'one half' and what it means for different shapes and axis.

### Science

- Explore folding other thin sheets of different materials, such as aluminium foil.

# Folding and folding

Name: \_\_\_\_\_ Date: \_\_\_\_\_

How many times can you fold a piece of paper in half?

Paper	What I predict	What I found out



Name: \_\_\_\_\_ Date: \_\_\_\_\_

How many times can you fold a piece of paper in half?

Paper	What I predict	What I found out

# Lesson 3 Stretching snakes

## AT A GLANCE

To provide students with hands-on, shared experiences of how the ability to physically change an object through stretching depends on the material it is made of, and that stretching can physically change the material itself.

Students:

- identify objects made from different materials that can be stretched
- observe the elastic properties of a rubber band
- compare the elasticity of different brands of jelly snakes.

## Lesson focus

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

## Assessment focus



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

- objects made from everyday materials can be physically changed by stretching.

## Key lesson outcomes

### Science

Students will be able to:

- identify elastic materials
- make claims about which jelly snake is the most elastic.

### Literacy

Students will be able to:

- make measurements of jelly snakes before and after stretching
- contribute to discussions on stretching objects made from different materials.

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

## Teacher background information

Tensile strength measures the force required to pull or stretch a material to the point where it breaks. The term tensile refers to being under tension or having a stretching force applied. To make a rope that could be used to tow a car, it is useful to use material with high tensile strength so that it does not break.

Materials with high tensile strength do not snap, tear or stretch under tension. Materials that stretch but do not snap have medium tensile strength. Materials with low tensile strength snap or tear easily under tension. Materials that can be stretched without snapping are said to be ductile, for example, chewed chewing gum.

Elastic materials return to their original shape after being stretched. The more elastic they are, the more completely they return to their original shape. The elasticity of a material can depend on the forces being applied to it: how strong they are and/or how long they are applied. Rubber bands are elastic under normal amounts of tensile force, but with repeated use they may stretch out and be less useful for keeping things together.

Many brands of jelly snakes subjected to a gentle stretch will contract back to close to the same length as when they started. They are made of elastic materials, although not as elastic as rubber. Pulled harder than their 'elastic limit' however, they will change shape permanently and/or break. Different brands may require different amounts of force to reach their elastic limit but they generally contract to almost the same length at which they started.

## Equipment

### FOR THE CLASS

- class science journal
- word wall
- team skills chart
- team roles chart
- 1 enlarged copy of 'Stretch it out!' (Resource sheet 3)
- 1 box of objects made from different materials that students can physically change (see 'Preparation', Lesson 1)
- 1 thin, large rubber band
- extra jelly snakes

### FOR EACH TEAM

- each team member's science journal
- role wristbands or badges for Manager and Speaker
- *optional*: 1 box of objects made from different materials that students can physically change (see 'Preparation', Lesson 1)
- 1 copy of 'Stretch it out!' (Resource sheet 3)
- 3 jelly snakes of different brands (see 'Preparation')
- each team member's completed copy of 'Change it!' (Resource sheet 1) from Lesson 1

## Preparation

- Read 'How to write questions for investigation' (Appendix 4).
- Read 'How to conduct a fair test' (Appendix 5).



- Write 'Can you stretch it?' in the next available column of the 'Observation table' in the class science journal (see Lesson 2, 'Preparation') as follows:

**Observation table**

Object	What is it made of?	Can you bend it?	Can you stretch it?	




*Optional:* Start a new table without the 'Can you bend it?' column.

- Collect three different brands of jelly snakes for each team. Cut the jelly snakes so that they are the same length (about 8 cm).

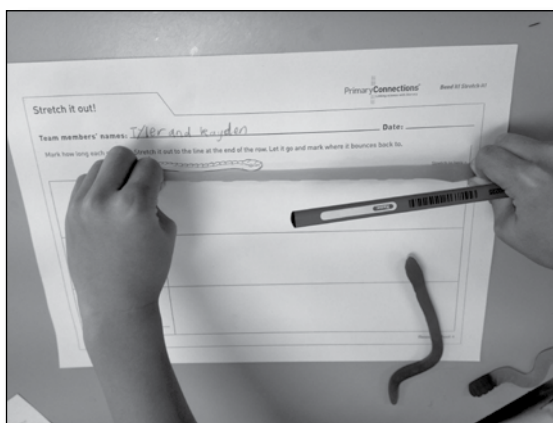
**Note:** If jelly snakes are not available you can substitute with other sweets that are long, thin and malleable, for example, sour worms or soft liquorice. Ensure there are extra jelly snakes so that students can organise to have the same colours of snakes if they want to keep that variable the same.

- *Optional:* Provide students with jelly snakes to eat after the lesson to encourage them not to eat the ones they experiment with for health and hygiene reasons.
- Enlarge a copy of 'Stretch it out!' (Resource sheet 3).
- *Optional:* Display the 'Observation table' in the class science journal and 'Stretch it out!' (Resource sheet 3) in a digital format.



## Lesson steps

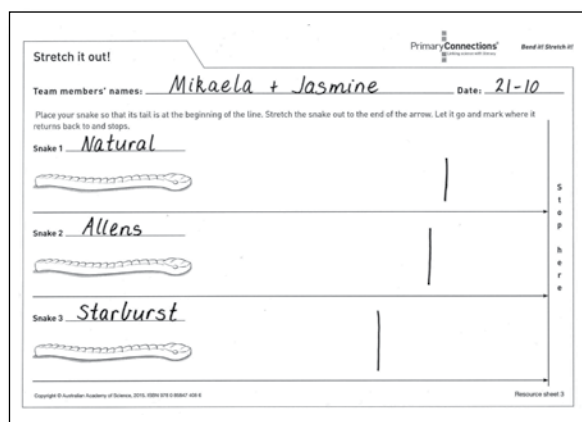
- 1 Review the previous session using the class science journal and word wall. Focus students' attention on the how the shape of paper was changed by folding.
- 2  Ask students to stand up and move parts of their body to demonstrate stretching. Ask questions such as:
  - What can you stretch on your body?
  - What happens when we stretch?
  - What words can you think of to describe 'stretching'?
 Record students' responses in the class science journal.
- 3 Show students the updated 'Observation table' in the class science journal (see 'Preparation'). Review the purpose and features of a table.
- 4  Ask students to give examples of objects that can be stretched from their completed copies of 'Change it' (Resource sheet 1). Record students' answers to the questions in each column of the prepared table.
- 5 Draw students' attention to the box of objects. Discuss other objects in it and whether students think they can be stretched. Ask students to explore stretching those objects and add their findings to the 'Observation table'.
- 6  Discuss the table in the class science journal, asking questions such as:
  - What happens to the objects when we stretch them?
  - Why do you think some objects stretch more easily than others?
  - Are objects made of certain materials more likely to stretch than others? Why do you think that is?

- Does being made of \_\_\_\_\_ definitely mean an object is easy to stretch? Why do you think that?
  - Do the objects go back to their original shape when you let them go? Why or why not?
  - Can you push the objects back into their original shape? Why or why not? Record students' answers in the class science journal.
- 7 Show students the rubber band. Ask students what happens when elastic bands are stretched. Stretch the rubber band and then allow it to bounce back. Discuss what happened when the rubber band was stretched and let go (it went back to its original length).
  - 8 Introduce the term 'elastic' and explain how it means 'to go back to its original form'. Explain that the more elastic something is the more it returns to its original form after being stretched. Discuss how some people describe 'rubber bands' (describing the material from which it is made) as 'elastic bands' (describing the properties of the material). Add the words 'elastic' and 'rubber' to the word wall.
  - 9 Introduce a jelly snake and ask if students think that it is elastic. Explain that students will be working in collaborative learning teams to investigate the elasticity of different brands of jelly snakes answering the question 'Which jelly snake is made from the most elastic material?'
  - 10 *Optional:* Ask students how they think they could find out the answer to the question. Record students' ideas in the class science journal.
  - 11 Show students the three brands of jelly snakes. Discuss the differences in appearance between them. Ask students what words they can think of to describe the look and feel of the snakes. Record students' responses in the class science journal.  
Explain that scientists do not eat the materials that they experiment with for health and hygiene reasons.
  - 12 Introduce the enlarged copy of 'Stretch it out!' (Resource sheet 3).  
Model how teams will:
    - Place the first snake on the sheet on the outline of the snake. Explain that this is like a running race where everyone has to start on the same line so that the race is fair.
    - Hold the tail end and stretch the jelly snake following the arrow by pulling gently until the other end touches the end of the row.
    - Release the jelly snake and wait until the snake stops moving. Mark where the snake stops.



**Student conducting jelly snake investigation**

- 13** Explain that you have cut the snakes so that they are all the same length. Ask students why they think that you have done that (So that the test is fair because all of the snakes are stretched over the same distance).
- 14** Ask students if the test would be fair if:
- The snakes' tails were not placed on the start line
  - We pulled some snakes to the end line and not others
  - We pulled some snakes very hard and others very softly.
-  **15** Ask students to predict what they think will happen and why. Record students' predictions in the class science journal.
-  **16** Form teams and allocate roles. Ask Managers to collect team equipment. Allow time for students to conduct the investigation.









Stretch it out!

PrimaryConnections

Team members' names: Mikaela + Jasmine Date: 21-10




Place your snake so that its tail is at the beginning of the line. Stretch the snake out to the end of the arrow. Let it go and mark where it returns back to and stops.

Snake	Original shape	Stretched shape
Snake 1 <u>Natural</u>		
Snake 2 <u>Allens</u>		
Snake 3 <u>Starburst</u>		

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Resource sheet 3

**Work sample of 'Stretch it out!' (Resource sheet 3)**

-  **17** Ask Speakers to share their team's findings with the class. Ask students to question each other using the 'Science Question starters' (see 'Appendix 6').
-  **18** As a class discuss the results of the investigation, asking questions such as:
- What did we learn about what happens to jelly snakes when they are stretched and then released?
  - How did the shape of the snake change before during and after being stretched?
  - Which snake do most teams think is made from the most elastic material?
  - Why do you think some teams have different results?
-  **19** Discuss what students have learned in today's lesson about making changes to materials and record ideas (claims) in the class science journal. For example:
- 'We can change the shape of some objects by stretching them.'
  - 'If an object is made of elastic material it will go back to its original shape.'
  - 'The more elastic a material is the more it will go back to its original shape.'
- 20** Update the word wall with words and images.

## Curriculum links

### Science

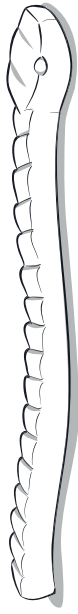
- Investigate the elasticity of different fabrics such as cotton, wool, nylon and lycra.

# Stretch it out!

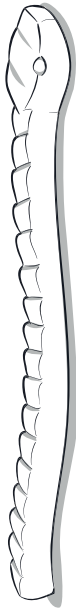
**Team members' names:** \_\_\_\_\_ **Date:** \_\_\_\_\_

Place your snake so that its tail is at the beginning of the line. Stretch the snake out to the end of the arrow. Let it go and mark where it returns back to and stops.

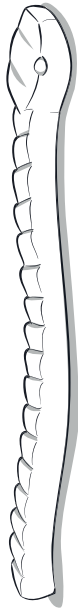
**Snake 1** \_\_\_\_\_



**Snake 2** \_\_\_\_\_



**Snake 3** \_\_\_\_\_



S t o p h e r e

# Lesson 4 All scrunched up

## AT A GLANCE

To provide students with hands-on, shared experiences of how the shapes of objects made of different materials can be physically changed by scrunching, and that the change may not be lasting.

Students:

- identify objects made from different materials that can be scrunched
- work in teams to compare the size of scrunched balls of different sheets of materials commonly found in the kitchen.

## Lesson focus

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

## Assessment focus



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

- objects made from some everyday materials can be physically changed by scrunching.

## Key lesson outcomes

### Science

Students will be able to:

- predict and explore which sheets of material can be scrunched the smallest
- discuss why some sheets of material expand after scrunching.

### Literacy

Students will be able to:

- understand the purpose and features of an annotated drawing
- represent results in an annotated drawing
- participate in discussions about how scrunching affects objects made of different materials.

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

# Teacher background information

Some sheets of material scrunch up better than others. How small the material scrunches up to depends on:

- the properties of the object, in particular the dimensions of the sheet; and
- the properties of the material, for example its plasticity, elasticity and whether it sticks to itself (self-adhesive).

The elasticity of a material reflects its ability to return to its original shape after being deformed through forces such as scrunching or squeezing. A material with high plasticity, for example playdough, changes shape when forces are applied to it and doesn't return to its original shape when the forces are removed.

## Equipment

### FOR THE CLASS

- class science journal
- word wall
- team roles chart
- team skills chart
- 1 box of objects made from different materials that students can physically change (see 'Preparation', Lesson 1)
- 1 enlarged copy of 'Scrunch it!' (Resource sheet 4)
- 1 timer
- *optional*: image of a landfill sit
- *optional*: digital camera

### FOR EACH TEAM

- each team member's science journal
- role wristbands or badges for Manager and Speaker
- approx.10 cm<sup>2</sup> sized pieces of plastic wrap, alfoil and paper towel
- 1 copy of 'Scrunch it!' (Resource sheet 4) per team member
- each team member's completed copy of 'Change it!' (Resource sheet 1) from Lesson 1
- *optional*: 1 box of objects made from different materials that students can physically change (see 'Preparation', Lesson 1)

## Preparation

- Write 'Can you scrunch it' in the next available column of the 'Observation table' in the class science journal (see Lesson 2, 'Preparation') as follows:

Observation table




Object	What is it made of?	Can you bend it?	Can you stretch it?	Can you scrunch it?

*Optional*: Start a new table without the 'Can you bend it?' and 'Can you stretch it' columns.

- Prepare three equal sized pieces of plastic wrap, alfoil and paper towel.
- Prepare dried out balls of playdough ahead for Lesson 6 (see 'Preparation' Lesson 6).
- Prepare an enlarged copy of 'Scrunch it!' (Resource sheet 4).

- *Optional:* Display the 'Observation table' of the class science journal and 'Scrunch it!' (Resource sheet 4) in a digital format.

## Lesson steps

- 1 Revise previous lesson using the class science journal and the word wall. Discuss how some materials can be stretched more than others. Revise what 'elastic' means.
-  2 Show students the updated 'Observation table' in the class science journal (see 'Preparation'). Ask students to give examples of objects that can be scrunched from their completed copies of 'Change it' (Resource sheet 1). Record students' answers to the questions in each column of the table.
-  3 Draw students' attention to the box of objects. Discuss other objects in it and whether students think they can be bent. Ask students to explore scrunching those objects and add their findings to the prepared table.
-  4 Discuss the table in the class science journal, asking questions such as:
  - What happens to objects when you scrunch them?
  - Why do you think some objects scrunch more easily than others?
  - Does being made of \_\_\_\_\_ definitely mean an object is easy to scrunch? Why do you think that?
  - What happened when you stopped scrunching an object made of \_\_\_\_\_?
  - Why do you think some objects returned to their original shape when you let them go?

Record students' answers in the class science journal.
- 5 Introduce the three different materials (see 'Preparation'). Discuss words to describe them, for example alfoil or cling wrap, and what sheets of the materials might be used for and why. Record students' ideas in the class science journal.
- 6 Explain that these materials are often scrunched up once they have been used and thrown away into the rubbish or recycle bin. Discuss with students why this happens, for example, so they take up less space in landfill  
*Optional:* Show students an image of what a landfill looks like
- 7 Explain that students will work in collaborative learning teams to investigate the question 'Which sheet of kitchen material can be scrunched into the smallest ball?'
- 8 Introduce the enlarged copy of 'Scrunch it!' (Resource sheet 4). Read through and discuss.
- 9 Model how students will complete the investigation. Discuss the purpose and features of an annotated drawing.

## Literacy focus

### Why do we use an annotated drawing?

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

### What does an annotated drawing include?

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



- 10 Form teams and allocate roles. Ask Managers to collect team equipment. Allow time for students to conduct the investigation.

### Work sample of 'Scrunch it!' (Resource sheet 4)



- 10 Ask Speakers to share their team's findings with the class. Ask students to question each other using the 'Science Question starters' (see 'Appendix 6').



- 11 As a class discuss the results of the investigation, and ask questions such as:
- Which sheet of material scrunched into the smallest ball straight away? Why do you think that happened?
  - Which ones did not scrunch up very small? Why do you think that happened?
  - Which ones held their shape ten minutes after being scrunched? Why do you think that happened?
  - Which ones did not hold their shape ten minutes after being scrunched? Why do you think that happened?
  - Which sheet of material would be best for wrapping up your lunch? Why do you think that?

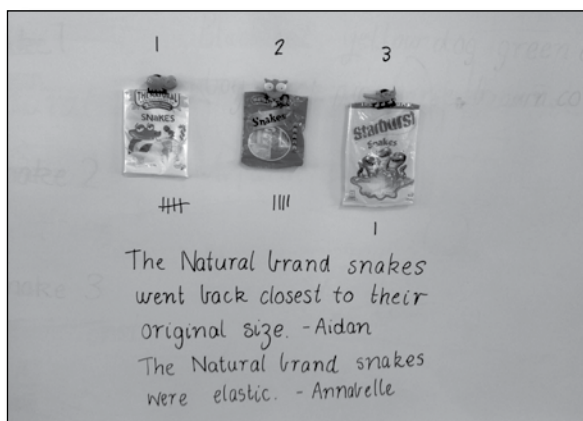
Record students' responses in the class science journal.



- 12 Discuss and record a claim that the class can make based on their results, for example, 'Some materials stay scrunched and other materials return to their original shape after they have been scrunched.'

- 13 Update the word wall with words and images.





**Class results of 'Scrunch it!' (Resource sheet 4)**

## Curriculum links

### Science

- Compare scrunching, twisting, bending and twisting different types of paper.

### Sustainability

- Discuss why people package food and the impact it can have on the environment depending on the packaging choice they make.

# Scrunch it!

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Question:** Which sheet of kitchen material can be scrunched into the smallest ball?

**Materials:** paper towel, plastic wrap, alfoil

I predict that \_\_\_\_\_ can be scrunched into the smallest ball.

Draw or trace the results:

Biggest

Next biggest

Smallest

Wait ten minutes.

Draw or trace the results:

Biggest

Next biggest

Smallest

We found out that:

---



---



---



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# Lesson 5 Changes everywhere

## AT A GLANCE

To support students to represent and explain their understanding of how objects made from everyday materials can be physically changed in a variety of ways.

To introduce current scientific views about physical changes to materials

### Session 1 Looking for changes

Students:

- find examples of changes that are made to objects made from everyday materials at home.

### Session 2 Presenting changes

Students:

- present and explain information from their 'Changing shapes at home' folders
- discuss whether the changes affect the materials or only the objects.

## 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:

- physical changes and their effect on everyday materials and objects.

## Key lesson outcomes

### Science

Students will be able to:

- explain how an object from home was physically changed
- identify that the ability to physically change an object depends on the material that it is made from
- discuss how physical changes that affect objects may not affect material and visa versa.

### Literacy

Students will be able to:

- understand the purpose and features of a flow chart
- create flow charts to explain how a physical change was made to an object
- use oral language to present information.

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

## Teacher background information

In this lesson, students are asked to look for examples of physical changes at home.

A physical change is a change to an object or material that does not alter the substance(s) that it is made of (ie. the molecular composition). In simple terms, for students at this level, they are looking for changes which do not change the material from which object is made from. Examples of physical changes include: changes of state (freezing water into ice, melting chocolate), changes of shape (crumpling a sheet of paper, bending a paperclip, shedding paper, moulding bread dough) and changes caused by mixing.

A chemical change involves a chemical reaction and the creation of a new substance (molecular product). Burning is considered a chemical change as the original material is replaced with different materials. For example, when paper is burnt it is replaced with charcoal, carbon dioxide and water. Rusting is also a chemical change since the original metal, for example iron, is replaced by rust, which is oxidised iron called iron oxide. This has different properties including colour.

# Session 1 Looking for changes

## Equipment

### FOR THE CLASS

- class science journal
- word wall
- 1 box of different objects that students can physically change (see 'Preparation' Lesson 1)
- 1 enlarged copy of 'Information note for families' (Resource sheet 5)

### FOR EACH STUDENT


- 1 'Changes at home' folder
- 1 copy of 'Information note for families' (Resource sheet 5)
- each team member's completed copy of 'Change it!' (Resource sheet 1) from Lesson 1
- *optional*: 1 box of different objects that students can physically change (see 'Preparation' Lesson 1) per team

## Preparation

- Prepare a page in the class science journal with the title 'Actions that cause physical change'.
- Make a 'Changes at home' folder for each student that includes an 'Information note for families' (Resource sheet 5).
- Students will present the information collected in the next session. Write the date for the next session on the 'Information note for families' (Resource sheet 5).
- *Optional*: Display the 'Actions that cause physical change' page of the class science journal and 'Information note for families' (Resource sheet 5) in a digital format.

EXPLAIN

## Lesson steps

- 1 Review the previous lessons using the class science journal and the word wall, focussing students' attention on the definition of physical change as a change where the material remains the same.
- 2 Introduce the prepared page in the class science journal (see 'Preparation'). Discuss with students the different actions they have explored (bend, stretch and scrunch).
- 3  Ask students to suggest other actions that have not been explored so far, such as tearing, twisting or heating without burning. Ask students if they have examples on their completed copies of 'Change it' (Resource sheet 1) or if they can think of new actions for objects in the current box.



- 4 List objects and students' ideas in the prepared page in the class science journal.  
Ask questions such as:
  - What action did you use to change the shape of that object?
  - What happened to the object when you did that?
  - Can the object go back to its original shape? Why or why not?
- 5 Introduce 'Changes at home' folder prepared for each student.
- 6 Introduce the enlarged copy of 'Information note for families' (Resource sheet 5).  
Read through and discuss.
- 7 Explain that students will identify physical changes that happen to objects in their home. Remind students that the objects still need to be made of the same material after the change. Brainstorm actions and changes to objects that students might observe. Record students' ideas in the class science journal.
- 8 Discuss how students could record the changes to the object, for example, by taking a photo, drawing it or bringing it to school.
- 9 Give each student a folder to take home.

# Information note for families

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

## Introducing the 'Changing at home' project

This term, our class is learning about how everyday objects and materials can be physically changed. This means that after the change the object is still made of the same material. For example, a piece of paper that is cut is still a piece of paper.

### Tasks to do

#### Each student is asked to:

- Find an object that is changed in some way during normal household activities.
- Write, draw or photograph the object before and after the change.
- Identify why the object changed and the material it is made from.

#### For example:

- Squeezing the water out of a sponge
- Thawing meat from the freezer
- Stretching a rubber band over a bunch of pencils
- Boiling vegetables

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

Thank you

Class teacher



# Session 2 Presenting changes

## Equipment

### FOR THE CLASS

- class science journal
- word wall
- team roles chart
- team skills chart
- 1 enlarged copy of 'Changes at home' (Resource sheet 6)

### FOR EACH TEAM

- each team member's science journal
- role wristbands or badges for Manager and Speaker
- 1 copy of 'Changes at home' (Resource sheet 6) per team member

## Preparation

- Prepare an enlarged copy of 'Changes at home' (Resource sheet 6).
- *Optional:* Display 'Changes at home' (Resource sheet 6) in a digital format.

## Lesson steps

- 1 Remind students of the task they were given in the previous session.  
*Optional:* If students have not completed the task, allow time for them to identify changes around the school.
- 2 Explain that students will be working in their collaborative learning teams to share their tasks from home about a way that an object was changed.
- 3 Introduce the enlarged copy of 'Changes at home' (Resource sheet 6) and read through with students. Discuss the purpose and features of a flow chart

### Literacy focus


#### Why do we use a flow chart?

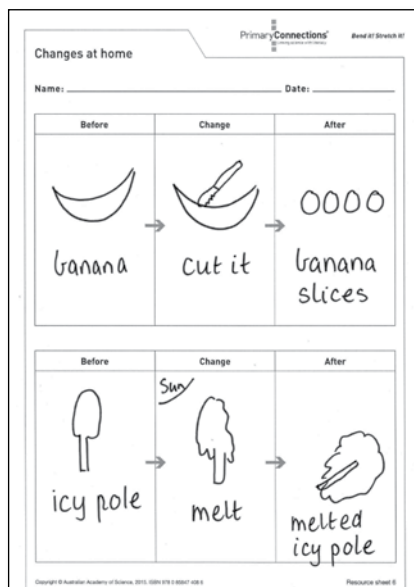
We use a **flow chart** to show the order that things happen in.

#### What does a flow chart include?







A **flow chart** includes a title, pictures and/or words and arrows. The arrows show the order that things happen and might go in a line or in a circle.



- 4 Explain that students will write a word to describe how the change was made in the 'Change' section of the table. Brainstorm possible words and add them to the word wall.
- 5 Model completing an entry on the enlarged copy of 'Changes at home' (Resource sheet 6).
-  6 Reform teams. Ask Managers to collect the equipment. Allow time for teams to complete the activity.






The image shows a worksheet titled 'Changes at home' with a header for 'PrimaryConnections' and 'Bend it! Stretch it!'. It has fields for 'Name:' and 'Date:'. Below are two tables, each with three columns: 'Before', 'Change', and 'After'.

Before	Change	After
 banana	 cut it	 banana slices
 icy pole	 melt	 melted icy pole

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Resource sheet 6

### Work sample of 'Changes at home' (Resource sheet 6)

-  7 Invite teams to make their presentations to the class. Ask questions such as:
  - What material is the object made from?
  - What change did you make?
  - What was different after the change?
-  8 For students who have retained non-scientific ideas, ask questions such as
  - Could you tell me more about that?
  - What do you mean by that?
  - Do other people have different ideas? Why do you think differently?
  - How does your idea compare to theirs?
-  9 Ask students if they have identified any actions which change the material itself, for example heating honey makes it more runny or putting an ice pole in the Sun makes it melt and change its shape.
- 10 Update the word wall with words and images.

# Changes at home

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Before	Change	After

Before	Change	After

# Lesson 6 All dried up

## AT A GLANCE

To support students to plan and conduct an investigation of how the properties of a material (playdough) change as it dries out.

Students:

- investigate how easy it is to change the shape of a ball of playdough the longer it is left to dry out
- discuss observations and 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.

## Assessment focus



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

## Key lesson outcomes

### Science

Students will be able to:

- suggest ways to conduct the investigation
- predict which ball of playdough will be the easiest to change shape
- choose a claim which supports their evidence from the investigation.

### Literacy

Students will be able to:

- record observations in a table
- participate in class discussions.

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

## Teacher background information

Most playdoughs are neither solid nor liquid, but are ‘suspensions’ — a mix of solid and liquid. Many playdough recipes include a starch, such as flour or cornflour, and oil. The particles are mixed or ‘suspended’ in the liquid. The gluten protein molecules in flour are long, strong and flexible, and tangle up when water is added, resulting in a sticky texture that traps bubbles. When the playdough dries out, it loses its pliable consistency. There may be some changes of chemical bonds with the water evaporation but at the level we are considering in this unit it is a physical change.

## Equipment

### FOR THE CLASS

- class science journal
- word wall
- team roles chart
- team skills chart
- 1 enlarged copy of ‘Easy or hard?’ (Resource sheet 7)

### FOR EACH TEAM

- each team member’s science journal
- role wristbands or badges for Manager and Speaker
- three 6 cm size balls of playdough (see ‘Preparation’)
- 1 copy of ‘Easy or hard?’ (Resource sheet 7) per team member

## Preparation

- Read ‘How to write questions for investigation’ (Appendix 4).
- Read ‘How to conduct a fair test’ (Appendix 5).
- Prepare three 6 cm size balls of playdough per team as follows:
  - ball in a sealed container (or wrapped in plastic wrap)
  - ball that has been left out of the container a couple of days
  - ball that has been left out of the container a couple of weeks
- Create three piles of playdough balls, each with a label, for Managers to collect from.
- Draw an investigation planner in the class science journal, allowing sufficient space for text and pictures, as follows:

## Playdough investigation planner

<b>Question:</b> 'How easy it is to change the shape of a ball of playdough the longer it is left out of its container?'		
We will <b>change</b> :		
We will <b>measure</b> :		
We will keep the <b>same</b> :		
What we found out		

- *Optional:* Prepare playdough using recipe below

<p><b>No-cook playdough (per 25 students)</b></p> <p><b>Ingredients:</b></p> <ul style="list-style-type: none"> <li>• 2 cups of salt</li> <li>• 8 cups of plain flour</li> <li>• 8 tspn oil</li> <li>• 8 tspn cream of tartar</li> <li>• 7–8 cups warm water</li> <li>• a few drops of food colouring</li> </ul> <p><b>Method:</b></p> <p>Mix all of the ingredients together then knead well on a floured board until the dough becomes smooth but not sticky.</p>
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

- Prepare the following page in the class science journal:  
**Question:** How easy is it to change the shape of a ball of playdough the longer it is left out of its container?  
**Claim 1:** The longer the playdough is left out of its container the easier it is to change its shape.  
**Claim 2:** The longer the playdough is left out of its container the harder it is to change its shape.  
**Claim 3:** Playdough gets cracks in it when it is left out of its container.
- *Optional:* Display the investigation planner and the claims in a digital format.

## Lesson steps

- 1 Revise the previous lesson using the class science journal and word wall, focussing students' attention on how changes can affect the shape of objects but also the materials that objects are made of.



- 2 Show students the playdough from the box collection of objects. Ask students why they think the playdough is stored in a sealed container. Ask students questions such as:

- Is it easy or hard to change the shape of a piece of playdough straight from the container? Why do you think that?
- Would it be easier or harder to change the shape of a piece of playdough after a few hours? A day? A week? Why do you think that?

Record students' ideas in the class science journal.

- 3 Explain that students will be working in collaborative learning teams to investigate the question: 'How easy it is to change the shape of a ball of playdough the longer it is left out of its container?'.

- 4 Show students the equipment table (see 'Preparation') with labelled groups of balls of playdough that have:

- come straight out of the container
- been left out of the container a couple of days
- been left out of the container a couple of weeks

Discuss with students how to keep track of which ball comes from which pile.

- 5 Remind students about the different ways that they used to change the shapes of objects (scrunch, stretch, bend). Explain that in this investigation teams will use each of the actions to compare how easy it is to change the shape of each ball of playdough.

- 6 Introduce the enlarged copy of 'Easy or hard?' (Resource sheet 7). Discuss words that the teams will use to decide how easy it is to change the shape of a ball of playdough, for example easy, okay, hard, can't do it. Add words to the word wall.



- 7 Ask students what they think (predict) they will find out. Record students' responses in the class science journal.

- 8 Introduce the investigation planner in the class science journal (see 'Preparation'). Read the question for investigation.

- 9 Discuss and record on the investigation planner what the teams will:

- **change:** how long the playdough is left out of its container
- **observe:** how easy it is to change the shape of each ball of playdough
- keep the **same:** the type of playdough, the amount of playdough, the shape of the playdough

- 10 Discuss why it is important to change how long the playdough is out of its container but keep everything else the same. Ask students questions such as:

- Would it be fair if we use different sized balls of playdough? Why or why not?
- Would it be fair if we use different brands of playdough? Why or why not?



- 11 Form teams and allocate roles. Ask Managers to collect team equipment. Allow time for teams to complete the activity.

Easy or hard?		PrimaryConnections <sup>®</sup>		Bend it! Stretch it!	
Team members' names: <u>Walheed + Tamara</u>		Date: <u>Nov 4</u>			
Recording results					
	roll	bend	squash	stretch	
New playdough	easy	easy	easy	easy	
	roll	bend	squash	stretch	
2 day out playdough	easy	easy	okay	okay	
	roll	bend	squash	stretch	
2 week out playdough	hard	hard	can't do it	can't do it	

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Resource sheet 7

### Work sample of 'Easy or hard?' (Resource sheet 7)

- 12 Ask Speakers to share their team's results with the class. Ask students to question each other using the 'Science Question starters' (see 'Appendix 6').
- 13 Ask teams questions such as:
  - What actions did you use to change the shape of the balls of playdough?
  - Which ball of playdough was it the easiest to change the shape of?
  - Which ball of playdough was it the hardest to change the shape of?
  - What do you notice happening in your results?
- 14 Introduce the prepared page in the class science journal (see 'Preparation'). Explain that these are three possible answers (or claims) to the question 'How easy it is to change the shape of a ball of playdough the longer it is left out of its container?'
- 15 Ask students to think about their results (evidence) and choose which claim answers the question.
- 16 Update the word wall with words and images.

## Curriculum links

### Mathematics

- Trace shape of each squashed playdough onto large graph paper. Students count the number of squares covered to compare the area of each.

Easy or hard?

Team members' names: \_\_\_\_\_ Date: \_\_\_\_\_

Recording results

Words to use: easy, okay, hard, can't do it

	roll	bend	squash	stretch
New playdough				

	roll	bend	squash	stretch
_____ day out playdough				

	roll	bend	squash	stretch
_____ week out playdough				



# Lesson 7 Change stories

## AT A GLANCE

To provide opportunities for students to represent what they know about physical changes to objects, and how everyday materials can be changed in a variety of ways.

To provide opportunities for students to reflect on their learning journey during the unit.

Students:

- create a plasticine model
- create an annotated drawing to explain how they changed the shape of a piece of plasticine to make the model
- reflect on their learning journey.

## 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:

- physical changes to objects, and how everyday materials can be changed in a variety of ways.

## Key lesson outcomes

### Science

Students will be able to:

- describe different ways to physically change the shape of a piece of plasticine
- identify physical changes that can affect the materials that objects are made of.

### Literacy

Students will be able to:

- create an annotated drawing about changes made to a piece of plasticine
- reflect on their learning journey.

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

## Equipment

### FOR THE CLASS

- class science journal
- word wall

### FOR EACH STUDENT

- science journal
- plasticine

## Preparation

- *Optional:* Source a short animation video of plasticine being shaped to tell a story.

## Lesson steps

- 1 Review the unit using the class science journal and word wall.
- 2 *Optional:* Show students an animation video of plasticine being shaped to tell a story.
- 3 Ask to students to make a plasticine model and use different actions explored throughout the unit, such as bending, stretching, scrunching, rolling.
- 4 Discuss with students why plasticine is a good choice for this activity.
- 5 Explain that students will create an annotated drawing to show how they changed the plasticine to make the different parts of their model. Revise the purpose and features of an annotated drawing.
- 6 Allow time for students to complete their models and annotated drawings.



**Work sample of a model and annotated drawing**



- 7 Ask students to present their model and annotated drawing to a partner (or the class) and describe how they made the shapes that the model is made from. For example:
  - 'I rolled the plasticine to make the antennae.'
  - 'I squashed small pieces of the plasticine to make the spots for its back.'



**8** Ask students questions such as:

- Was the plasticine still plasticine after you changed its shape? How do you know?
- What could you do to the plasticine that might change the plasticine itself?
- Do you think we could make the plasticine softer/harder? How?
- How could we make the plasticine stickier? What makes you think that?

**9** Review the unit asking students questions such as:

- I really enjoyed ...
- I learned a lot about ...
- In the beginning of the unit I thought ...now I know ...
- I could improve ...
- I'm still wondering about ...
- I would like to know more about ...

# Appendix 1

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

### Introduction

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

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

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

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

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

### Team structure

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

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

### Team roles

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

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

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

### **Manager**

The Manager is responsible for collecting and returning the team's equipment.

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

### **Speaker**

The Speaker is responsible for asking the teacher or another team's Speaker for help.

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

### **Director (Year 3–Year 6)**

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

## **Team skills**

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

Students will practise the following team skills throughout the year:

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

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

## **Supporting equity**

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

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

# TEAM ROLES

## **Manager**

Collects and returns all materials the team needs

## **Speaker**

Asks the teacher and other team speakers for help

# TEAM SKILLS

- 1** Move into your teams quickly and quietly
- 2** Stay with your team
- 3** Take turns

## Appendix 2

### How to use a science journal

#### Introduction

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

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

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

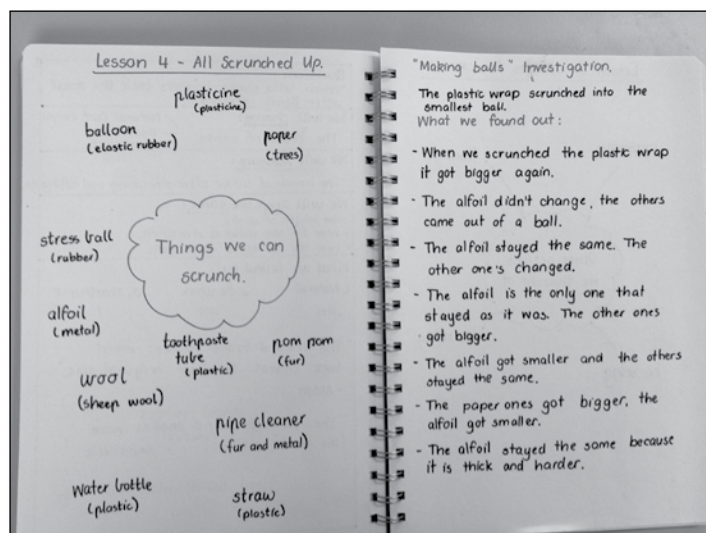
Maintaining a science journal aligns to descriptions in the Australian Curriculum: Science and English. See pages xi and xiii.

#### Using a science journal

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



- 6 In science journal work, you can refer students to display charts, pictures, diagrams, word walls and phrases about the topic displayed around the classroom. Revisit and revise this material during the unit. Explore the vocabulary, visual texts and ideas that have developed from the science unit, and encourage students to use them in their science journals.
- 7 Combine the use of resource sheets with journal entries. After students have pasted their completed resource sheets in their journal, they might like to add their own drawings and reflections
- 8 Use the science journal to assess student learning in both science and literacy. For example, during the *Engage* phase, use journal entries for diagnostic assessment as you determine students' prior knowledge.
- 9 Discuss the importance of entries in the science journal during the *Explain* and *Evaluate* phases. Demonstrate how the information in the journal will help students develop literacy products, such as posters, brochures, letters and oral or written presentations.



***Bend it! Stretch it!* class 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

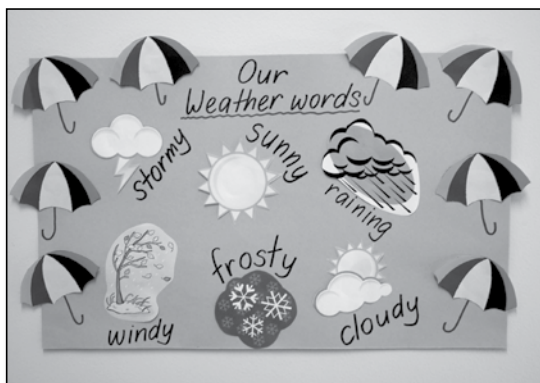
Position the word wall so that students have easy access to the words. They need to be able to see, remove and return word cards to the wall. A classroom could have one main word wall and two or three smaller ones, each with a different focus, for example, high-frequency words.

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.

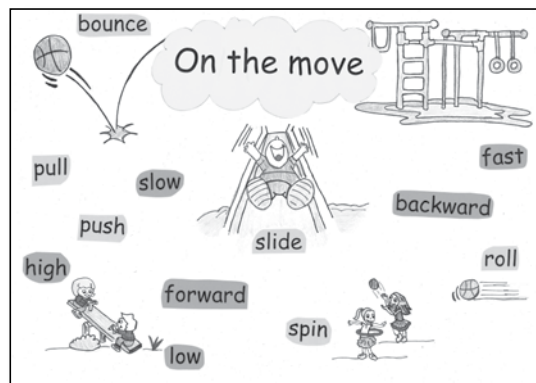
Word walls do not need to be confined to a wall. Use a portable wall, display screen, shower curtain or window curtain. Consider a cardboard shape that fits with the unit, for example, an apple for a needs unit.

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 changing materials unit might be organised under headings, such as 'Bend', 'Stretch' and 'Scrunch'.



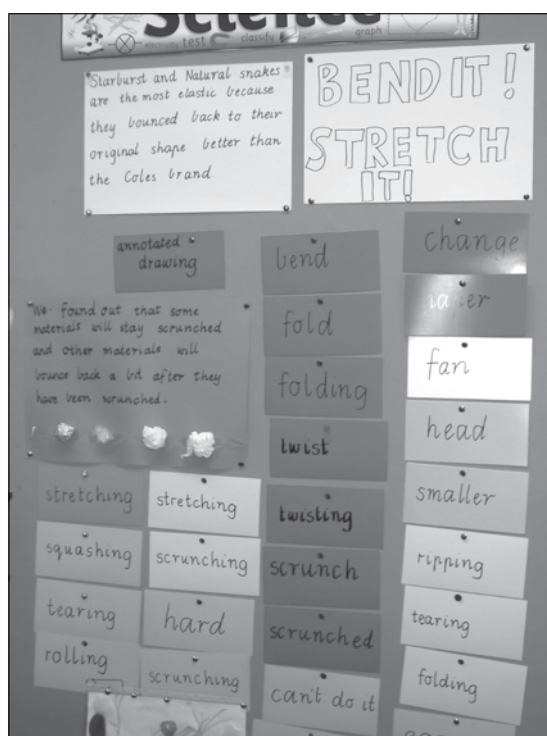
**Weather in my world word wall**



**On the move word wall**

## 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.



**Bend it! Stretch it! word wall**

## Appendix 4

### How to write questions for investigation

#### Introduction

Scientific inquiry and investigation are focused on and driven by questions. Some questions are open to scientific investigation, while others are not. Students often experience difficulty in developing their own questions for investigation.

This appendix explains the structure of questions and how they are related to variables in a scientific investigation. It describes an approach to developing questions for investigation and provides a guide for constructing investigable questions with your students.

Developing their own questions for investigation helps students to have ownership of their investigation and is an important component of scientific literacy.

#### The structure of questions for investigation

The way that a question is posed in a scientific investigation affects the type of investigation that is carried out and the way information is collected. Examples of different types of questions for investigation include:

- How does/do ...?
- What effect does ...?
- Which type of ...?
- What happens to ...?

All science investigations involve *variables*. Variables are things that can be changed, measured or kept the same (controlled) in an investigation.

- The **independent variable** is the thing that is changed during the investigation.
- The **dependent variable** is the thing that is affected by the independent variable, and is measured or observed.
- **Controlled variables** are all the other things in an investigation that could change but are kept the same to make it a fair test.

An example of the way students can structure questions for investigation is:

- What happens to \_\_\_\_\_ when we change \_\_\_\_\_?
- **dependent variable** **independent variable**

The type of question for investigation in *Bend it ! Stretch it!* refers to two variables and the relationship between them, for example, an investigation of the variables that affect how easy it is to change the shape of a material (how malleable/plastic it is). The question for investigation could be:

**Q1: What happens to how easy it is to change the shape of a ball of playdough when we change the amount of water in the playdough?**

In this question, *how easy it is to change the shape of a ball of playdough* depends on *the amount of water in the playdough*. The amount of water in the playdough is the thing that is **changed** (independent variable) and how easy it is to change its shape is the thing that is measured or **observed** (dependent variable).

## Q2: What happens to how easy it is to change the shape of a ball of playdough when it is heated?

In this question, *how easy it is to change the shape of a ball of playdough* depends on *how hot it is*. The temperature of the playdough is the thing that is **changed** (independent variable) and how easy it is to change its shape is the thing that is measured or **observed** (dependent variable).

### Developing questions for investigation

The process of developing questions for investigation in *Bend it! Stretch it!* is to:

- Provide a context and reason for investigating.
- Pose a general focus question in the form of: 'What things might affect \_\_\_\_\_ (**dependent variable**)?'.
- For example, 'What things might affect how easy it is to change the shape of a ball of playdough?'.
- Use questioning to elicit the things (**independent variables**) students think might affect the **dependent variable**, such as the temperature of the playdough, the amount of water in the playdough, how long the playdough is left out of its container
- Each of the **independent variables** can be developed into a question for investigation, for example, the temperature of the playdough. These are the things that might be changed (**independent variables**), which students think will affect the thing that is measured or observed (**dependent variable**).
- Use the scaffold 'What happens to \_\_\_\_\_ when we change \_\_\_\_\_?' to help students develop specific questions for their investigation, for example, 'What happens to how easy it is to change the shape of a ball of playdough if we change the temperature of the playdough?'.
- Ask students to review their question for investigation after they have conducted their investigation and collected and analysed their information.
- Encouraging students to review their question will help them to understand the relationship between what was changed and what was measured in their investigation. It also helps students to see how the information they collected relates to their prediction.

# Appendix 5

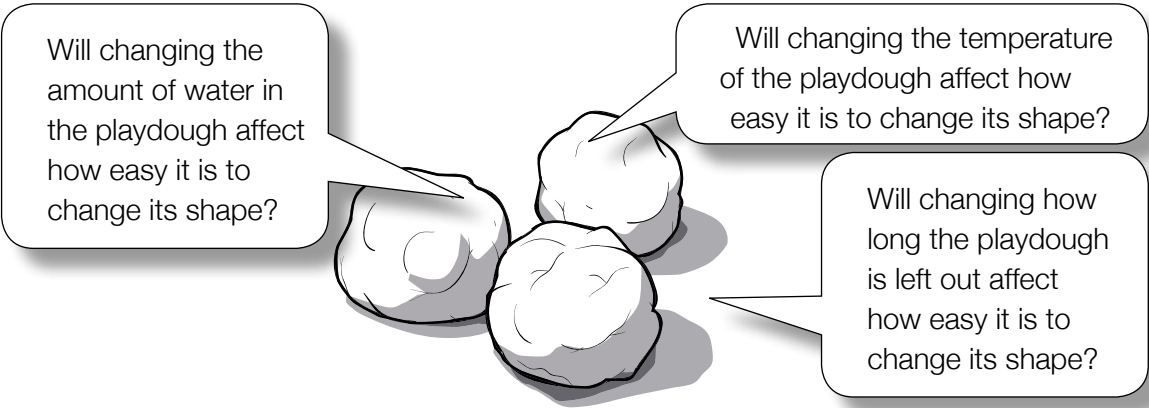
## How to conduct a fair test

### Introduction

Scientific investigations involve posing questions, testing predictions, planning and conducting tests, interpreting and representing evidence, drawing conclusions and communicating findings

### Planning a fair test

In *Bend it! Stretch it!* students investigate how drying out affects the properties of playdough.



All scientific investigations involve variables. Variables are things that can be changed (independent), measured/observed (dependent) or kept the same (controlled) in an investigation. When planning an investigation, to make it a fair test, we need to identify the variables.

It is only by conducting a fair test that students can be sure that what they have changed in their investigation has affected what is being measured/observed.

**Note:** It is not intended that Year 1 students be introduced to the word ‘variable’.

‘**C**ows **M**oo **S**oftly’ is a useful scaffold to remind students how to plan a fair test:

- Cows:** **Change** one thing (independent variable)
- Moo:** **Measure/Observe** another thing (dependent variable) and
- Softly:** keep the other things (controlled variables) the **Same**.

To investigate ‘How easy is it to change the shape of a ball of playdough the longer it is left in its container?’, students could:

<b>CHANGE</b>	how long the playdough is left out of its container	Independent variable
<b>MEASURE/OBSERVE</b>	how easy it is to change the shape of a ball of playdough	Dependent variable
KEEP THE <b>SAME</b>	the type of playdough, the amount of playdough, the shape of the playdough	Controlled variables

## Appendix 6

### How to facilitate evidence-based discussions

#### Introduction

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

In the primary science classroom, argumentation is about students:

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

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

#### Establish norms

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

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

#### Question, Claim, Evidence and Reasoning

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

- Q** What **question** are you trying to answer? For example, 'How easy is it to change the shape of a ball of playdough the longer it is left out of its container?'
- C** The **claim**. For example, 'The longer the playdough is left out of its container the harder it is to change its shape.'
- E** The **evidence**. For example, 'The playdough that stayed in its container was the easiest to change the shape of and the playdough that had been out of its container for 2 weeks was the hardest to change the shape of.'
- R** The **reasoning**. How the evidence supports the claim.  
(Not required at Year 1 level).

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 PrimaryConnections 5Es video, *Elaborate*).

### Science question starters

Question type	Question starter
<b>Asking for evidence</b>	I have a question about _____. How does your evidence support your claim _____? What other evidence do you have to support your claim _____?
<b>Agreeing</b>	I agree with _____ because _____.
<b>Disagreeing</b>	I disagree with _____ because _____. One difference between my idea and yours is _____.
<b>Questioning further</b>	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 _____?
<b>Clarifying</b>	I'm not sure what you meant there. Could you explain your thinking to me again?



# DISCUSSION SKILLS

- 1** Listen when others speak
- 2** Ask questions of each other
- 3** Criticise ideas not people
- 4** Discuss all ideas before selecting one

## Appendix 7

### ***Bend it! Stretch it!*** equipment list

EQUIPMENT ITEM	QUANTITIES	LESSON	1	2	3	4	5	5	6	7	
		SESSION						1	2		
Equipment and materials											
box of different objects that can be physically changed (see 'Preparation' Lesson 1)	1 per class		•	•	•	•	•	•			
box of different objects that can be physically changed (see 'Preparation' Lesson 1), <i>optional</i>	1 per team			•	•	•	•	•			
'Changing shapes at home' folder	1 per student							•			
image of landfill site, optional	1 per class					•					
jelly snakes, 3 different brands	1 of each brand per team				•						
jelly snakes, 3 different brands	extras per class				•						
paper, A3	2 per team, 1 per class			•							
paper, A4	2 per team, 1 per class			•							
paper, A5	1 per class		•								
paper, tissue A4	2 per team, 1 per class			•							
plastic wrap, alfoil, paper towel, approx. 10 cm <sup>2</sup>	1 piece each per team					•					
plasticine	per student									•	
playdough, three 6 cm size balls (see 'Preparation')	per team								•		
rubber band, large, thin	1 per class				•						
timer	1 per class					•					
toilet paper, thin <i>optional</i>	1 per class			•							

EQUIPMENT ITEM	QUANTITIES	LESSON SESSION						
		1	2	3	4	5	5	7
						1	2	
<b>Resource sheets</b>								
'Change it!' (RS1)	1 per student	•						
'Change it!' (RS1), completed copy	1 per student		•	•	•	•		
'Change it!' (RS1), enlarged	1 per class	•	•					
'Folding and folding' (RS2)	2 per team		•					
'Folding and folding' (RS2), enlarged	1 per class		•					
'Stretch it out!' (RS3)	1 per team			•				
'Stretch it out!' (RS3), enlarged	1 per class			•				
'Scrunch it!' (RS4)	2 per team				•			
'Scrunch it!' (RS4), enlarged	1 per class				•			
'Information note for families' (RS5)	1 per student					•		
'Information note for families' (RS5), enlarged	1 per class					•		
'Changes at home' (RS6)	1 per student						•	
'Changes at home' (RS6), enlarged	1 per class						•	
'Easy or hard?' (RS7)	1 per team member							•
'Easy or hard?' (RS7), enlarged	1 per class							•
<b>Teaching tools</b>								
class science journal	1 per class	•	•	•	•	•	•	•
role wristbands or badges for Manager and Speaker	1 set per team		•	•	•	•	•	
student science journal	1 per student	•	•	•	•	•	•	•
team roles chart	1 per class		•	•	•	•	•	
team skills chart	1 per class		•	•	•	•	•	
word wall	1 per class	•	•	•	•	•	•	•
<b>Multimedia</b>								
digital camera <i>optional</i>	1 per class	•	•		•			

## Appendix 8

### Bend it! Stretch it! unit overview

		SCIENCE OUTCOMES*	LITERACY OUTCOMES*	LESSON SUMMARY	ASSESSMENT OPPORTUNITIES
ENGAGE	Lesson 1 Is it possible?	<p>Students will be able to represent their current understanding as they:</p> <ul style="list-style-type: none"><li>list ways to physically change a piece of paper</li><li>discuss whether changes to objects result in changes to the material it is made of</li><li>discuss why we make physical changes to objects</li><li>list ways the change the properties of materials.</li></ul>	<p>Students will be able to:</p> <ul style="list-style-type: none"><li>understand the purpose and features of a science journal</li><li>understand the purpose and features of a word wall</li><li>contribute to discussions about physical changes to objects.</li></ul>	<p>Students:</p> <ul style="list-style-type: none"><li>brainstorm ways to change a piece of paper</li><li>observe how cutting a piece of paper can create a larger shape</li><li>explore physically changing objects made from different materials.</li></ul>	<p><b>Diagnostic assessment</b></p> <ul style="list-style-type: none"><li>Science journal entries</li><li>Class discussions</li><li>‘Change it!’ (Resource sheet 1)</li></ul>
	EXPLORE	Lesson 2 Bend it!	<ul style="list-style-type: none"><li>identify some materials that can be folded</li><li>discuss how the size and thickness of the piece of paper changes with each fold, affecting whether it can be folded.</li></ul>	<ul style="list-style-type: none"><li>understand the purpose and features of a table</li><li>record results in a table</li><li>contribute to discussions on bending objects made of different materials.</li></ul>	<ul style="list-style-type: none"><li>identify objects made from different materials that can be bent or folded</li><li>discuss how different materials and/or shapes affect whether an object can be bent or folded</li><li>investigate how many times sheets of different types of paper can be folded.</li></ul>

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

	SCIENCE OUTCOMES*	LITERACY OUTCOMES*	LESSON SUMMARY	ASSESSMENT OPPORTUNITIES
<b>EXPLORE</b>	<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• identify elastic materials</li> <li>• make claims about which jelly snake is the most elastic.</li> </ul>	<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• make measurements of jelly snakes before and after stretching</li> <li>• contribute to discussions on stretching objects made from different materials.</li> </ul>	<p>Students:</p> <ul style="list-style-type: none"> <li>• identify objects made from different materials that can be stretched</li> <li>• observe the elastic properties of a rubber band</li> <li>• compare the elasticity of different brands of jelly snakes.</li> </ul>	<p><b>Formative assessment</b></p> <ul style="list-style-type: none"> <li>• Science journal entries</li> <li>• Class discussions</li> <li>• ‘Stretch it out!’ (Resource sheet 3)</li> </ul>
<b>EXPLORE</b>	<p><b>Lesson 4</b> All scrunched up</p> <ul style="list-style-type: none"> <li>• predict and explore which sheets of material can be scrunched the smallest</li> <li>• discuss why some sheets of material expand after scrunching.</li> </ul>	<ul style="list-style-type: none"> <li>• understand the purpose and features of an annotated drawing</li> <li>• represent results in an annotated drawing</li> <li>• participate in discussions about how scrunching affects objects made from different materials.</li> </ul>	<ul style="list-style-type: none"> <li>• identify objects made from different materials that can be scrunched</li> <li>• work in teams to compare the size of scrunched balls of different sheets of materials commonly found in the kitchen.</li> </ul>	<p><b>Formative assessment</b></p> <ul style="list-style-type: none"> <li>• Science journal entries</li> <li>• Class discussions</li> <li>• ‘Scrunch it!’ (Resource sheet 4)</li> </ul>

\* These lesson outcomes are aligned to relevant descriptions of the Australian Curriculum. See page xi for Science, page xiii for English and Mathematics.

		SCIENCE OUTCOMES*	LITERACY OUTCOMES*	LESSON SUMMARY	ASSESSMENT OPPORTUNITIES
		Students will be able to:	Students will be able to:	Students:	
EXPLAIN	<b>Lesson 5</b> Changes everywhere	<ul style="list-style-type: none"><li>explain how an object from home was physically changed</li><li>identify that the ability to physically change an object depends on the material it is made from</li><li>discuss how physical changes that affect objects may not affect materials and visa versa.</li></ul>	<ul style="list-style-type: none"><li>understand the purpose and features of a flow chart</li><li>create flow charts to explain how a physical change was made to an object</li><li>use oral language to present information.</li></ul>	<b>Session 1</b> Looking for changes <ul style="list-style-type: none"><li>find examples of changes that are made to objects made from everyday materials at home.</li></ul> <b>Session 2</b> Presenting changes <ul style="list-style-type: none"><li>present and explain information from their 'Changing shapes at home' folders</li><li>discuss whether the changes affect the materials or only the objects.</li></ul>	<b>Formative assessment</b> <ul style="list-style-type: none"><li>Science journal entries</li><li>Class discussions</li><li>'Changes at home' (Resource sheet 6)</li></ul>
ELABORATE	<b>Lesson 6</b> All dried up	<ul style="list-style-type: none"><li>suggest ways to conduct the investigation</li><li>predict which ball of playdough will be the easiest to change shape</li><li>choose a claim which supports their evidence from the investigation.</li></ul>	<ul style="list-style-type: none"><li>record observations in a table.</li><li>participate in class discussions.</li></ul>	<ul style="list-style-type: none"><li>investigate how easy it is to change the shape of a ball of playdough the longer it is left to dry out</li><li>discuss observations and results of the investigation.</li></ul>	<b>Summative assessment</b> of Science Inquiry Skills <ul style="list-style-type: none"><li>Science journal entries</li><li>Class discussions</li><li>'Easy or hard?' (Resource sheet 7)</li></ul>

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

EVALUATE	SCIENCE OUTCOMES*	LITERACY OUTCOMES*	LESSON SUMMARY	ASSESSMENT OPPORTUNITIES
	Students will be able to:	Students will be able to:	Students:	
Lesson 7 Change stories	<ul style="list-style-type: none"><li>describe different ways to physically change the shape of a piece of plasticine</li><li>identify physical changes that can affect the materials that objects are made of.</li></ul>	<ul style="list-style-type: none"><li>create an annotated drawing about changes made to a piece of plasticine</li><li>reflect on their learning journey.</li></ul>	<ul style="list-style-type: none"><li>create a plasticine model</li><li>create an annotated drawing to explain how they changed the shape of a piece of plasticine to make the model</li><li>reflect on their learning journey.</li></ul>	<b>Summative assessment</b> of Science Understanding <ul style="list-style-type: none"><li>Science journal entries</li><li>Class discussions</li><li>Models</li><li>Annotated drawings</li></ul>

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

# 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?	Package it better		Smooth moves
	Among the gum trees			
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