


Alignment with the Australian Curriculum: Science

This *Smooth moves* unit embeds all three strands of the Australian Curriculum: Science. The table below lists sub-strands and their content for Year 4. This unit is designed to be taught in conjunction with other Year 4 units to cover the full range of the Australian Curriculum: Science content for Year 4.

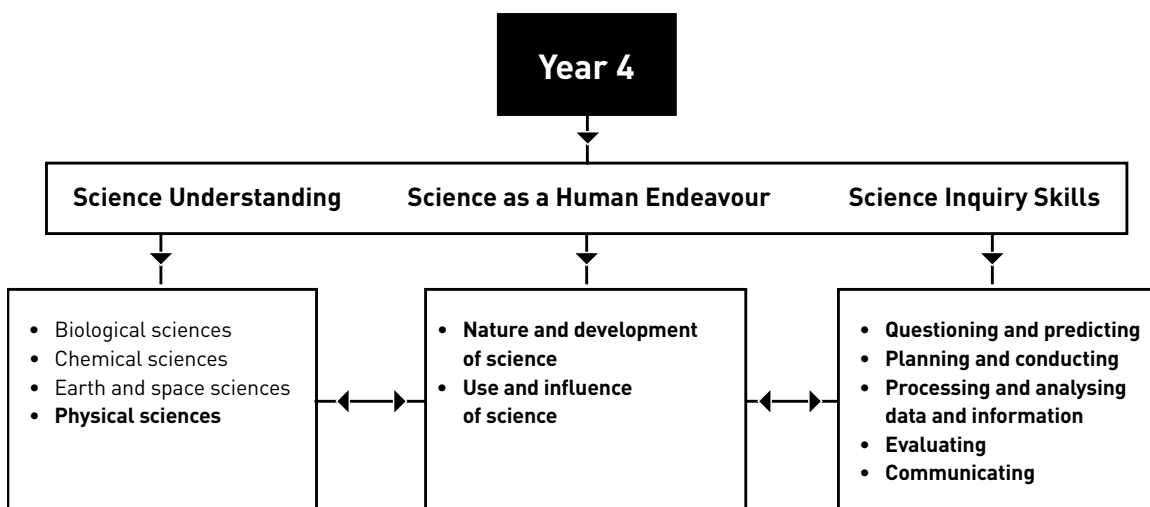
For ease of assessment the table below outlines the sub-strands and their aligned lessons.

Strand	Sub-strand	Code	Year 4 content descriptions	Lessons
Science Understanding	Physical Sciences	ACSSU076	Forces can be exerted by one object on another through direct contact or from a distance	1–7
Science as a Human Endeavour	Nature and development of science	ACSHE061	Science involves making predictions and describing patterns and relationships	1–7
	Use and influence of science	ACSHE062	Science knowledge helps people to understand the effect of their actions	3,4,5,7
Science Inquiry Skills	Questioning and predicting	AC SIS064	With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge	1,2,3,4,6
	Planning and conducting	AC SIS065	Suggest ways to plan and conduct investigations to find answers to questions	3,6
		AC SIS066	Safely use appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate	1,2,3,4,6
	Processing and analysing data and information	AC SIS068	Use a range of methods including tables and simple column graphs to represent data and to identify patterns and trends	6
		AC SIS216	Compare results with predictions, suggesting possible reasons for findings	1,2,3,4,6
	Evaluating	AC SIS069	Reflect on the investigation; including whether a test was fair or not	6
	Communicating	AC SIS071	Represent and communicate ideas and findings in a variety of ways, such as diagrams, physical representations and simple reports	1–7

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

Interrelationship of the science strands

The interrelationship between the three strands—Science Understanding, Science as a Human Endeavour and Science Inquiry Skills—and their sub-strands is shown below. Sub-strands covered in this unit are in bold.



All the terms in this diagram are sourced from the Australian Curriculum.

Relationship to overarching ideas

In the Australian Curriculum: Science, six overarching ideas support the coherence and developmental sequence of science knowledge within and across year levels.

In *Smooth moves*, these overarching ideas are represented by:

Overarching idea	Incorporation in <i>Smooth moves</i>
Patterns, order and organisation	Students observe the movement of everyday objects and identify how forces are affecting the movement. They identify sequences of events and underlying cause and effect, and identify patterns, for example ‘stronger’ pushes make objects of the same mass move further.
Form and function	Students explore how the form of an object affects how it responds to different forces, in particular they identify that greater surface area in contact with other objects or surfaces can increase friction. If a machine’s function is to maximise useful transfer of energy, for example, a bicycle transfers movement of pedals into movement of the whole machine, then its form is designed to minimise friction between parts.
Stability and change	Students identify that different forces can change the movement of objects, either slowing or increasing it, and that it is the sum of these forces that determines whether an object starts, continues or stops moving at a certain speed. They also identify that an object that is not moving has balanced forces acting upon it, for example, the pull of gravity is balanced by the push of the surface the object is resting upon.
Scale and measurement	Students vary the size of the force acting upon objects and then measure the distance travelled using formal measurement. They analyse and compare this data to extrapolate to other scales. Students explore how to represent their understanding of different-sized forces using scaled arrows.
Matter and energy	Students directly experience the phenomenon of movement energy being transferred between objects, affecting the movement of both, for example, the movement energy of a bowling ball being transferred to pins in a bowling game.
Systems	Students describe simple systems of forces acting on objects on Earth and explain them with force-arrow diagrams.

Curriculum focus

The Australian Curriculum: Science is described by year level, but provides advice across four year groupings on the nature of learners. Each year grouping has a relevant curriculum focus.

Curriculum focus Years 3–6	Incorporation in <i>Smooth moves</i>
Recognising questions that can be investigated scientifically and investigating them	Students formulate investigable questions about how various factors affect the movement of objects. They investigate forces that affect the movement of objects, using fair tests. They identify forces which act directly or from a distance, and represent their understanding in a variety of ways.

Achievement standards

The achievement standards of the Australian Curriculum: Science indicate the quality of learning that students typically demonstrate by a particular point in their schooling, for example, at the end of a year level. These standards will be reviewed regularly by ACARA and are available on the ACARA website.





By the end of this unit, teachers will be able to make evidence-based judgments on whether the students are achieving below, at or above the Australian Curriculum: Science Year 4 achievement standard.

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 units. For further information see: www.australiancurriculum.edu.au

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

Smooth moves—Australian Curriculum general capabilities

General capabilities	Australian Curriculum description	Smooth moves examples
Literacy	<p>Literacy knowledge specific to the study of science develops along with scientific understanding and skills.</p> <p>Primary Connections 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.</p>	<p>In <i>Smooth moves</i> the literacy focuses are:</p> <ul style="list-style-type: none"> • annotated drawings • science journals • word walls • storyboards • role-plays • narratives • force-arrow diagrams • tables • graphs.
 Numeracy	<p>Elements of numeracy are particularly evident in Science Inquiry Skills. These include practical measurement and the collection, representation and interpretation of data.</p>	<p>Students:</p> <ul style="list-style-type: none"> • collect, represent and interpret data through tables and graphs • measure distances objects move when subject to different-sized forces • use force-arrow diagrams to indicate size and direction of forces in everyday examples.
Information and communication technology (ICT) competence	<p>ICT competence is particularly evident in Science Inquiry Skills. Students use digital technologies to investigate, create, communicate, and share ideas and results.</p>	<p>Students are given optional opportunities to:</p> <ul style="list-style-type: none"> • use interactive resource technology to view, record and discuss information • communicate with a school in another country to discuss what they know about gravity in the world.
 Critical and creative thinking	<p>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.</p>	<p>Students:</p> <ul style="list-style-type: none"> • use reasoning to develop questions for inquiry • formulate, pose and respond to questions • consider different ways of thinking about forces, such as pushes, pulls, friction and gravity • make evidence-based claims about forces and motion.
Ethical behaviour	<p>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.</p>	<p>Students:</p> <ul style="list-style-type: none"> • ask questions respecting each other's point of view.
 Personal and social competence	<p>Students develop personal and social competence as they learn to work effectively in teams, develop collaborative methods of inquiry, work safely, and use their scientific knowledge to make informed choices.</p>	<p>Students:</p> <ul style="list-style-type: none"> • work collaboratively in teams • listen to and follow instructions to safely complete investigations • participate in discussions.
 Intercultural understanding	<p>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.</p>	<ul style="list-style-type: none"> • 'Cultural perspectives' opportunities are highlighted. • Important contributions made to science by people from a range of cultures are highlighted where relevant.

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 this unit as described below. For further information see: www.australiancurriculum.edu.au/CrossCurriculumPriorities



Aboriginal and Torres Strait Islander histories and cultures

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

Smooth moves focuses on the Western science way of making evidence-based claims about the movement of objects in their environment. Students explore forces, such as pushes, pulls, friction, gravity and magnetism, and how the movement or shape of objects can be understood through the interaction of different forces on an object. They perform fair test investigations about how the size of a force acting on an object can affect its movement.

Aboriginal and Torres Strait Islander Peoples might have other explanations for the observations of objects changing motion, direction or shape, particularly as forces, such as gravity and magnetism, can only be explored through the effects they have on objects (they cannot be seen).

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

Sustainability

The *Smooth moves* unit provides opportunities for students to develop an understanding of how forces act upon objects on Earth, including direct forces, such as pushes and pulls, as well as forces which act at a distance such as gravity. Through investigating how the available surface area of an object affects the amount of friction an object experiences, students describe how well designed machines are more efficient. Students also experience the effect of gels on reducing friction. This can assist them to develop knowledge, skills and values for making decisions about individual and community actions that contribute to sustainable and conservative patterns of energy use, for example, keeping machinery well oiled to reduce friction and therefore wear and tear, and maintain efficiency.

Alignment with the Australian Curriculum: English and Mathematics

Strand	Sub-strand	Code	Year 4 content descriptions	Lessons
English– Language	Language variation and change	ACELA1487	Understand that Standard Australian English is one of many social dialects used in Australia, and that while it originated in England it has been influenced by many other languages	1–7
	Language for interaction	ACELA1488	Understand that social interactions influence the way people engage with ideas and respond to others for example when exploring and clarifying the ideas of others, summarising students' own views and reporting them to a larger group	1–7
		ACELA1489	Understand the differences between the language of opinion and feeling and the language of factual reporting or recording	1–7
	Text structure and organisation	ACELA1490	Understand how texts vary in complexity and technicality depending on the approach to the topic, the purpose and the intended audience	1
	Expressing and developing ideas	ACELA1498	Incorporate new vocabulary from a range of sources into students' own texts including vocabulary encountered in research	1–7
English– Literacy	Interacting with others	ACELY1687	Interpret ideas and information in spoken texts and listen for key points in order to carry out tasks and use information to share and extend ideas and information	1–7
		ACELY1688	Use interaction skills such as acknowledging another's point of view and linking students' response to the topic, using familiar and new vocabulary and a range of vocal effects such as tone, pace, pitch and volume to speak clearly and coherently	1–7
		ACELY1689	Plan, rehearse and deliver presentations incorporating learned content and taking into account particular purposes and audiences	5, 7
	Creating texts	ACELY1694	Plan, draft and publish imaginative, informative and persuasive texts containing key information and supporting details for a widening range of audiences, demonstrating increasing control over text structures and language features	2, 7
English– Literature	Creating literature	ACELT1607	Create literary texts that explore students' own experiences and imagining.	5