The Australian Curriculum

Subjects	Science
Year levels	Foundation Year,Year 1,Year 2,Year 3,Year 4,Year 5,Year 6,Year 7,Year 8,Year 9,Year 10

acara AUSTRALIAN CURRICULUM, ASSESSMENT AND REPORTING AUTHORITY

Table of Contents

The Australian Curriculum

Science

Science - How the Subject works

Rationale

Science provides an empirical way of answering interesting and important questions about the biological, physical and technological world. The knowledge it produces has proved to be a reliable basis for action in our personal, social and economic lives. Science is a dynamic, collaborative and creative human endeavour arising from our desire to make sense of our world through exploring the unknown, investigating universal mysteries, making predictions and solving problems. Science aims to understand a large number of observations in terms of a much smaller number of broad principles. Science knowledge is contestable and is revised, refined and extended as new evidence arises.

The Australian Curriculum: Science provides opportunities for students to develop an understanding of important science concepts and processes, the practices used to develop scientific knowledge, of science's contribution to our culture and society, and its applications in our lives. The curriculum supports students to develop the scientific knowledge, understandings and skills to make informed decisions about local, national and global issues and to participate, if they so wish, in science-related careers.

In addition to its practical applications, learning science is a valuable pursuit in its own right. Students can experience the joy of scientific discovery and nurture their natural curiosity about the world around them. In doing this, they develop critical and creative thinking skills and challenge themselves to identify questions and draw evidence-based conclusions using scientific methods. The wider benefits of this 'scientific literacy' are well established, including giving students the capability to investigate the natural world and changes made to it through human activity.

The ability to think and act in scientific ways helps build the broader suite of capabilities in students as confident, self-motivated and active members of our society.

Aims

The Australian Curriculum: Science aims to ensure that students develop:

- an interest in science as a means of expanding their curiosity and willingness to explore, ask questions about and speculate on the changing world in which they live
- an understanding of the vision that science provides of the nature of living things, of Earth and its place in the cosmos, and of the physical and chemical processes that explain the behaviour of all material things
- an understanding of the nature of scientific inquiry and the ability to use a range of scientific inquiry methods, including questioning; planning and conducting experiments and investigations based on ethical principles; collecting and analysing data; evaluating results; and drawing critical, evidence-based conclusions
- an ability to communicate scientific understanding and findings to a range of audiences, to

justify ideas on the basis of evidence, and to evaluate and debate scientific arguments and claims
- an ability to solve problems and make informed, evidence-based decisions about current and future applications of science while taking into account ethical and social implications of decisions
- an understanding of historical and cultural contributions to science as well as contemporary science issues and activities and an understanding of the diversity of careers related to science
- a solid foundation of knowledge of the biological, chemical, physical, earth and space sciences, including being able to select and integrate the scientific knowledge and methods needed to explain and predict phenomena, to apply that understanding to new situations and events, and to appreciate the dynamic nature of science knowledge.

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, as shown Figure 1 below. These are embedded within each year level description and guide the teaching/learning emphasis for the relevant year level.

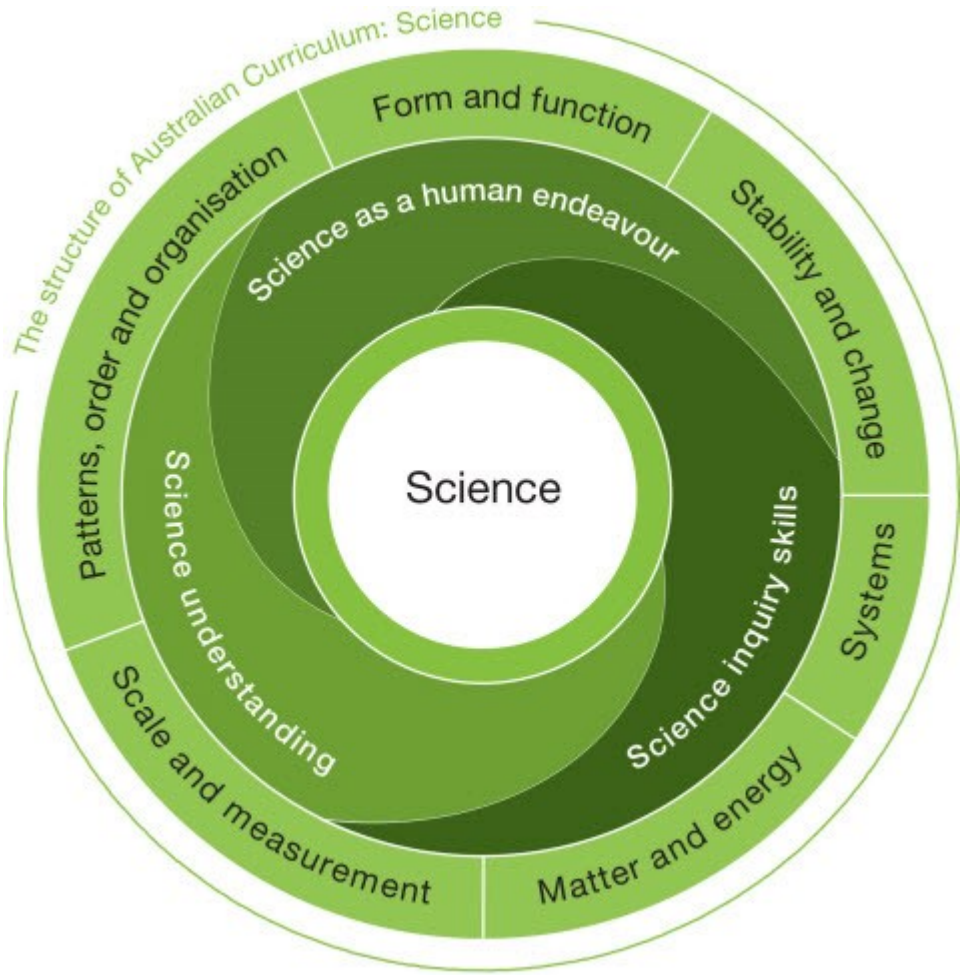


Figure 1: Key ideas of the science curriculum

These key ideas are designed to support the coherence and developmental sequence of science knowledge within and across year levels. The key ideas frame the development of concepts in the science understandingstrand, support key aspects of the science inquiry skills strand and contribute to developing students' appreciation of the nature of science.

The six key ideas that frame the Australian Curriculum: Science are:

Patterns, order and organisation

An important aspect of science is recognising patterns in the world around us, and ordering and organising phenomena at different scales. As students progress from Foundation to Year 10, they build skills and understanding that will help them to observe and describe patterns at different scales, and develop and use classifications to organise events and phenomena and make predictions. Classifying objects and events into groups (such as solid/liquid/gas or living/non-living) and developing criteria for those groupings relies on making observations and identifying patterns of similarity and difference.

As students progress through the primary years, they become more proficient in identifying and describing the relationships that underpin patterns, including cause and effect. Students increasingly recognise that scale plays an important role in the observation of patterns; some patterns may only be evident at certain time and spatial scales. For example, the pattern of day and night is not evident over the time scale of an hour.

Form and function

Many aspects of science are concerned with the relationships between form (the nature or make-up of an aspect of an object or organism) and function (the use of that aspect).

As students progress from Foundation to Year 10, they see that the functions of both living and non-living objects rely on their forms. Their understanding of forms such as the features of living things or the nature of a range of materials, and their related functions or uses, is initially based on observable behaviours and physical properties. In later years, students recognise that function frequently relies on form and that this relationship can be examined at many scales. They apply an understanding of microscopic and atomic structures, interactions of force and flows of energy and matter to describe relationships between form and function.

Stability and change

Many areas of science involve the recognition, description and prediction of stability and change. Early in their schooling, students recognise that in their observations of the world around them, some properties and phenomena appear to remain stable or constant over time, whereas others change.

As they progress from Foundation to Year 10, they also recognise that phenomena (such as properties of objects and relationships between living things) can appear to be stable at one spatial or time scale, but at a larger or smaller scale may be seen to be changing. They begin to appreciate that stability can be the result of competing, but balanced forces. Students become increasingly adept at quantifying change through measurement and looking for patterns of change by representing and analysing data in tables or graphs.

Scale and measurement

Quantification of time and spatial scale is critical to the development of science understanding as it enables the comparison of observations. Students often find it difficult to work with scales that are outside

their everyday experience – these include the huge distances in space, the incredibly small size of atoms and the slow processes that occur over geological time.

As students progress from Foundation to Year 10, their understanding of relative sizes and rates of change develops and they are able to conceptualise events and phenomena at a wider range of scales. They progress from working with scales related to their everyday experiences and comparing events and phenomena using relative language (such as 'bigger' or 'faster') and informal measurement, to working with scales beyond human experience and quantifying magnitudes, rates of change and comparisons using formal units of measurement.

Matter and energy

Many aspects of science involve identifying, describing and measuring transfers of energy and/or matter. As students progress through Foundation to Year 10, they become increasingly able to explain phenomena in terms of the flow of matter and energy.

Initially, students focus on direct experience and observation of phenomena and materials. They are introduced to the ways in which objects and living things change and begin to recognise the role of energy and matter in these changes. In later years, they are introduced to more abstract notions of particles, forces and energy transfer and transformation. They use these understandings to describe and model phenomena and processes involving matter and energy.

Systems

Science frequently involves thinking, modelling and analysing in terms of systems in order to understand, explain and predict events and phenomena. As students progress through Foundation to Year 10, they explore, describe and analyse increasingly complex systems.

Initially, students identify the observable components of a clearly identified ‘whole’ such as features of plants and animals and parts of mixtures. Over Years 3 to 6, they learn to identify and describe relationships between components within simple systems, and they begin to appreciate that components within living and non-living systems are interdependent. In Years 7 to 10, they are introduced to the processes and underlying phenomena that structure systems such as ecosystems, body systems and the carbon cycle. They recognise that within systems, interactions between components can involve forces and changes acting in opposing directions and that for a system to be in a steady state, these factors need to be in a state of balance or equilibrium. They are increasingly aware that systems can exist as components within larger systems, and that one important part of thinking about systems is identifying boundaries, inputs and outputs.

Structure

The three interrelated strands of science

The Australian Curriculum: Science has three interrelated strands: science understanding, science as a human endeavour and science inquiry skills.

Together, the three strands of the science curriculum provide students with understanding, knowledge and skills through which they can develop a scientific view of the world. Students are challenged to explore

science, its concepts, nature and uses through clearly described inquiry processes.

Science understanding

Science understanding is evident when a person selects and integrates appropriate science knowledge to explain and predict phenomena, and applies that knowledge to new situations. Science knowledge refers to facts, concepts, principles, laws, theories and models that have been established by scientists over time. This strand provides the content through which the key ideas of science and skills are developed within contexts appropriate to the learners.

The science understanding strand comprises four sub-strands. The content is described by year level.

Biological sciences

The biological sciences sub-strand is concerned with understanding living things. The key concepts developed within this sub-strand are that: a diverse range of living things have evolved on Earth over hundreds of millions of years; living things are interdependent and interact with each other and their environment; and the form and features of living things are related to the functions that their body systems perform.

Through this sub-strand, students investigate living things, including animals, plants and microorganisms, and their interdependence and interactions within ecosystems. They explore their life cycles, body systems, structural adaptations and behaviours, how these features aid survival, and how their characteristics are inherited from one generation to the next. Students are introduced to the cell as the basic unit of life and the processes that are central to its function.

Chemical sciences

The chemical sciences sub-strand is concerned with understanding the composition and behaviour of substances. The key concepts developed within this sub-strand are that: the chemical and physical properties of substances are determined by their structure at an atomic scale; substances change and new substances are produced by rearranging atoms through atomic interactions and energy transfer.

In this sub-strand, students classify substances based on their properties, such as solids, liquids and gases, or their composition, such as elements, compounds and mixtures. They explore physical changes such as changes of state and dissolving, and investigate how chemical reactions result in the production of new substances. Students recognise that all substances consist of atoms which can combine to form molecules, and chemical reactions involve atoms being rearranged and recombined to form new substances. They explore the relationship between the way in which atoms are arranged and the properties of substances, and the effect of energy transfers on these arrangements.

Earth and space sciences

The earth and space sciences sub-strand is concerned with Earth’s dynamic structure and its place in the cosmos. The key concepts developed within this sub-strand are that: Earth is part of a solar system that is part of a larger universe; Earth is subject to change within and on its surface, over a range of timescales as a result of natural processes and human use of resources.

Through this sub-strand, students view Earth as part of a solar system, which is part of a galaxy, which is one of many in the universe, and explore the immense scales associated with space. They explore how changes on Earth, such as day and night and the seasons, relate to Earth’s rotation and its orbit around the sun. Students investigate the processes that result in change to Earth’s surface, recognising that Earth has evolved over 4.5 billion years and that the effect of some of these processes is only evident when

viewed over extremely long timescales. They explore the ways in which humans use resources from Earth and appreciate the influence of human activity on the surface of Earth and its atmosphere.

Physical sciences

The physical sciences sub-strand is concerned with understanding the nature of forces and motion, and matter and energy. The two key concepts developed within this sub-strand are that: forces affect the behaviour of objects; energy can be transferred and transformed from one form to another.

Through this sub-strand, students gain an understanding of how an object's motion (direction, speed and acceleration) is influenced by a range of contact and non-contact forces such as friction, magnetism, gravity and electrostatic forces. They develop an understanding of the concept of energy and how energy transfer is associated with phenomena involving motion, heat, sound, light and electricity. They appreciate that concepts of force, motion, matter and energy apply to systems ranging in scale from atoms to the universe itself.

Science as a human endeavour

Through science, humans seek to improve their understanding and explanations of the natural world. Science involves the construction of explanations based on evidence and science knowledge can be changed as new evidence becomes available. Science influences society by posing, and responding to, social and ethical questions, and scientific research is itself influenced by the needs and priorities of society.

This strand highlights the development of science as a unique way of knowing and doing, and the importance of science in contemporary decision-making and problem-solving. It acknowledges that in making decisions about science practices and applications, ethical and social implications must be taken into account. This strand also recognises that science advances through the contributions of many different people from different cultures and that there are many rewarding science-based career paths. This strand provides context and relevance to students and to our broader community.

The content in the science as a human endeavour strand is described in two-year bands. There are two sub-strands of science as a human endeavour. These are:

Nature and development of science: This sub-strand develops an appreciation of the unique nature of science and scientific knowledge, including how current knowledge has developed over time through the actions of many people.

Use and influence of science: This sub-strand explores how science knowledge and applications affect peoples' lives, including their work, and how science is influenced by society and can be used to inform decisions and actions.

Science inquiry skills

Science inquiry involves identifying and posing questions; planning, conducting and reflecting on investigations; processing, analysing and interpreting evidence; and communicating findings. This strand is concerned with evaluating claims, investigating ideas, solving problems, drawing valid conclusions and developing evidence-based arguments. The skills students develop give them the tools they need to achieve deeper understanding of the science concepts and how scientific thinking applies to these understandings.

Science investigations are activities in which ideas, predictions or hypotheses are tested and conclusions

are drawn in response to a question or problem. Investigations can involve a range of activities, including experimental testing, field work, locating and using information sources, conducting surveys, and using modelling and simulations. The choice of the approach taken will depend on the context (science as a human endeavour) and subject of the investigation (science understanding).

In science investigations, collection and analysis of primary data and evidence play a major role. This can involve collecting or extracting information and reorganising data in the form of tables, graphs, flow charts, diagrams, prose, keys, spreadsheets and databases. Students will also develop their understandings through the collection and analysis of secondary data and information.

The content in the science inquiry skillsstrand is described in two-year bands. There are five sub-strands of science inquiry skills. These are:

Questioning and predicting: Identifying and constructing questions, proposing hypotheses and suggesting possible outcomes.

Planning and conducting: Making decisions about how to investigate or solve a problem and carrying out an investigation, including the collection of data.

Processing and analysing data and information: Representing data in meaningful and useful ways; identifying trends, patterns and relationships in data, and using this evidence to justify conclusions.

Evaluating: Considering the quality of available evidence and the merit or significance of a claim, proposition or conclusion with reference to that evidence.

Communicating: Conveying information or ideas to others through appropriate representations, text types and modes.

Relationship between the strands

In the practice of science, the three strands of science understanding, science as a human endeavour and science inquiry skills are closely integrated; the work of scientists reflects the nature and development of science, is built around scientific inquiry and seeks to respond to and influence society's needs. Students' experiences of school science should mirror and connect to this multifaceted view of science.

To achieve this, the three strands of the Australian Curriculum: Science should be taught in an integrated way. The content descriptions of the three strands have been written so that at each year this integration is possible. In the earlier years, the nature and development of science sub-strand within the science as a human endeavour strand focuses on scientific inquiry. This enables students to make clear connections between the inquiry skills that they are learning and the work of scientists. As students progress through the curriculum they investigate how science understanding has developed, including considering some of the people and the stories behind these advances in science.

They will also recognise how this science understanding can be applied to their lives and the lives of others. As students develop a more sophisticated understanding of the knowledge and skills of science they are increasingly able to appreciate the role of science in society. The content of the science understanding strand will inform students' understanding of contemporary issues such as climate change, use of resources, medical interventions, biodiversity and the origins of the universe. The importance of these areas of science can be emphasised through the context provided by the science as a human endeavour strand, and students can be encouraged to view contemporary science critically through aspects of the science inquiry skills strand; for example, by analysing, evaluating and communicating.

Science Scope and Sequence (PDF)

Resources and support materials for the Australian Curriculum: Science are available as PDF documents.

Science: Sequence of content

Science: Sequence of achievement

The Australian Curriculum

Science

Curriculum F-10

Foundation Year Level Description

The Science content includes the three strands of science understanding, science inquiry skills and science as a human endeavour. The three strands of the curriculum are interrelated and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching and learning programs are decisions to be made by the teacher.

Incorporating the key ideas of science

From Foundation to Year 2, students learn that observations can be organised to reveal patterns, and that these patterns can be used to make predictions about phenomena.

In Foundation, students observe and describe the behaviours and properties of everyday objects, materials and living things. They explore change in the world around them, including changes that impact on them, such as the weather, and changes they can effect, such as making things move or change shape. They learn that seeking answers to questions they pose and making observations is a core part of science and use their senses to gather different types of information.

Foundation Year Content Descriptions

Science Understanding

Biological sciences

Living things have basic needs, including food and water (ACSSU002 - Scootle)

Elaborations

recognising how Aboriginal and Torres Strait Islander Peoples care for living things

identifying the needs of humans such as warmth, food and water, using students' own experiences

recognising the needs of living things in a range of situations such as pets at home, plants in the garden or plants and animals in bushland

comparing the needs of plants and animals

Chemical sciences

Objects are made of materials that have observable properties (ACSSU003 - Scootle)

Elaborations

sorting and grouping materials on the basis of observable properties such as colour, texture and flexibility

thinking about how the materials used in buildings and shelters are suited to the local environment

investigating different forms of clothing used for different activities

comparing the traditional materials used for clothing from around the world

Earth and space sciences

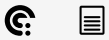
Daily and seasonal changes in our environment affect everyday life (ACSSU004 - Scootle)

Elaborations

learning how Aboriginal and Torres Strait Islander Peoples' concepts of time and weather patterns explain how things happen in the world around them

linking the changes in the daily weather to the way we modify our behaviour and dress for different conditions, including examples from different cultures

investigating how changes in the weather might affect animals such as pets, animals that hibernate, or migratory animals



Physical sciences

The way objects move depends on a variety of factors, including their size and shape (ACSSU005 - Scootle)

Elaborations

exploring how the size and shape of traditional instructive toys used by Aboriginal and Torres Strait Islander Peoples influence their movement

observing the way different shaped objects such as balls, blocks and tubes move

comparing the way different sized, but similar shaped, objects such as tennis balls, golf balls, marbles and basketballs roll and bounce

observing how the movement of different living things depends on their size and shape

Science as a Human Endeavour

Nature and development of science

Science involves observing, asking questions about, and describing changes in, objects and events (ACSHE013 - Scootle)

Elaborations

recognising how Aboriginal and Torres Strait Islander Peoples gain knowledge about the land and its vital resources, such as water and food, through observation

recognising that observation is an important part of exploring and investigating the things and places around us

sharing observations with others and communicating their experiences



exploring and observing using the senses: hearing, smell, touch, sight and taste

Science Inquiry Skills

Questioning and predicting

Pose and respond to questions about familiar objects and events (ACSIS014 - Scootle)



Elaborations

considering questions relating to the home and school and objects used in everyday life


Planning and conducting

Participate in guided investigations and make observations using the senses (ACSIS011 - Scootle)

Elaborations

using sight, hearing, touch, taste and smell so that students can gather information about the world around them

Processing and analysing data and information

Engage in discussions about observations and represent ideas (ACSIS233 - Scootle)

Elaborations

taking part in informal and guided discussions relating to students'observations

using drawings to represent observations and ideas and discussing their representations with others

Communicating

Share observations and ideas (ACSIS012 - Scootle)

Elaborations

working in groups to describe what students have done and what they have found out

communicating ideas through role play and drawing

Foundation Year Achievement Standards

By the end of the Foundation year, students describe the properties and behaviour of familiar objects. They suggest how the environment affects them and other living things.

Students share and reflect on observations, and ask and respond to questions about familiar objects and events.

Year 1 Level Description

The science inquiry skills and science as a human endeavour strands are described across a two-year band. In their planning, schools and teachers refer to the expectations outlined in the achievement standard and also to the content of the science understanding strand for the relevant year level to ensure that these two strands are addressed over the two-year period. The three strands of the curriculum are interrelated and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching and learning programs are decisions to be made by the teacher.

Incorporating the key ideas of science

From Foundation to Year 2, students learn that observations can be organised to reveal patterns, and that these patterns can be used to make predictions about phenomena.

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

Year 1 Content Descriptions

Science Understanding

Biological sciences

Living things have a variety of external features (ACSSU017 - Scootle)

Elaborations

exploring how Aboriginal and Torres Strait Islander Peoples' observations of external features of living things are mimicked and replicated in traditional dance

recognising common features of animals such as head, legs and wings

describing the use of animal body parts for particular purposes such as moving and feeding

identifying common features of plants such as leaves and roots

describing the use of plant parts for particular purposes such as making food and obtaining water

Living things live in different places where their needs are met (ACSSU211 - Scootle)

Elaborations

exploring different habitats in the local environment such as the beach, bush and backyard

recognising that different living things live in different places such as land and water

exploring what happens when habitats change and some living things can no longer have their needs met

Chemical sciences

Everyday materials can be physically changed in a variety of ways (ACSSU018 - Scootle)

Elaborations

exploring how Aboriginal and Torres Strait Islander Peoples apply physical changes to natural materials to render them useful for particular purposes

predicting and comparing how the shapes of objects made from different materials can be physically changed through actions such as bending, stretching and twisting

exploring how materials such as water, chocolate or play dough change when warmed or cooled

Earth and space sciences

Observable changes occur in the sky and landscape (ACSSU019 - Scootle)

Elaborations

recognising the extensive knowledge of daily and seasonal changes in weather patterns and landscape held by Aboriginal and Torres Strait Islander Peoples

exploring the local environment to identify and describe natural, managed and constructed features

recording short and longer term patterns of events that occur on Earth and in the sky, such as the appearance of the moon and stars at night, the weather and the seasons

Physical sciences

Light and sound are produced by a range of sources and can be sensed (ACSSU020 - Scootle)

Elaborations

exploring how traditional musical instruments used by Aboriginal and Torres Strait Islander Peoples produce their characteristic sounds

recognising senses are used to learn about the world around us: our eyes to detect light, our ears to detect sound, and touch to feel vibrations

identifying the sun as a source of light

recognising that objects can be seen when light from sources is available to illuminate them

exploring different ways to produce sound using familiar objects and actions such as striking, blowing, scraping and shaking

comparing sounds made by musical instruments using characteristics such as loudness, pitch and actions used to make the sound

Science as a Human Endeavour

Nature and development of science

Science involves observing, asking questions about, and describing changes in, objects and events (ACSHE021 - Scootle)

Elaborations

recognising how Aboriginal and Torres Strait Islander Peoples use changes in the landscape and the sky to answer questions about when to gather certain resources

jointly constructing questions about the events and features of the local environment with teacher guidance

recognising that descriptions of what we observe are used by people to help identify change

Use and influence of science

People use science in their daily lives, including when caring for their environment and living things (ACSHE022 - Scootle)

Elaborations

identifying ways that science knowledge is used in the care of the local environment such as animal habitats, and suggesting changes to parks and gardens to better meet the needs of native animals

considering how science is used in activities such as cooking, fishing, transport, sport, medicine and caring for plants and animals

considering that technologies used by Aboriginal and Torres Strait Islander Peoples require an understanding of how materials can be sustainably sourced to make tools and weapons, musical instruments, clothing, cosmetics and artworks

exploring how musical instruments can be used to produce different sounds

comparing how different light sources are used in daily life

Science Inquiry Skills

Questioning and predicting

Pose and respond to questions, and make predictions about familiar objects and events (ACSIS024 - Scootle)

Elaborations

thinking about "What will happen if……?" type questions about everyday objects and events

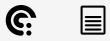
using the senses to explore the local environment to pose interesting questions and making predictions about what will happen

Planning and conducting

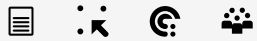
Participate in guided investigations to explore and answer questions (ACSIS025 - Scootle)

Elaborations

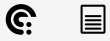
manipulating objects and making observations of what happens



researching ideas collaboratively using big books, web pages and ICT within the classroom



exploring different ways of solving science questions through guided discussion



sorting information and classifying objects based on easily observable characteristics with teacher guidance

Use informal measurements to collect and record observations, using digital technologies as appropriate (ACSIS026 - Scootle)

Elaborations

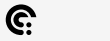
using units that are familiar to students from home and school, such as cups (cooking), hand spans (length) and walking paces (distance) to make and record observations with teacher guidance

Processing and analysing data and information

Use a range of methods to sort information, including drawings and provided tables and through discussion, compare observations with predictions (ACSIS027 - Scootle)

Elaborations

using matching activities, including identifying similar things, odd-one-out and opposites



discussing original predictions and, with guidance, comparing these to their observations

exploring ways of recording and sharing information through class discussion

jointly constructing simple column graphs and picture graphs to represent class investigations

Evaluating

Compare observations with those of others (ACSIS213 - Scootle)

Elaborations

consulting with Aboriginal and Torres Strait Islander Peoples to compare observations and evaluate identifications of animal tracks

discussing observations as a whole class to identify similarities and differences in their observations

Communicating

Represent and communicate observations and ideas in a variety of ways (ACSIS029 - Scootle)

Elaborations

acknowledging and learning about Aboriginal and Torres Strait Islander Peoples' ways of representing and sharing observations

discussing or representing what was discovered in an investigation

engaging in whole class or guided small group discussions to share observations and ideas

Year 1 Achievement Standards

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

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

Year 2 Level Description

The science inquiry skills and science as a human endeavour strands are described across a two-year band. In their planning, schools and teachers refer to the expectations outlined in the achievement standard and also to the content of the science understanding strand for the relevant year level to ensure that these two strands are addressed over the two-year period. The three strands of the curriculum are interrelated and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching and learning programs are decisions to be made by the teacher.

Incorporating the key ideas of science

From Foundation to Year 2, students learn that observations can be organised to reveal patterns, and that these patterns can be used to make predictions about phenomena.

In Year 2, students describe the components of simple systems, such as stationary objects subjected to pushes or pulls, or combinations of materials, and show how objects and materials interact through direct manipulation. They observe patterns of growth and change in living things, and describe patterns and make predictions. They explore the use of resources from Earth and are introduced to the idea of the flow of matter when considering how water is used. They use counting and informal measurements to make and compare observations and begin to recognise that organising these observations in tables makes it easier to show patterns.

Year 2 Content Descriptions

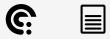
Science Understanding

Biological sciences

Living things grow, change and have offspring similar to themselves (ACSSU030 - Scootle)

Elaborations

representing personal growth and changes from birth



recognising that living things have predictable characteristics at different stages of development

exploring different characteristics of life stages in animals such as egg, caterpillar and butterfly

observing that all animals have offspring, usually with two parents

Chemical sciences

Different materials can be combined for a particular purpose (ACSSU031 - Scootle)

Elaborations

investigating the ways in which Aboriginal and Torres Strait Islander Peoples combine different materials to produce utensils (hafting, weaving, sewing and gluing)

exploring the local environment to observe a variety of materials, and describing ways in which materials are used

investigating the effects of mixing materials together

suggesting why different parts of everyday objects such as toys and clothes are made from different materials

identifying materials such as paper that can be changed and remade or recycled into new products

Earth and space sciences

Earth's resources are used in a variety of ways (ACSSU032 - Scootle)

Elaborations

considering how Aboriginal and Torres Strait Islander Peoples live in regions with scarce resources or in sensitive environments

identifying the Earth's resources including water, soil and minerals, and describing how they are used in the school

describing how a resource such as water is transferred from its source to its point of use

considering what might happen to humans if there were a change in a familiar available resource, such as water

identifying actions at school such as turning off dripping taps, that can conserve resources

Physical sciences

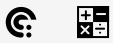
A push or a pull affects how an object moves or changes shape (ACSSU033 - Scootle)

Elaborations

investigating the push and pull movements of traditional Aboriginal and Torres Strait Islander children's instructive toys

exploring ways that objects move on land, through water and in the air

exploring how different strengths of pushes and pulls affect the movement of objects



identifying toys from different cultures that use the forces of push or pull

considering the effects of objects being pulled towards the Earth

Science as a Human Endeavour

Nature and development of science

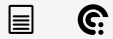
Science involves observing, asking questions about, and describing changes in, objects and events (ACSHE034 - Scootle)

Elaborations

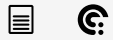
recognising how Aboriginal and Torres Strait Islander Peoples observe and describe developmental changes in living organisms and answer questions about when to harvest certain resources

describing everyday events and experiences and changes in our environment using knowledge of science

suggesting how everyday items work, using knowledge of forces or materials

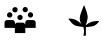


identifying and describing sources of water



Use and influence of science

People use science in their daily lives, including when caring for their environment and living things (ACSHE035 - Scootle)



Elaborations

monitoring information about the environment and Earth's resources, such as rainfall, water levels and temperature

investigating how Aboriginal and Torres Strait Islander Peoples use science to meet their needs, such as food supply

exploring how different cultures have made inks, pigments and paints by mixing materials

identifying the ways humans manage and protect resources, such as reducing waste and caring for water supplies

recognising that many living things rely on resources that may be threatened, and that science understanding can contribute to the preservation of such resources

Science Inquiry Skills

Questioning and predicting

Pose and respond to questions, and make predictions about familiar objects and events (ACSIS037 - Scootle)

Elaborations

using the senses to explore the local environment to pose interesting questions, make inferences and predictions

thinking about 'What will happen if...?' type questions about everyday objects and events

Planning and conducting

Participate in guided investigations to explore and answer questions (ACSIS038 - Scootle)

Elaborations

manipulating objects and materials and making observations of the results

researching with the use of simple information sources

sorting objects and events based on easily identified characteristics

Use informal measurements to collect and record observations, using digital technologies as appropriate (ACSIS039 - Scootle)

Elaborations

using units that are familiar to students from home and school, such as cups (cooking), hand spans (length) and walking paces (distance) to make and compare observations

Processing and analysing data and information

Use a range of methods to sort information, including drawings and provided tables and through discussion, compare observations with predictions (ACSIS040 - Scootle)

Elaborations

constructing column and picture graphs with teacher guidance to record gathered information

comparing and discussing, with guidance, whether observations were expected

sorting information in provided tables or graphic organisers

Evaluating

Compare observations with those of others (ACSIS041 - Scootle)

Elaborations

discussing observations with other students to see similarities and differences in results

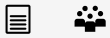
Communicating

Represent and communicate observations and ideas in a variety of ways (ACSIS042 - Scootle)

Elaborations

presenting ideas to other students, both one-to-one and in small groups

discussing with others what was discovered from an investigation



Year 2 Achievement Standards

By the end of Year 2, students describe changes to objects, materials and living things. They identify that certain materials and resources have different uses and describe examples of where science is used in people's daily lives.

Students pose and respond to questions about their experiences and predict outcomes of investigations. They use informal measurements to make and compare observations. They record and represent observations and communicate ideas in a variety of ways.

Year 3 Level Description

The science inquiry skills and science as a human endeavour strands are described across a two-year band. In their planning, schools and teachers refer to the expectations outlined in the achievement standard and also to the content of the science understanding strand for the relevant year level to ensure that these two strands are addressed over the two-year period. The three strands of the curriculum are interrelated and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching and learning programs are decisions to be made by the teacher.

Incorporating the key ideas of science

Over Years 3 to 6, students develop their understanding of a range of systems operating at different time and geographic scales.

In Year 3, students observe heat and its effects on solids and liquids and begin to develop an understanding of energy flows through simple systems. In observing day and night, they develop an appreciation of regular and predictable cycles. Students order their observations by grouping and classifying; in classifying things as living or non-living they begin to recognise that classifications are not always easy to define or apply. They begin to quantify their observations to enable comparison, and learn more sophisticated ways of identifying and representing relationships, including the use of tables and graphs to identify trends. They use their understanding of relationships between components of simple systems to make predictions.

Year 3 Content Descriptions

Science Understanding

Biological sciences

Living things can be grouped on the basis of observable features and can be distinguished from non-living things (ACSSU044 - Scootle)

Elaborations

investigating Aboriginal and Torres Strait Islander Peoples' systems of classifying living things and how these systems differ from those used by contemporary science (OI.2, OI.3, OI.5)

recognising Aboriginal and Torres Strait Islander Peoples' use of observable features to group living things (OI.2, OI.3, OI.5)

recognising characteristics of living things such as growing, moving, sensitivity and reproducing

recognising the range of different living things

sorting living and non-living things based on characteristics


exploring differences between living, once living and products of living things

Chemical sciences

A change of state between solid and liquid can be caused by adding or removing heat (ACSSU046 - Scootle)

Elaborations

investigating how changes of state in materials used by Aboriginal and Torres Strait Islander Peoples, such as beeswax or resins, are important for their use (OI.5)

investigating how liquids and solids respond to changes in temperature, for example water changing to ice, or melting chocolate

exploring how changes from solid to liquid and liquid to solid can help us recycle materials

predicting the effect of heat on different materials

Earth and space sciences

Earth's rotation on its axis causes regular changes, including night and day (ACSSU048 - Scootle)

Elaborations

exploring how cultural stories of Aboriginal and Torres Strait Islander Peoples explain the cyclic phenomena involving sun, moon and stars and how those explanations differ from contemporary science understanding (OI.3, OI.5)

recognising the sun as a source of light

constructing sundials and investigating how they work

describing timescales for the rotation of the Earth

modelling the relative sizes and movement of the sun, Earth and moon

Physical sciences

Heat can be produced in many ways and can move from one object to another (ACSSU049 - Scootle)

Elaborations

investigating the production and transfer of heat in Aboriginal and Torres Strait Islander Peoples' methods of cooking, such as the use of ground ovens (OI.5)

describing how heat can be produced such as through friction or motion, electricity or chemically (burning)

identifying changes that occur in everyday situations due to heating and cooling

exploring how heat can be transferred through conduction

recognising that we can feel heat and measure its effects using a thermometer

Science as a Human Endeavour

Nature and development of science

Science involves making predictions and describing patterns and relationships (ACSHE050 - Scootle)

Elaborations

researching how knowledge of astronomy has been used by some Aboriginal and Torres Strait Islander Peoples (OI.3, OI.5)

making predictions about change and events in our environment

considering how posing questions helps us plan for the future

Use and influence of science

Science knowledge helps people to understand the effect of their actions (ACSHE051 - Scootle)

Elaborations

researching Aboriginal and Torres Strait Islander Peoples' knowledge of the local natural environment, such as the characteristics of plants and animals (OI.2, OI.3, OI.5)

considering how heating affects materials used in everyday life

investigating how science helps people such as nurses, doctors, dentists, mechanics and gardeners

considering how materials including solids and liquids affect the environment in different ways

deciding what characteristics make a material a pollutant

Science Inquiry Skills

Questioning and predicting

With guidance, identify questions in familiar contexts that can be investigated scientifically and make predictions based on prior knowledge (ACSIS053 - Scootle)

Elaborations

consulting with and using existing knowledge held by Aboriginal and Torres Strait Islander Peoples to guide the formulation of investigable questions regarding invasive species

choosing questions to investigate from a list of possibilities

jointly constructing questions that may form the basis for investigation

listing shared experiences as a whole class and identifying possible investigations

working in groups to discuss things that might happen during an investigation

Planning and conducting

With guidance, plan and conduct scientific investigations to find answers to questions, considering the safe use of appropriate materials and equipment (ACSIS054 - Scootle)

Elaborations

consulting with Aboriginal and Torres Strait Islander Peoples to guide the planning of scientific investigations, including safety considerations for field investigations

working with teacher guidance to plan investigations to test simple cause-and-effect relationships

discussing as a whole class ways to investigate questions and evaluating which ways might be most successful

discussing safety rules for equipment and procedures

Consider the elements of fair tests and use formal measurements and digital technologies as appropriate, to make and record observations accurately (ACSIS055 - Scootle)

Elaborations

recording measurements using familiar formal units and appropriate abbreviations, such as seconds (s), grams (g), centimetres (cm)

using a variety of tools to make observations, such as digital cameras, thermometers, rulers and scales

Processing and analysing data and information

Use a range of methods including tables and simple column graphs to represent data and to identify patterns and trends (ACSIS057 - Scootle)

Elaborations

using provided tables to organise materials and objects based on observable properties

discussing how to graph data presented in a table

identifying and discussing numerical and visual patterns in data collected from students' own investigations and from secondary sources

Compare results with predictions, suggesting possible reasons for findings (ACSIS215 - Scootle)

Elaborations

discussing how well predictions matched results from an investigation and sharing ideas about what was learnt

Evaluating

Reflect on investigations, including whether a test was fair or not (ACSIS058 - Scootle)

Elaborations

describing experiences of carrying out investigations to the teacher, small group or whole class

discussing as a whole class the idea of fairness in testing

Communicating

Represent and communicate observations, ideas and findings using formal and informal representations (ACSIS060 - Scootle)

Elaborations

consulting Aboriginal and Torres Strait Islander Peoples' representations of living things as evidenced and communicated through formal and informal sharing of information

acknowledging and exploring Aboriginal and Torres Strait Islander Peoples' ways of communicating information about anatomical features of organisms

communicating with other students carrying out similar investigations to share experiences and improve investigation skill

exploring different ways to show processes and relationships through diagrams, models and role play

using simple explanations and arguments, reports or graphical representations to communicate ideas to other students

Year 3 Achievement Standards

By the end of Year 3, students use their understanding of the movement of Earth, materials and the behaviour of heat to suggest explanations for everyday observations. They group living things based on observable features and distinguish them from non-living things. They describe how they can use science investigations to respond to questions.

Students use their experiences to identify questions and make predictions about scientific investigations. They follow procedures to collect and record observations and suggest possible reasons for their findings, based on patterns in their data. They describe how safety and fairness were considered and they use diagrams and other representations to communicate their ideas.

Year 4 Level Description

The science inquiry skills and science as a human endeavour strands are described across a two-year band. In their planning, schools and teachers refer to the expectations outlined in the achievement standard and also to the content of the science understanding strand for the relevant year level to ensure that these two strands are addressed over the two-year period. The three strands of the curriculum are interrelated and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching and learning programs are decisions to be made by the teacher.

Incorporating the key ideas of science

Over Years 3 to 6, students develop their understanding of a range of systems operating at different time and geographic scales.

In Year 4, students broaden their understanding of classification and form and function through an exploration of the properties of natural and processed materials. They learn that forces include non-contact forces and begin to appreciate that some interactions result from phenomena that can’t be seen with the naked eye. They begin to appreciate that current systems, such as Earth’s surface, have characteristics that have resulted from past changes and that living things form part of systems. They understand that some systems change in predictable ways, such as through cycles. They apply their knowledge to make predictions based on interactions within systems, including those involving the actions of humans.

Year 4 Content Descriptions

Science Understanding

Biological sciences

Living things have life cycles (ACSSU072 - Scootle)

Elaborations

investigating how Aboriginal and Torres Strait Islander Peoples understand and utilise the life cycles of certain species (OI.2, OI.3, OI.5)

making and recording observations of living things as they develop through their life cycles

describing the stages of life cycles of different living things such as insects, birds, frogs and flowering plants

comparing life cycles of animals and plants

recognising that environmental factors can affect life cycles such as fire and seed germination

Living things depend on each other and the environment to survive (ACSSU073 - Scootle)

Elaborations

recognising how Aboriginal and Torres Strait Islander Peoples perceive themselves as being an integral part of the environment (OI.2, OI.3)

investigating how plants provide shelter for animals

investigating the roles of living things in a habitat, for instance producers, consumers or decomposers

observing and describing predator-prey relationships

predicting the effects when living things in feeding relationships are removed or die out in an area

recognising that interactions between living things may be competitive or mutually beneficial

Chemical sciences

Natural and processed materials have a range of physical properties that can influence their use (ACSSU074 - Scootle)

Elaborations

considering how Aboriginal and Torres Strait Islander Peoples use natural and processed materials for different purposes, such as tools, clothing and shelter, based on their properties (OI.5)

considering how Aboriginal and Torres Strait Islander Peoples' knowledge of natural and processed materials informs the preparation of effective, vibrant and long-lasting paints (OI.5)

describing a range of common materials, such as metals or plastics, and their uses

investigating a particular property across a range of materials

selecting materials for uses based on their properties

considering how the properties of materials affect the management of waste or can lead to pollution

Earth and space sciences

Earth's surface changes over time as a result of natural processes and human activity (ACSSU075 - Scootle)

Elaborations

considering how Aboriginal and Torres Strait Islander Peoples' fire management practices over tens of thousands of years have changed the distribution of flora and fauna in most regions of Australia (OI.3, OI.6)

collecting evidence of change from local landforms, rocks or fossils

exploring a local area that has changed as a result of natural processes, such as an eroded gully, sand dunes or river banks

investigating the characteristics of soils

considering how different human activities cause erosion of the Earth's surface

considering the effect of events such as floods and extreme weather on the landscape, both in Australia and in the Asia region

Physical sciences

Forces can be exerted by one object on another through direct contact or from a distance (ACSSU076 - Scootle)

Elaborations

investigating the effect of contact and non-contact forces on the movement of objects in traditional Aboriginal and Torres Strait Islander children's instructive toys and games (OI.5)

observing qualitatively how speed is affected by the size of a force

exploring how non-contact forces are similar to contact forces in terms of objects pushing and pulling another object

comparing and contrasting the effect of friction on different surfaces, such as tyres and shoes on a range of surfaces

investigating the effect of forces on the behaviour of an object through actions such as throwing, dropping, bouncing and rolling

exploring the forces of attraction and repulsion between magnets

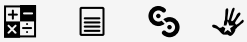
Science as a Human Endeavour

Nature and development of science

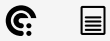
Science involves making predictions and describing patterns and relationships (ACSHE061 - Scootle)

Elaborations

considering how scientific practices such as sorting, classification and estimation are used by Aboriginal and Torres Strait Islander Peoples in everyday life (OI.1, OI.5)



exploring ways in which scientists gather evidence for their ideas and develop explanations



Use and influence of science

Science knowledge helps people to understand the effect of their actions (ACSHE062 - Scootle)

Elaborations

investigating how a range of people, such as clothing designers, builders or engineers use science to select appropriate materials for their work

considering methods of waste management and how they can affect the environment

exploring how science has contributed to a discussion about an issue such as loss of habitat for living things or how human activity has changed the local environment

considering how to minimise the effects of erosion caused by human activity

Science Inquiry Skills

Questioning and predicting

With guidance, identify questions in familiar contexts that can be investigated scientifically and make predictions based on prior knowledge (ACSIS064 - Scootle)

Elaborations

acknowledging and using information from Aboriginal and Torres Strait Islander Peoples to guide the formulation of investigable questions regarding life cycles

considering familiar situations in order to think about possible areas for investigation

reflecting on familiar situations to make predictions with teacher guidance

choosing questions to investigate from a list of possibilities

Planning and conducting

With guidance, plan and conduct scientific investigations to find answers to questions, considering the safe use of appropriate materials and equipment (ACSIS065 - Scootle)

Elaborations

exploring different ways to conduct investigations and connecting these to the types of questions asked with teacher guidance

working in groups, with teacher guidance, to plan ways to investigate questions

discussing and recording safety rules for equipment as a whole class

Consider the elements of fair tests and use formal measurements and digital technologies as appropriate, to make and record observations accurately (ACSIS066 - Scootle)

Elaborations

making and recording measurements using familiar formal units and appropriate abbreviations, such as seconds (s), grams (g), centimetres (cm) and millilitres (mL)

recognising the elements of a fair test and using these when planning the steps and processes of an investigation

Processing and analysing data and information

Use a range of methods including tables and simple column graphs to represent data and to identify patterns and trends (ACSIS068 - Scootle)

Elaborations

identifying and discussing numerical and visual patterns in data collected from students' investigations and from other sources

using provided graphic organisers to sort and represent information

discussing with teacher guidance which graphic organisers will be most useful in sorting or organising data arising from investigations

Compare results with predictions, suggesting possible reasons for findings (ACSIS216 - Scootle)

Elaborations

discussing how well predictions matched results from an investigation and proposing reasons for findings

comparing, in small groups, proposed reasons for findings and explaining their reasoning

Evaluating

Reflect on investigations, including whether a test was fair or not (ACSIS069 - Scootle)

Elaborations

reflecting on investigations, identifying what went well, what was difficult or didn't work so well, and how well the investigation helped answer the question

discussing which aspects of the investigation helped improve fairness, and any aspects that weren't fair

Communicating

Represent and communicate observations, ideas and findings using formal and informal representations (ACSIS071 - Scootle)

Elaborations

communicating with other students carrying out similar investigations to share experiences and improve investigation skills

using simple explanations and arguments, reports or graphical representations to communicate ideas to other students


Year 4 Achievement Standards

By the end of Year 4, students apply the observable properties of materials to explain how objects and materials can be used. They describe how contact and non-contact forces affect interactions between objects. They discuss how natural processes and human activity cause changes to Earth's surface. They describe relationships that assist the survival of living things and sequence key stages in the life cycle of a plant or animal. They identify when science is used to understand the effect of their actions.

Students follow instructions to identify investigable questions about familiar contexts and make predictions based on prior knowledge. They describe ways to conduct investigations and safely use equipment to make and record observations with accuracy. They use provided tables and column graphs to organise data and identify patterns. Students suggest explanations for observations and compare their findings with their predictions. They suggest reasons why a test was fair or not. They use formal and informal ways to communicate their observations and findings.

Year 5 Level Description

The science inquiry skills and science as a human endeavour strands are described across a two-year band. In their planning, schools and teachers refer to the expectations outlined in the achievement standard and also to the content of the science understanding strand for the relevant year level to ensure that these two strands are addressed over the two-year period. The three strands of the curriculum are interrelated and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching and learning programs are decisions to be made by the teacher.

Incorporating the key ideas of science

Over Years 3 to 6, students develop their understanding of a range of systems operating at different time and geographic scales.

In Year 5, students are introduced to cause and effect relationships through an exploration of adaptations of living things and how this links to form and function. They explore observable phenomena associated with light and begin to appreciate that phenomena have sets of characteristic behaviours. They broaden their classification of matter to include gases and begin to see how matter structures the world around them. Students consider Earth as a component within a solar system and use models for investigating systems at astronomical scales. Students begin to identify stable and dynamic aspects of systems, and learn how to look for patterns and relationships between components of systems. They develop explanations for the patterns they observe.

Year 5 Content Descriptions

Science Understanding

Biological sciences

Living things have structural features and adaptations that help them to survive in their environment (ACSSU043 - Scootle)

Elaborations

investigating Aboriginal and Torres Strait Islander Peoples' knowledge of the adaptations of certain species and how those adaptations can be exploited (OI.5, OI.9)

explaining how particular adaptations help survival such as nocturnal behaviour, silvery coloured leaves of dune plants

describing and listing adaptations of living things suited for particular Australian environments

exploring general adaptations for particular environments such as adaptations that aid water conservation in deserts

Chemical sciences

Solids, liquids and gases have different observable properties and behave in different ways (ACSSU077 - Scootle)

Elaborations

recognising Aboriginal and Torres Strait Islander Peoples' knowledge and understanding of evaporation and how the effect of evaporation can be reduced to conserve water, such as by covering surfaces (OI.2, OI.5)

recognising Aboriginal and Torres Strait Islander People's knowledge and understanding of solids, liquids and gases (OI.5)

recognising that substances exist in different states depending on the temperature


observing that gases have mass and take up space, demonstrated by using balloons or bubbles

exploring the way solids, liquids and gases change under different situations such as heating and cooling

recognising that not all substances can be easily classified on the basis of their observable properties

Earth and space sciences

The Earth is part of a system of planets orbiting around a star (the sun) (ACSSU078 - Scootle)

Elaborations

researching Aboriginal and Torres Strait Islander Peoples' understanding of the night sky and its use for timekeeping purposes as evidenced in oral cultural records, petroglyphs, paintings and stone arrangements (OI.3, OI.5)

identifying the planets of the solar system and comparing how long they take to orbit the sun


modelling the relative size of and distance between Earth, other planets in the solar system and the sun


recognising the role of the sun as a provider of energy for the Earth

Physical sciences

Light from a source forms shadows and can be absorbed, reflected and refracted (ACSSU080 - Scootle)

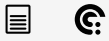
Elaborations

recognising Aboriginal and Torres Strait Islander Peoples' understanding of refraction as experienced in spear fishing and in shimmering body paint, and of absorption and reflection as evidenced by material selected for construction of housing (OI.3, OI.5)

drawing simple labelled ray diagrams to show the paths of light from a source to our eyes

comparing shadows from point and extended light sources such as torches and fluorescent tubes

classifying materials as transparent, opaque or translucent based on whether light passes through them or is absorbed



recognising that the colour of an object depends on the properties of the object and the colour of the light source

exploring the use of mirrors to demonstrate the reflection of light

recognising the refraction of light at the surfaces of different transparent materials, such as when light travels from air to water or air to glass

Science as a Human Endeavour

Nature and development of science

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions (ACSHE081 - Scootle)

Elaborations

learning how Aboriginal and Torres Strait Islander Peoples use observation of the night sky to assist with navigation (OI.3, OI.5)

developing an understanding of the behaviour of light by making observations of its effects

testing predictions relating to the behaviour of solids, liquids and gases by conducting observational experiments

researching how scientists were able to develop ideas about the solar system through the gathering of evidence through space exploration

describing how scientists from a range of cultures have improved our understanding of the solar system, such as Copernicus, KhayyÃ¡m and Galileo

researching the different types of scientists who work in teams in space exploration, and Australia's involvement in space exploration

Use and influence of science

Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE083 - Scootle)

Elaborations

investigating how Aboriginal and Torres Strait Islander Peoples' traditional ecological and zoological knowledge informs sustainable harvesting practices of certain species, such as dugongs and turtles (OI.2, OI.6)

investigating how Torres Strait Islander Peoples and Aboriginal Peoples of arid regions of Australia use scientific knowledge to manage precious water resources (OI.5)

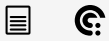
considering how best to ensure growth of plants

considering how decisions are made to grow particular plants and crops depending on environmental

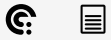
conditions

comparing the benefits of using solid, liquid or gaseous fuels to heat a home

describing the safety aspects of using gases

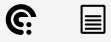


investigating how the development of materials such as plastics and synthetic fabrics have led to the production of useful products



describing how technologies developed to aid space exploration have changed the way people live, work and communicate

exploring objects and devices that include parts that involve the reflection, absorption or refraction of light such as mirrors, sunglasses and prisms



Science Inquiry Skills

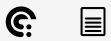
Questioning and predicting

With guidance, pose clarifying questions and make predictions about scientific investigations (ACSIS231 - Scootle)

Elaborations

acknowledging and using information from Aboriginal and Torres Strait Islander Peoples to guide the formulation of investigable questions about adaptations

exploring the range of questions that can be asked about a problem or phenomena and with guidance, identifying those questions that could be investigated



applying experience from similar situations in the past to predict what might happen in a new situation

Planning and conducting

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (ACSIS086 - Scootle)

Elaborations

consulting with Aboriginal and Torres Strait Islander Peoples to guide the planning of scientific investigations, considering potential risks for field investigations

experiencing a range of ways of investigating questions, including experimental testing, internet research, field observations and exploring simulations

explaining rules for safe processes and use of equipment

discussing the advantages of certain types of investigation for answering certain types of questions

considering different ways to approach problem solving, including researching, using trial and error, experimental testing and creating models

Decide variables to be changed and measured in fair tests, and observe measure and record data with accuracy using digital technologies as appropriate (ACSIS087 - Scootle)

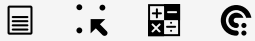
Elaborations

discussing in groups how investigations can be made as fair as possible

using tools to accurately measure objects and events in investigation and exploring which tools provide the most accurate measurements

using familiar units such as grams, seconds and meters and developing the use of standard multipliers such as kilometres and millimetres

recording data in tables and diagrams or electronically as digital images and spreadsheets



Processing and analysing data and information

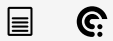
Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate (ACSIS090 - Scootle)

Elaborations

constructing tables, graphs and other graphic organisers to show trends in data

identifying patterns in data and developing explanations that fit these patterns

identifying similarities and differences in qualitative data in order to group items or materials



Compare data with predictions and use as evidence in developing explanations (ACSIS218 - Scootle)

Elaborations

sharing ideas as to whether observations match predictions, and discussing possible reasons for predictions being incorrect

Evaluating

Reflect on and suggest improvements to scientific investigations (ACSIS091 - Scootle)

Elaborations

working collaboratively to identify where methods could be improved, including where testing was not fair and practices could be improved

Communicating

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (ACSIS093 - Scootle)

Elaborations

acknowledging and exploring Aboriginal and Torres Strait Islander Peoples' ways of representing and communicating information about anatomical features, including structural adaptations

discussing how models represent scientific ideas and constructing physical models to demonstrate an aspect of scientific understanding

constructing multi-modal texts to communicate science ideas

using labelled diagrams, including cross-sectional representations, to communicate ideas

Year 5 Achievement Standards

By the end of Year 5, students classify substances according to their observable properties and behaviours. They explain everyday phenomena associated with the transfer of light. They describe the key features of our solar system. They analyse how the form of living things enables them to function in their environments. Students discuss how scientific developments have affected people's lives, help us solve problems and how science knowledge develops from many people's contributions.

Students follow instructions to pose questions for investigation and predict the effect of changing variables when planning an investigation. They use equipment in ways that are safe and improve the accuracy of their observations. Students construct tables and graphs to organise data and identify patterns in the data . They compare patterns in their data with predictions when suggesting explanations. They describe ways to improve the fairness of their investigations, and communicate their ideas and findings using multimodal texts.

Year 6 Level Description

The science inquiry skills and science as a human endeavour strands are described across a two-year band. In their planning, schools and teachers refer to the expectations outlined in the achievement standard and also to the content of the science understanding strand for the relevant year level to ensure that these two strands are addressed over the two-year period. The three strands of the curriculum are interrelated and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching and learning programs are decisions to be made by the teacher.

Incorporating the key ideas of science

Over Years 3 to 6, students develop their understanding of a range of systems operating at different time and geographic scales.

In Year 6, students explore how changes can be classified in different ways. They learn about transfer and transformations of electricity, and continue to develop an understanding of energy flows through systems. They link their experiences of electric circuits as a system at one scale to generation of electricity from a variety of sources at another scale and begin to see links between these systems. They develop a view of Earth as a dynamic system, in which changes in one aspect of the system impact on other aspects; similarly, they see that the growth and survival of living things are dependent on matter and energy flows within a larger system. Students begin to see the role of variables in measuring changes and the value of accuracy in these measurements. They learn how to look for patterns and to use these to identify and explain relationships by drawing on evidence.

Year 6 Content Descriptions

Science Understanding

Biological sciences

The growth and survival of living things are affected by physical conditions of their environment (ACSSU094 - Scootle)

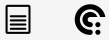
Elaborations

investigating Aboriginal and Torres Strait Islander Peoples' knowledge and understanding of the physical conditions necessary for the survival of certain plants and animals in the environment (OI.2, OI.3)

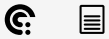
investigating how changing the physical conditions for plants impacts on their growth and survival such as salt water, use of fertilizers and soil types

observing the growth of fungi such as yeast and bread mould in different conditions

researching organisms that live in extreme environments such as Antarctica or a desert



considering the effects of physical conditions causing migration and hibernation



Chemical sciences

Changes to materials can be reversible or irreversible (ACSSU095 - Scootle)

Elaborations

investigating Aboriginal and Torres Strait Islander Peoples' knowledge of reversible processes, such as the application of adhesives, and of irreversible processes, such as the use of fuels for torches (OI.5)

describing what happens when materials are mixed

investigating the solubility of common materials in water

investigating the change in state caused by heating and cooling of a familiar substance

investigating irreversible changes such as rusting, burning and cooking

exploring how reversible changes can be used to recycle materials

investigate reversible changes such as melting, freezing and evaporating

Earth and space sciences

Sudden geological changes and extreme weather events can affect Earth's surface (ACSSU096 - Scootle)

Elaborations

researching Aboriginal and Torres Strait Islander peoples' cultural stories that provide evidence of geological events (OI.3)

investigating major geological events such as earthquakes, volcanic eruptions and tsunamis in Australia, the Asia region and throughout the world

recognising that earthquakes can cause tsunamis

describing how people measure significant geological events

exploring ways that scientific understanding can assist in natural disaster management to minimise both long- and short-term effects

considering the effect of drought on living and non-living aspects of the environment

Physical sciences

Electrical energy can be transferred and transformed in electrical circuits and can be generated from a range of sources (ACSSU097 - Scootle)

Elaborations

recognising the need for a complete circuit to allow the flow of electricity

investigating different electrical conductors and insulators

exploring the features of electrical devices such as switches and light globes

investigating how moving air and water can turn turbines to generate electricity

investigating the use of solar panels

considering whether an energy source is sustainable

Science as a Human Endeavour

Nature and development of science

Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena and reflects historical and cultural contributions (ACSHE098 - Scootle)

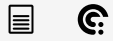
Elaborations

investigating how Aboriginal and Torres Strait Islander Peoples test predictions and gather data in the development of technologies and processes (OI.5, OI.9)

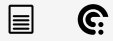
learning how Aboriginal and Torres Strait Islander Peoples' knowledge, such as the medicinal and nutritional properties of Australian plants, is being used as part of the evidence base for scientific advances (OI.9)

investigating how knowledge about the effects of using the Earth's resources has changed over time

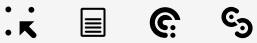
describing how understanding of the causes and effects of major natural events has changed as new evidence has become available



investigating the use of electricity, including predicting the effects of changes to electric circuits

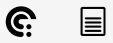


considering how gathering evidence helps scientists to predict the effect of major geological or climatic events

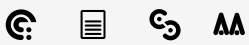


investigating how people from different cultures have used sustainable sources of energy, for example water and solar power

exploring institutions and locations where contemporary Australian scientists conduct research on catastrophic natural events



investigating the development of earthquake measurements from the Chinese invention of the seismograph in the second century



Use and influence of science

Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE100 - Scootle)

Elaborations

discussing how modern approaches to fire ecology in Australia are being informed by Aboriginal and Torres Strait Islander Peoples' traditional ecological knowledge and fire management practices (OI.2, OI.9)

considering how personal and community choices influence our use of sustainable sources of energy

investigating how understanding of catastrophic natural events helps in planning for their early detection and minimising their impact

recognising that science can inform choices about where people live and how they manage natural disasters

considering how guidelines help to ensure the safe use of electrical devices

discussing the use of electricity and the conservation of sources of energy

researching the scientific work involved in global disaster alerts and communication, such as cyclone, earthquake and tsunami alerts

investigating how electrical energy is generated in Australia and around the world

researching the use of methane generators in Indonesia

considering how electricity and electrical appliances have changed the way some people live

Science Inquiry Skills

Questioning and predicting

With guidance, pose clarifying questions and make predictions about scientific investigations (ACSIS232 - Scootle)

Elaborations

consulting with Aboriginal and Torres Strait Islander Peoples to clarify investigable questions based upon their traditional ecological knowledge, such as predictions regarding the impact of invasive species

refining questions to enable scientific investigation

asking questions to understand the scope or nature of a problem

applying experience from previous investigations to predict the outcomes of investigations in new contexts

Planning and conducting

Identify, plan and apply the elements of scientific investigations to answer questions and solve problems using equipment and materials safely and identifying potential risks (ACSIS103 - Scootle)

Elaborations

following a procedure to design an experimental or field investigation

discussing methods chosen with other students, and refining methods accordingly

considering which investigation methods are most suited to answer a particular question or solve a problem

Decide variables to be changed and measured in fair tests, and observe measure and record data with accuracy using digital technologies as appropriate (ACSIS104 - Scootle)

Elaborations

using familiar units such as grams, seconds and metres and developing the use of standard multipliers such as kilometres and millimetres

using the idea of an independent variable (note: this terminology does not need to be used at this stage) as something that is being investigated by changing it and measuring the effect of this change

using digital technologies to make accurate measurements and to record data

Processing and analysing data and information

Construct and use a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data using digital technologies as appropriate (ACSIS107 - Scootle)

Elaborations

exploring how different representations can be used to show different aspects of relationships, processes or trends

using digital technologies to construct representations, including dynamic representations

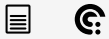
Compare data with predictions and use as evidence in developing explanations (ACSIS221 - Scootle)

Elaborations

sharing ideas as to whether observations match predictions, and discussing possible reasons for predictions being incorrect

discussing the difference between data and evidence

referring to evidence when explaining the outcomes of an investigation



Evaluating

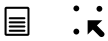
Reflect on and suggest improvements to scientific investigations (ACSIS108 - Scootle)

Elaborations

discussing improvements to the methods used, and how these methods would improve the quality of the data obtained

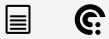
Communicating

Communicate ideas, explanations and processes using scientific representations in a variety of ways, including multi-modal texts (ACSIS110 - Scootle)

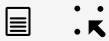


Elaborations

discussing the best way to communicate science ideas and what should be considered when planning a text



using a variety of communication modes, such as reports, explanations, arguments, debates and procedural accounts, to communicate science ideas



using labelled diagrams, including cross-sectional representations, to communicate ideas and processes within multi-modal texts

Year 6 Achievement Standards

By the end of Year 6, students compare and classify different types of observable changes to materials. They analyse requirements for the transfer of electricity and describe how energy can be transformed from one form to another when generating electricity. They explain how natural events cause rapid change to Earth's surface. They describe and predict the effect of environmental changes on individual living things. Students explain how scientific knowledge helps us to solve problems and inform decisions and identify historical and cultural contributions.

Students follow procedures to develop investigable questions and design investigations into simple cause-and-effect relationships. They identify variables to be changed and measured and describe potential safety risks when planning methods. They collect, organise and interpret their data, identifying where improvements to their methods or research could improve the data. They describe and analyse relationships in data using appropriate representations and construct multimodal texts to communicate ideas, methods and findings.

Year 7 Level Description

The science inquiry skills and science as a human endeavour strands are described across a two-year band. In their planning, schools and teachers refer to the expectations outlined in the achievement standard and also to the content of the science understanding strand for the relevant year level to ensure that these two strands are addressed over the two-year period. The three strands of the curriculum are interrelated and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching and learning programs are decisions to be made by the teacher.

Incorporating the key ideas of science

Over Years 7 to 10, students develop their understanding of microscopic and atomic structures; how systems at a range of scales are shaped by flows of energy and matter and interactions due to forces, and develop the ability to quantify changes and relative amounts.

In Year 7, students explore the diversity of life on Earth and continue to develop their understanding of the role of classification in ordering and organising information. They use and develop models such as food chains, food webs and the water cycle to represent and analyse the flow of energy and matter through ecosystems and explore the impact of changing components within these systems. They consider the interaction between multiple forces when explaining changes in an object's motion. They explore the notion of renewable and non-renewable resources and consider how this classification depends on the timescale considered. They investigate relationships in the Earth-sun-moon system and use models to predict and explain events. Students make accurate measurements and control variables to analyse relationships between system components. They explore and explain these relationships through appropriate representations and consider the role of science in decision making processes.

Year 7 Content Descriptions

Science Understanding

Biological sciences

Classification helps organise the diverse group of organisms (ACSSU111 - Scootle)

Elaborations

investigating classification systems used by Aboriginal and Torres Strait Islander Peoples and how they differ with respect to approach and purpose from those used by contemporary science (OI.3, OI.5)

considering the reasons for classifying such as identification and communication

grouping a variety of organisms on the basis of similarities and differences in particular features

considering how biological classifications have changed over time

classifying using hierarchical systems such as kingdom, phylum, class, order, family, genus, species

using scientific conventions for naming species

using provided keys to identify organisms surveyed in a local habitat

Interactions between organisms, including the effects of human activities can be represented by food chains and food webs (ACSSU112 - Scootle)

Elaborations

investigating Aboriginal and Torres Strait Islander Peoples' responses to the disruptive interactions of

invasive species and their effect on important food webs that many communities are a part of, and depend on, for produce and medicine (OI.2, OI.5, OI.6)

using food chains to show feeding relationships in a habitat

constructing and interpreting food webs to show relationships between organisms in an environment

classifying organisms of an environment according to their position in a food chain

recognising the role of microorganisms within food chains and food webs

investigating the effect of human activity on local habitats, such as deforestation, agriculture or the introduction of new species

exploring how living things can cause changes to their environment and impact other living things, such as the effect of cane toads

researching specific examples of human activity, such as the effects of palm oil production in Sumatra and Borneo

Chemical sciences

Mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques (ACSSU113 - Scootle)

Elaborations

investigating separation techniques used by Aboriginal and Torres Strait Islander Peoples, such as hand picking, sieving, winnowing, yandying, filtering, cold-pressing and steam distilling (OI.5)

recognising the differences between pure substances and mixtures and identifying examples of each

identifying the solvent and solute in solutions

investigating and using a range of physical separation techniques such as filtration, decantation, evaporation, crystallisation, chromatography and distillation

exploring and comparing separation methods used in the home

Earth and space sciences

Predictable phenomena on Earth, including seasons and eclipses, are caused by the relative positions of the sun, Earth and the moon (ACSSU115 - Scootle)

Elaborations

researching knowledges held by Aboriginal and Torres Strait Islander Peoples regarding the phases of the moon and the connection between the lunar cycle and ocean tides (OI.3, OI.5)

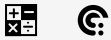
researching Aboriginal and Torres Strait Islander Peoples' oral traditions and cultural recordings of solar and lunar eclipses and investigating similarities and differences with contemporary understandings of such phenomena (OI.3, OI.9)

Investigating Aboriginal and Torres Strait Islander Peoples' calendars and how they are used to predict seasonal changes (OI.3, OI.5)

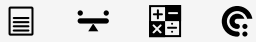
investigating natural phenomena such as lunar and solar eclipses, seasons and phases of the moon

comparing times for the rotation of Earth, the sun and moon, and comparing the times for the orbits of Earth and the moon

modelling the relative movements of the Earth, sun and moon and how natural phenomena such as solar and lunar eclipses and phases of the moon occur



explaining why different regions of the Earth experience different seasonal conditions

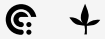


Some of Earth's resources are renewable, including water that cycles through the environment, but others are non-renewable (ACSSU116 - Scootle)

Elaborations

exploring Aboriginal and Torres Strait Islander Peoples' connections with, and valuing of, water and water resource management (OI.2, OI.3)

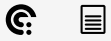
considering what is meant by the term 'renewable' in relation to the Earth's resources



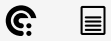
considering timescales for regeneration of resources

comparing renewable and non-renewable energy sources, including how they are used in a range of situations

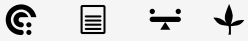
considering the water cycle in terms of changes of state of water



investigating factors that influence the water cycle in nature



exploring how human management of water impacts on the water cycle



Physical sciences

Change to an object's motion is caused by unbalanced forces, including Earth's gravitational attraction,

acting on the object (ACSSU117 - Scootle)

Elaborations

investigating the effect of forces through the application of simple machines, such as the bow and arrows used by Torres Strait Islander Peoples or the spear throwers used by Aboriginal Peoples (OI.5, OI.7)

investigating the effects of applying different forces to familiar objects

investigating common situations where forces are balanced, such as stationary objects, and unbalanced, such as falling objects

investigating a simple machine such as lever or pulley system

exploring how gravity affects objects on the surface of Earth

considering how gravity keeps planets in orbit around the sun

Science as a Human Endeavour

Nature and development of science

Scientific knowledge has changed peoples' understanding of the world and is refined as new evidence becomes available (ACSHE119 - Scootle)

Elaborations

investigating the contributions of Aboriginal and Torres Strait Islander Peoples' knowledge in the identification of medicinal and endemic plants (OI.9)

investigating how advances in telescopes and space probes have provided new evidence about space

researching different ideas used in the development of models of the solar system developed by scientists such as Copernicus, Khayyám and Galileo

researching developments in the understanding of astronomy, such as the predictions of eclipses and the calculation of the length of the solar year by Al-Battani in the tenth century

Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures (ACSHE223 - Scootle)

Elaborations

investigating how land management practices of Aboriginal and Torres Strait Islander Peoples informs sustainable management of the environment to protect biodiversity (OI.5, OI.9)

considering how water use and management relies on knowledge from different areas of science, and involves the application of technology

identifying the contributions of Australian scientists to the study of human impact on environments and to local environmental management projects

studying transnational collaborative research in the Antarctic

Use and influence of science

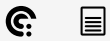
Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations (ACSHE120 - Scootle)

Elaborations

researching the development of commercial products that are founded on the traditional knowledge and practices of Aboriginal and Torres Strait Islander Peoples and discussing related ethical

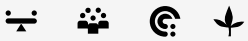
considerations associated with biopiracy and intellectual property rights (OI.9)

relating regulations about wearing seatbelts or safety helmets to knowledge of forces and motion



considering issues relating to the use and management of water within a community

considering decisions made in relation to the recycling of greywater and blackwater



considering how human activity in the community can have positive and negative effects on the sustainability of ecosystems

investigating ways to control the spread of the cane toad

People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (ACSHE121 - Scootle)

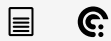
Elaborations

investigating how the knowledge and experience of Aboriginal and Torres Strait Islander Peoples are being used to inform scientific decisions, such as the care of Country/Place (OI.2, OI.9)

investigating everyday applications of physical separation techniques such as filtering, sorting waste materials, reducing pollution, extracting products from plants, separating blood products and cleaning up oil spills

investigating how advances in science and technology have been applied to the treatment of water in industrial and household systems

researching the different scientific responses to the rabbit plagues in Australian agricultural areas



recognising that water management plays a role in areas such as farming, land management and gardening

investigating how separation techniques are used in the food and wine industries

considering how seasonal changes affect people in a variety of activities such as farming

considering how sports scientists apply knowledge of forces to improve performance

Science Inquiry Skills

Questioning and predicting

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124 - Scootle)

Elaborations

working collaboratively to identify a problem to investigate

recognising that the solution of some questions and problems requires consideration of social, cultural, economic or moral aspects rather than or as well as scientific investigation

using information and knowledge from previous investigations to predict the expected results from an investigation

Planning and conducting

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS125 - Scootle)

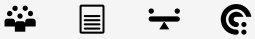
Elaborations

collaborating with Aboriginal and Torres Strait Islander Peoples in planning scientific investigations, and seeking guidance regarding culturally sensitive locations during fieldwork

consulting with Aboriginal and Torres Strait Islander land councils in planning scientific investigations, and seeking guidance regarding land access rights

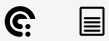
collaborating with Aboriginal and Torres Strait Islander communities and organisations to conduct research investigations about ecosystems, ensuring mutually beneficial outcomes

working collaboratively to decide how to approach an investigation



learning and applying specific skills and rules relating to the safe use of scientific equipment

identifying whether the use of their own observations and experiments or the use of other research materials is appropriate for their investigation



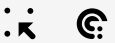
developing strategies and techniques for effective research using secondary sources, including use of the internet

Measure and control variables, select equipment appropriate to the task and collect data with accuracy (ACSIS126 - Scootle)

Elaborations

recognising the differences between controlled, dependent and independent variables

using a digital camera to record observations and compare images using information technologies



using specialised equipment to increase the accuracy of measurement within an investigation

Processing and analysing data and information

Construct and use a range of representations, including graphs, keys and models to represent and

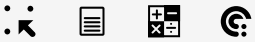
analyse patterns or relationships in data using digital technologies as appropriate (ACSIS129 - Scootle)

Elaborations

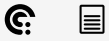
collaborating with Aboriginal and Torres Strait Islander Peoples in the production of calendars that demonstrate seasonal patterns and relationships using digital technologies

understanding different types of graphical and physical representation and considering their advantages and disadvantages

using spreadsheets to aid the presentation and simple analysis of data



describing the trends shown in collected data



Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS130 - Scootle)

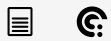
Elaborations

acknowledging, analysing and interpreting data and information from Aboriginal and Torres Strait Islander Peoples' understandings of Earth's systems and cycles

using diagrammatic representations to convey abstract ideas and to simplify complex situations

comparing and contrasting data from a number of sources in order to create a summary of collected data

identifying data which provides evidence to support or negate the hypothesis under investigation



referring to relevant evidence when presenting conclusions drawn from an investigation

Evaluating

Reflect on scientific investigations including evaluating the quality of the data collected, and identifying improvements (ACSIS131 - Scootle)

Elaborations

discussing investigation methods with others to share ideas about the quality of the inquiry process

identifying and considering indicators of the quality of the data when analysing results

suggesting improvements to inquiry methods based on experience

Use scientific knowledge and findings from investigations to evaluate claims based on evidence (ACSIS132 - Scootle)

Elaborations

using the evidence provided by scientific investigations to evaluate the claims or conclusions of their peers

Communicating

Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS133 - Scootle)

Elaborations

presenting the outcomes of research using effective forms of representation of data or ideas and scientific language that is appropriate for the target audience

using digital technologies to access information and to communicate and collaborate with others on

and off site

Year 7 Achievement Standards

By the end of Year 7, students describe techniques to separate pure substances from mixtures. They represent and predict the effects of unbalanced forces, including Earth's gravity, on motion. They explain how the relative positions of Earth, the sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of human and environmental changes on interactions between organisms and classify and organise diverse organisms based on observable differences. Students describe situations where scientific knowledge from different science disciplines and diverse cultures has been used to solve a real-world problem. They explain possible implications of the solution for different groups in society.

Students identify questions that can be investigated scientifically. They plan fair experimental methods, identifying variables to be changed and measured. They select equipment that improves fairness and accuracy and describe how they considered safety. Students draw on evidence to support their conclusions. They summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods. They communicate their ideas, methods and findings using scientific language and appropriate representations.

Year 8 Level Description

The science inquiry skills and science as a human endeavour strands are described across a two-year band. In their planning, schools and teachers refer to the expectations outlined in the achievement standard and also to the content of the science understanding strand for the relevant year level to ensure that these two strands are addressed over the two-year period. The three strands of the curriculum are interrelated and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching and learning programs are decisions to be made by the teacher.

Incorporating the key ideas of science

Over Years 7 to 10, students develop their understanding of microscopic and atomic structures; how systems at a range of scales are shaped by flows of energy and matter and interactions due to forces, and develop the ability to quantify changes and relative amounts.

In Year 8, students are introduced to cells as microscopic structures that explain macroscopic properties of living systems. They link form and function at a cellular level and explore the organisation of body systems in terms of flows of matter between interdependent organs. Similarly, they explore changes in matter at a particle level, and distinguish between chemical and physical change. They begin to classify different forms of energy, and describe the role of energy in causing change in systems, including the role of heat and kinetic energy in the rock cycle. Students use experimentation to isolate relationships between components in systems and explain these relationships through increasingly complex representations. They make predictions and propose explanations, drawing on evidence to support their views while considering other points of view.

Year 8 Content Descriptions

Science Understanding

Biological sciences

Cells are the basic units of living things; they have specialised structures and functions (ACSSU149 - Scootle)

Elaborations

examining a variety of cells using a light microscope, by digital technology or by viewing a simulation

distinguishing plant cells from animal or fungal cells

identifying structures within cells and describing their function

recognising that some organisms consist of a single cell

recognising that cells reproduce via cell division

describing mitosis as cell division for growth and repair

Multi-cellular organisms contain systems of organs carrying out specialised functions that enable them to survive and reproduce (ACSSU150 - Scootle)

Elaborations

identifying the organs and overall function of a system of a multicellular organism in supporting the life processes

describing the structure of each organ in a system and relating its function to the overall function of the system

examining the specialised cells and tissues involved in structure and function of particular organs

comparing similar systems in different organisms such as digestive systems in herbivores and carnivores, respiratory systems in fish and mammals

distinguishing between asexual and sexual reproduction

comparing reproductive systems of organisms

Chemical sciences

Properties of the different states of matter can be explained in terms of the motion and arrangement of particles (ACSSU151 - Scootle)

Elaborations

explaining why a model for the structure of matter is needed

modelling the arrangement of particles in solids, liquids and gases

using the particle model to explain observed phenomena linking the energy of particles to temperature changes

Differences between elements, compounds and mixtures can be described at a particle level (ACSSU152 - Scootle)

Elaborations

modelling the arrangement of particles in elements and compounds

recognising that elements and simple compounds can be represented by symbols and formulas

locating elements on the periodic table

Chemical change involves substances reacting to form new substances (ACSSU225 - Scootle)

Elaborations

investigating chemical reactions employed by Aboriginal and Torres Strait Islander Peoples in the production of substances such as quicklime, plaster, pigments, acids, salts and ethanol (OI.5)

identifying the differences between chemical and physical changes

identifying evidence that a chemical change has taken place

investigating simple reactions such as combining elements to make a compound

recognising that the chemical properties of a substance, for example its flammability and ability to corrode, will affect its use

Earth and space sciences

Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153 - Scootle)

Elaborations

exploring the traditional geological knowledge of Aboriginal and Torres Strait Islander Peoples that is used in the selection of different rock types for different purposes (OI.2, OI.5)

representing the stages in the formation of igneous, metamorphic and sedimentary rocks, including indications of timescales involved

identifying a range of common rock types using a key based on observable physical and chemical properties

recognising that rocks are a collection of different minerals

considering the role of forces and energy in the formation of different types of rocks and minerals

recognising that some rocks and minerals, such as ores, provide valuable resources

Physical sciences

Energy appears in different forms, including movement (kinetic energy), heat and potential energy, and energy transformations and transfers cause change within systems (ACSSU155 - Scootle)

Elaborations

investigating traditional fire-starting methods used by Aboriginal and Torres Strait Islander Peoples and their understanding of the transformation of energy (OI.5, OI.7)

recognising that kinetic energy is the energy possessed by moving bodies

recognising that potential energy is stored energy, such as gravitational, chemical and elastic energy

investigating different forms of energy in terms of the effects they cause, such as gravitational potential causing objects to fall and heat energy transferred between materials that have a different temperature

recognising that heat energy is often produced as a by-product of energy transfer, such as brakes on a car and light globes

using flow diagrams to illustrate changes between different forms of energy

Science as a Human Endeavour

Nature and development of science

Scientific knowledge has changed peoples' understanding of the world and is refined as new evidence becomes available (ACSHE134 - Scootle)

Elaborations

investigating developments in the understanding of cells and how this knowledge has impacted on areas such as health and medicine

discovering how people's understanding of the nature of matter has changed over time as evidence for particle theory has become available through developments in technology

considering how the idea of elements has developed over time as knowledge of the nature of matter has improved

investigating the development of the microscope and the impact it has had on the understanding of cell functions and division

Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures (ACSHE226 - Scootle)

Elaborations

investigating how Aboriginal and Torres Strait Islander Peoples connect knowledge from the disciplines of physics, chemistry, biology and geology in the development of material culture (OI.3, OI.5)

investigating how Aboriginal and Torres Strait Islander Peoples employ knowledge from the disciplines of chemistry, biology, physics and geology in their development of pigments and dyes (OI.3, OI.5)

investigating how knowledge of the location and extraction of mineral resources relies on expertise from across the disciplines of science

considering how advances in technology, combined with scientific understanding of the functioning of body systems, has enabled medical science to replace or repair organs

researching the use of reproductive technologies and how developments in this field rely on scientific knowledge from different areas of science

Use and influence of science

Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations (ACSHE135 - Scootle)

Elaborations

investigating use of sustainable technologies to deliver basic services in remote Aboriginal and Torres Strait Islander communities and considering ethical implications of these (OI. 6)

investigating requirements and the design of systems for collecting and recycling household waste

investigating strategies implemented to maintain part of the local environment, such as bushland, a beach, a lake, a desert or a shoreline

investigating how energy efficiency can reduce energy consumption

investigating the development of vehicles over time, including the application of science to contemporary designs of solar-powered vehicles

discussing ethical issues that arise from organ transplantation

People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity (ACSHE136 - Scootle)

Elaborations

investigating how Aboriginal and Torres Strait Islander Peoples used scientific understandings of complex ecological relationships to develop specific fire-based agricultural practices (OI.2, OI.3, OI.5)

describing how technologies have been applied to modern farming techniques to improve yields and sustainability

describing the impact of plant cloning techniques (asexual production) in agriculture such as horticulture, fruit production and vineyards

investigating the role of science in the development of technology important to the economies and communities of the Asia–Pacific regions, for example car manufacture, earthquake prediction and electronic optics

recognising the role of knowledge of the environment and ecosystems in a number of occupations

considering how engineers improve energy efficiency of a range of processes

recognising the role of knowledge of cells and cell divisions in the area of disease treatment and control

investigating how scientists have created new materials such as synthetic fibres, heat-resistant plastics and pharmaceuticals

Science Inquiry Skills

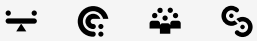
Questioning and predicting

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS139 - Scootle)

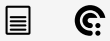
Elaborations

considering whether investigation using available resources is possible when identifying questions or problems to investigate

recognising that the solution of some questions and problems requires consideration of social, cultural, economic or moral aspects rather than or as well as scientific investigation

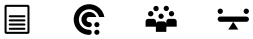


using information and knowledge from their own investigations and secondary sources to predict the expected results from an investigation



Planning and conducting

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS140 - Scootle)

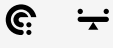


Elaborations

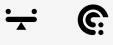
collaborating with Aboriginal and Torres Strait Islander Peoples in the planning of scientific investigations, including considerations of heritage sites and artefacts

working collaboratively to decide how to best approach an investigation

identifying any ethical considerations that may apply to the investigation



taking into consideration all aspects of fair testing, available equipment and safe investigation when planning investigations



Measure and control variables, select equipment appropriate to the task and collect data with accuracy (ACSIS141 - Scootle)

Elaborations

using specialised equipment to increase the accuracy of measurement within an investigation

identifying and explaining the differences between controlled, dependent and independent variables

Processing and analysing data and information

Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate (ACSIS144 - Scootle)

Elaborations

describing measures of central tendency and identifying outliers for quantitative data

explaining the strengths and limitations of representations such as physical models, diagrams and simulations in terms of the attributes of systems included or not included

Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS145 - Scootle)

Elaborations

constructing tables, graphs, keys and models to represent relationships and trends in collected data

drawing conclusions based on a range of evidence including primary and secondary sources

Evaluating

Reflect on scientific investigations including evaluating the quality of the data collected, and identifying improvements (ACSIS146 - Scootle)

Elaborations

suggesting improvements to investigation methods that would improve the accuracy of the data recorded

discussing investigation methods with others to share ideas about the quality of the inquiry process

Use scientific knowledge and findings from investigations to evaluate claims based on evidence (ACSIS234 - Scootle)

Elaborations

identifying the scientific evidence available to evaluate claims

deciding whether or not to accept claims based on scientific evidence

identifying where science has been used to make claims relating to products and practices

Communicating

Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS148 - Scootle)

Elaborations

using digital technologies to construct a range of text types to present science ideas

selecting and using appropriate language and representations to communicate science ideas within a specified text type and for a specified audience

Year 8 Achievement Standards

By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the timescales involved. They analyse the relationship between structure and function at cell, organ and body system levels. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems. They reflect on implications of these solutions for different groups in society.

Students identify and construct questions and problems that they can investigate scientifically. They consider safety and ethics when planning investigations, including designing field or experimental methods. They identify variables to be changed, measured and controlled. Students construct representations of their data to reveal and analyse patterns and trends, and use these when justifying their conclusions. They explain how modifications to methods could improve the quality of their data and apply their own scientific knowledge and investigation findings to evaluate claims made by others. They use appropriate language and representations to communicate science ideas, methods and findings in a range of text types.

Year 9 Level Description

The science inquiry skills and science as a human endeavour strands are described across a two-year band. In their planning, schools and teachers refer to the expectations outlined in the achievement standard and also to the content of the science understanding strand for the relevant year level to ensure that these two strands are addressed over the two-year period. The three strands of the curriculum are interrelated and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching and learning programs are decisions to be made by the teacher.

Incorporating the key ideas of science

Over Years 7 to 10, students develop their understanding of microscopic and atomic structures, how systems at a range of scales are shaped by flows of energy and matter and interactions due to forces, and develop the ability to quantify changes and relative amounts.

In Year 9, students consider the operation of systems at a range of scales. They explore ways in which the human body as a system responds to its external environment and the interdependencies between biotic and abiotic components of ecosystems. They are introduced to the notion of the atom as a system of protons, electrons and neutrons, and how this system can change through nuclear decay. They learn that matter can be rearranged through chemical change and that these changes play an important role in many systems. They are introduced to the concept of the conservation of matter and begin to develop a more sophisticated view of energy transfer. They begin to apply their understanding of energy and forces to global systems such as continental movement.

Year 9 Content Descriptions

Science Understanding

Biological sciences

Multi-cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment (ACSSU175 - Scootle)

Elaborations

describing how the requirements for life (for example oxygen, nutrients, water and removal of waste) are provided through the coordinated function of body systems such as the respiratory, circulatory, digestive, nervous and excretory systems

explaining how body systems work together to maintain a functioning body using models, flow diagrams or simulations

identifying responses using nervous and endocrine systems

investigating the response of the body to changes as a result of the presence of micro-organisms

investigating the effects on humans of exposure to electromagnetic radiations such as X-rays and microwaves

Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems (ACSSU176 - Scootle)

Elaborations

investigating the interdependence of communities and the role of Aboriginal and Torres Strait Islander Peoples in maintaining their environment (OI.2, OI.5)

exploring interactions between organisms such as predator/prey, parasites, competitors, pollinators and disease

examining factors that affect population sizes such as seasonal changes, destruction of habitats, introduced species

considering how energy flows into and out of an ecosystem via the pathways of food webs, and how it must be replaced to maintain the sustainability of the system

investigating how ecosystems change as a result of events such as bushfires, drought and flooding

Chemical sciences

All matter is made of atoms that are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms (ACSSU177 - Scootle)

Elaborations

investigating how radiocarbon and other dating methods have been used to establish that Aboriginal Peoples have been present on the Australian continent for more than 60,000 years (OI.6)

describing and modelling the structure of atoms in terms of the nucleus, protons, neutrons and electrons

comparing the mass and charge of protons, neutrons and electrons

describing in simple terms how alpha and beta particles and gamma radiation are released from unstable atoms

Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed (ACSSU178 - Scootle)

Elaborations

identifying reactants and products in chemical reactions

modelling chemical reactions in terms of rearrangement of atoms

describing observed reactions using word equations

considering the role of energy in chemical reactions

recognising that the conservation of mass in a chemical reaction can be demonstrated by simple chemical equations

Chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer (ACSSU179 - Scootle)

Elaborations

investigating how Aboriginal and Torres Strait Islander Peoples use fire-mediated chemical reactions to facilitate energy and nutrient transfer in ecosystems through the practice of firestick farming (OI.2, OI.5)

investigating reactions of acids with metals, bases, and carbonates

investigating a range of different reactions to classify them as exothermic or endothermic

recognising the role of oxygen in combustion reactions and comparing combustion with other oxidation reactions

comparing respiration and photosynthesis and their role in biological processes

describing how the products of combustion reactions affect the environment

Earth and space sciences

The theory of plate tectonics explains global patterns of geological activity and continental movement (ACSSU180 - Scootle)

Elaborations

recognising the major plates on a world map

modelling sea-floor spreading

relating the occurrence of earthquakes and volcanic activity to constructive and destructive plate boundaries

considering the role of heat energy and convection currents in the movement of tectonic plates

relating the extreme age and stability of a large part of the Australian continent to its plate tectonic history

Physical sciences

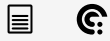
Energy transfer through different mediums can be explained using wave and particle models (ACSSU182 - Scootle)

Elaborations

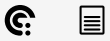
investigating the impact of material selection on the transfer of sound energy in Aboriginal and Torres Strait Islander Peoples' traditional musical, hunting and communication instruments (OI.5)

investigating aspects of heat transfer and conservation in the design of Aboriginal and Torres Strait Islander Peoples' bedding and clothing in the various climatic regions of Australia (OI.5, OI.7)

exploring how and why the movement of energy varies according to the medium through which it is transferred



discussing the wave and particle models and how they are useful for understanding aspects of phenomena



investigating the transfer of heat in terms of convection, conduction and radiation, and identifying situations in which each occurs

understanding the processes underlying convection and conduction in terms of the particle model

investigating factors that affect the transfer of energy through an electric circuit

exploring the properties of waves, and situations where energy is transferred in the form of waves, such as sound and light

Science as a Human Endeavour

Nature and development of science

Scientific understanding, including models and theories, is contestable and is refined over time through a process of review by the scientific community (ACSHE157 - Scootle)

Elaborations

investigating how fire research has evaluated the effects of traditional Aboriginal and Torres Strait Islander Peoples fire regimes and how these findings have influenced fire management policy throughout Australia (OI.2, OI.5, OI.9)

investigating the historical development of models of the structure of the atom

investigating how the theory of plate tectonics developed, based on evidence from sea-floor spreading and occurrence of earthquakes and volcanic activity

considering how ideas about disease transmission have changed from medieval time to the present as knowledge has developed

investigating the work of scientists such as Ernest Rutherford, Pierre Curie and Marie Curie on radioactivity and subatomic particles

investigating how models can be used to predict the changes in populations due to environmental changes, such as the impact of flooding or fire on rabbit or kangaroo populations

Advances in scientific understanding often rely on technological advances and are often linked to scientific discoveries
(ACSHE158 - Scootle)

Elaborations

researching how technological advances in monitoring greenhouse gas emissions and other environmental factors have contributed to the reinstatement of traditional fire management practices as a strategy to reduce atmospheric pollution (OI.2, OI.5, OI.9)

considering how common properties of electromagnetic radiation relate to its uses, such as radar, medicine, mobile phone communications and microwave cooking

investigating technologies involved in the mapping of continental movement

considering how the development of imaging technologies have improved our understanding of the functions and interactions of body systems

Use and influence of science

People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people's lives, including generating new career opportunities (ACSHE160 - Scootle)

Elaborations

considering how the traditional ecological knowledge of Aboriginal and Torres Strait Islander Peoples is being reaffirmed by modern science and how this is generating new career opportunities in the field of restorative ecology (OI.2, OI.5, OI.9)

using knowledge of science to test claims made in advertising or expressed in the media

investigating how technologies using electromagnetic radiation are used in medicine, such as in the detection and treatment of cancer

investigating the use of nanotechnology in medicine, such as the delivery of pharmaceuticals

describing how science is used in the media to explain a natural event or justify actions

evaluating claims relating to products such as electrical devices, fuels, indigestion tablets

considering the impact of technological advances developed in Australia, such as the cochlear implant and bionic eye

considering how communication methods are influenced by new mobile technologies that rely on electromagnetic radiation

considering the impacts of human activity on an ecosystem from a range of different perspectives

recognising aspects of science, engineering and technology within careers such as medicine, medical technology, telecommunications, biomechanical engineering, pharmacy and physiology

Values and needs of contemporary society can influence the focus of scientific research (ACSHE228 - Scootle)

Elaborations

researching how Torres Strait Islander Peoples are at the forefront of the development of scientific measures to prevent the transfer of certain infectious diseases and pests to the Australian continent (OI.9)

considering how technologies have been developed to meet the increasing needs for mobile communication

investigating how scientific and technological advances have been applied to minimising pollution from industry

considering how choices related to the use of fuels are influenced by environmental considerations

investigating the work of Australian scientists such as Fiona Wood and Marie Stoner on artificial skin

considering safe sound levels for humans and implications in the workplace and leisure activities

investigating contemporary science issues related to living in a Pacific country located near plate boundaries, for example Japan, Indonesia, New Zealand

Science Inquiry Skills

Questioning and predicting

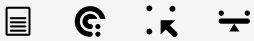
Formulate questions or hypotheses that can be investigated scientifically (ACSIS164 - Scootle)

Elaborations

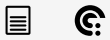
acknowledging and using information from Aboriginal and Torres Strait Islander Peoples to hypothesise about fauna or flora distributions

collaborating with Aboriginal and Torres Strait Islander Peoples to formulate questions and hypotheses that can be investigated scientifically regarding disrupted ecosystems

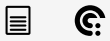
using internet research to identify problems that can be investigated



evaluating information from secondary sources as part of the research process



revising and refining research questions to target specific information and data collection or finding a solution to the specific problem identified



developing ideas from students own or others' investigations and experiences to investigate further

Planning and conducting

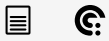
Plan, select and use appropriate investigation types, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS165 - Scootle)

Elaborations

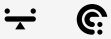
acknowledging cultural heritage protection Acts as they relate to Aboriginal and Torres Strait Islander peoples in planning field investigations

explaining the choice of variables to be controlled, changed and measured in an investigation

identifying the potential hazards of chemicals or biological materials used in experimental investigations

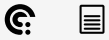


ensuring that any investigation involving or impacting on animals is justified, humane and considerate of each animal's needs



using modelling and simulations, including using digital technology to investigate situations and events

combining research using primary and secondary sources with students' own experimental investigation



considering how investigation methods and equipment may influence the reliability of collected data

Select and use appropriate equipment, including digital technologies, to collect and record data systematically and accurately (ACSIS166 - Scootle)

Elaborations

using probes and data loggers to record information

applying specific skills for the use of scientific instruments

Processing and analysing data and information

Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS169 - Scootle)

Elaborations

using spreadsheets to present data in tables and graphical forms and to carry out mathematical analyses on data

describing sample properties (such as mean, median, range, large gaps visible on a graph) to predict characteristics of the larger population

designing and constructing appropriate graphs to represent data and analysing graphs for trends and patterns

Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS170 - Scootle)

Elaborations

consulting Aboriginal and Torres Strait Islander Peoples' histories and cultures that reveal scientific information about the past

acknowledging and identifying the relationship between First Peoples' knowledges and contemporary science and the co-contributions in arriving at shared understanding when working "both-ways"

comparing conclusions with earlier predictions and reviewing scientific understanding where appropriate

suggesting more than one possible explanation of the data presented

Evaluating

Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS171 - Scootle)

Elaborations

identifying gaps or weaknesses in conclusions (their own or those of others)

identifying alternative explanations that are also consistent with the evidence

Critically analyse the validity of information in primary and secondary sources and evaluate the approaches used to solve problems (ACSIS172 - Scootle)

Elaborations

discussing what is meant by 'validity' and how we can evaluate the validity of information in secondary sources

researching the methods used by scientists in studies reported in the media

describing how scientific arguments are used to make decisions regarding personal and community issues

Communicating

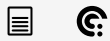
Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS174 - Scootle)

Elaborations

acknowledging and exploring Aboriginal and Torres Strait Islander peoples' ways of communicating their understanding of the internal systems of organisms

presenting results and ideas using formal experimental reports, oral presentations, slide shows, poster presentations and contributing to group discussions

using secondary sources as well as students' own findings to help explain a scientific concept



using the internet to facilitate collaboration in joint projects and discussions

Year 9 Achievement Standards

By the end of Year 9, students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. They analyse how biological systems function and respond to external changes with reference to interdependencies, energy transfers and flows of matter. They describe social and technological factors that have influenced scientific developments and predict how future applications of science and technology may affect people's lives.

Students design questions that can be investigated using a range of inquiry skills. They design methods that include the control and accurate measurement of variables and systematic collection of data and describe how they considered ethics and safety. They analyse trends in data, identify relationships between variables and reveal inconsistencies in results. They analyse their methods and the quality of their data, and explain specific actions to improve the quality of their evidence. They evaluate others' methods and explanations from a scientific perspective and use appropriate language and representations when communicating their findings and ideas to specific audiences.

Year 10 Level Description

The science inquiry skills and science as a human endeavour strands are described across a two-year band. In their planning, schools and teachers refer to the expectations outlined in the achievement standard and also to the content of the science understanding strand for the relevant year level to ensure that these two strands are addressed over the two-year period. The three strands of the curriculum are interrelated and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching and learning programs are decisions to be made by the teacher.

Incorporating the key ideas of science

In the Year 10 curriculum students explore systems at different scales and connect microscopic and macroscopic properties to explain phenomena. Students explore the biological, chemical, geological and physical evidence for different theories, such as the theories of natural selection and the Big Bang.

Students develop their understanding of atomic theory to understand relationships within the periodic table. They understand that motion and forces are related by applying physical laws. They learn about the relationships between aspects of the living, physical and chemical world that are applied to systems on a local and global scale and this enables them to predict how changes will affect equilibrium within these systems.

Year 10 Content Descriptions

Science Understanding

Biological sciences

Transmission of heritable characteristics from one generation to the next involves DNA and genes (ACSSU184 - Scootle)

Elaborations

investigating Aboriginal and Torres Strait Islander Peoples' knowledge of heredity as evidenced by the strict adherence to kinship and family structures, especially marriage laws (OI.8)

describing the role of DNA as the blueprint for controlling the characteristics of organisms

using models and diagrams to represent the relationship between DNA, genes and chromosomes

recognising that genetic information passed on to offspring is from both parents by meiosis and fertilisation

representing patterns of inheritance of a simple dominant/recessive characteristic through generations of a family

predicting simple ratios of offspring genotypes and phenotypes in crosses involving dominant/recessive gene pairs or in genes that are sex-linked

describing mutations as changes in DNA or chromosomes and outlining the factors that contribute to causing mutations

The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence (ACSSU185 - Scootle)

Elaborations

investigating some of the structural and physiological adaptations of Aboriginal and Torres Strait Islander Peoples to the Australian environment (OI.3, OI.7)

outlining processes involved in natural selection including variation, isolation and selection


describing biodiversity as a function of evolution



investigating changes caused by natural selection in a particular population as a result of a specified selection pressure such as artificial selection in breeding for desired characteristics


relating genetic characteristics to survival and reproductive rates



evaluating and interpreting evidence for evolution, including the fossil record, chemical and anatomical similarities, and geographical distribution of species


Chemical sciences

The atomic structure and properties of elements are used to organise them in the Periodic Table (ACSSU186 - Scootle)

Elaborations

recognising that elements in the same group of the periodic table have similar properties

describing the structure of atoms in terms of electron shells


explaining how the electronic structure of an atom determines its position in the periodic table and its properties


investigating the chemical activity of metals

Different types of chemical reactions are used to produce a range of products and can occur at different rates (ACSSU187 - Scootle)

Elaborations

investigating some of the chemical reactions and methods employed by Aboriginal and Torres Strait Islander Peoples to convert toxic plants into edible food products (OI.5)

investigating how chemistry can be used to produce a range of useful substances such as fuels, metals and pharmaceuticals

predicting the products of different types of simple chemical reactions

using word or symbol equations to represent chemical reactions

investigating the effect of a range of factors, such as temperature and catalysts, on the rate of chemical reactions

Earth and space sciences

The universe contains features including galaxies, stars and solar systems, and the Big Bang theory can be used to explain the origin of the universe (ACSSU188 - Scootle)

Elaborations

researching Aboriginal and Torres Strait Islander Peoples' knowledge of celestial bodies and explanations of the origin of the universe (OI.3, OI.5)

identifying the evidence supporting the Big Bang theory, such as Edwin Hubble's observations and the detection of microwave radiation

recognising that the age of the universe can be derived using knowledge of the Big Bang theory

describing how the evolution of the universe, including the formation of galaxies and stars, has continued since the Big Bang

Global systems, including the carbon cycle, rely on interactions involving the biosphere, lithosphere, hydrosphere and atmosphere (ACSSU189 - Scootle)

Elaborations

investigating how Aboriginal and Torres Strait Islander Peoples are reducing Australia's greenhouse gas emissions through the reinstatement of traditional fire management regimes (OI.5, OI.9)

investigating how human activity affects global systems

modelling a cycle, such as the water, carbon, nitrogen or phosphorus cycle within the biosphere

explaining the causes and effects of the greenhouse effect

investigating the effect of climate change on sea levels and biodiversity

considering the long-term effects of loss of biodiversity

investigating currently occurring changes to permafrost and sea ice and the impacts of these changes

examining the factors that drive the deep ocean currents, their role in regulating global climate, and their effects on marine life

Physical sciences

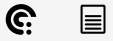
Energy conservation in a system can be explained by describing energy transfers and transformations (ACSSU190 - Scootle)

Elaborations

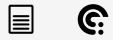
recognising that the Law of Conservation of Energy explains that total energy is maintained in energy transfer and transformation

recognising that in energy transfer and transformation, a variety of processes can occur, so that the usable energy is reduced and the system is not 100% efficient

comparing energy changes in interactions such as car crashes, pendulums, lifting and dropping



using models to describe how energy is transferred and transformed within systems



The motion of objects can be described and predicted using the laws of physics (ACSSU229 - Scootle)

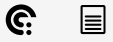
Elaborations

investigating how Aboriginal and Torres Strait Islander Peoples achieve an increase in velocity and subsequent impact force through the use of spear throwers and bows (OI.5)

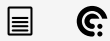
gathering data to analyse everyday motions produced by forces, such as measurements of distance and time, speed, force, mass and acceleration

recognising that a stationary object, or a moving object with constant motion, has balanced forces acting on it

using Newton’s Second Law to predict how a force affects the movement of an object



recognising and applying Newton's Third Law to describe the effect of interactions between two objects



Science as a Human Endeavour

Nature and development of science

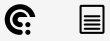
Scientific understanding, including models and theories, is contestable and is refined over time through a process of review by the scientific community (ACSHE191 - Scootle)

Elaborations

investigating how prior to germ theory Aboriginal and Torres Strait Islander Peoples used their scientific observations to develop traditional medicines to treat wounds and infections of the skin (OI. 5)

considering the role of different sources of evidence including biochemical, anatomical and fossil evidence for evolution by natural selection

investigating the development of the Watson and Crick double helix model for the structure of DNA



investigating the history and impact of developments in genetic knowledge

investigating the development of the periodic table and how this was dependent on experimental evidence at the time

considering the role of science in identifying and explaining the causes of climate change

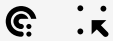
recognising that Australian scientists such as Brian Schmidt and Penny Sackett are involved in the exploration and study of the universe

Advances in scientific understanding often rely on technological advances and are often linked to scientific discoveries (ACSHE192 - Scootle)

Elaborations

researching how technological advances in dating methods of Aboriginal Peoples' material culture are contributing to our understanding of the changing climatic conditions and human interaction with the Australian megafauna (OI.5, OI.9)

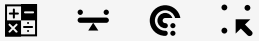
recognising that the development of fast computers has made possible the analysis of DNA sequencing, radio astronomy signals and other data



considering how computer modelling has improved knowledge and predictability of phenomena such as climate change and atmospheric pollution

researching examples of major international scientific projects, for example the Large Hadron Collider and the International Space Station

considering how information technology can be applied to different areas of science such as bioinformatics and the Square Kilometre Array



Use and influence of science

People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people's lives, including generating new career opportunities (ACSHE194 - Scootle)

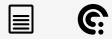
Elaborations

considering how ecological sciences are recognising the efficacy of traditional ecological practices of Aboriginal and Torres Strait Islander Peoples and how restorative programs based on these practices are generating new career opportunities (OI.2, OI.5)

predicting future applications of aspects of nanotechnology on people's lives

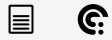
describing how science is used in the media to explain a natural event or justify people's actions

recognising that the study of the universe and the exploration of space involve teams of specialists from the different branches of science, engineering and technology



using knowledge of science to test claims made in advertising

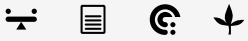
considering how the computing requirements in many areas of modern science depend on people working in the area of information technology



considering the scientific knowledge used in discussions relating to climate change

investigating the applications of gene technologies such as gene therapy and genetic engineering

evaluating claims relating to environmental footprints



recognising that scientific developments in areas such as sustainable transport and low-emissions electrical generation require people working in a range of fields of science, engineering and technology

Values and needs of contemporary society can influence the focus of scientific research (ACSHE230 - Scootle)

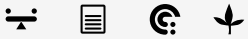
Elaborations

researching how the values of 19th and early 20th century Australian society, combined with scientific misconceptions about heredity and evolution, influenced policies and attitudes towards Aboriginal and

Torres Strait Islander Peoples (OI.6)

investigating how disease outbreaks and the emergence of drug-resistant infections have focused scientific research into Aboriginal and Torres Strait Islander Peoples' traditional medicines to identify effective therapeutic compounds for the use in pharmaceuticals (OI.5, OI.9)

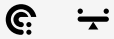
investigating technologies associated with the reduction of carbon pollution, such as carbon capture



considering innovative energy transfer devices, including those used in transport and communication

investigating the use and control of CFCs based on scientific studies of atmospheric ozone

recognising that financial backing from governments or commercial organisations is required for scientific developments and that this can determine what research is carried out



considering the use of genetic testing for decisions such as genetic counselling, embryo selection, identification of carriers of genetic mutations and the use of this information for personal use or by organisation such as insurance companies or medical facilities

Science Inquiry Skills

Questioning and predicting

Formulate questions or hypotheses that can be investigated scientifically (ACSIS198 - Scootle)

Elaborations

developing hypotheses based on well-developed models and theories

using internet research to identify problems that can be investigated

formulating questions that can be investigated within the scope of the classroom or field with available resources

developing ideas from students own or others' investigations and experiences to investigate further

evaluating information from secondary sources as part of the research process

Planning and conducting

Plan, select and use appropriate investigation types, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS199 - Scootle)

Elaborations

collaborating with Aboriginal and Torres Strait Islander Peoples to explore the development of a commercial product based upon traditional ecological knowledge while addressing ethical issues

combining research using primary and secondary sources with a student's own experimental investigation

using modelling and simulations, including using digital technology, to investigate situations and events

deciding how much data are needed to produce reliable measurements

considering possible confounding variables or effects and ensuring these are controlled

identifying the potential hazards of chemicals or biological materials used in experimental investigations

identifying safety risks and impacts on animal welfare and ensuring these are effectively managed within the investigation

Select and use appropriate equipment, including digital technologies, to collect and record data systematically and accurately (ACSIS200 - Scootle)

Elaborations

selecting and using probes and data loggers to record information

applying specific skills for the use of scientific instruments

identifying where human error can influence the reliability of data

Processing and analysing data and information

Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS203 - Scootle)

Elaborations

using spreadsheets to present data in tables and graphical forms and to carry out mathematical analyses on data

describing sample properties (such as mean, median, range, large gaps visible on a graph) to predict characteristics of the larger population, acknowledging uncertainties and the effects of outliers

exploring relationships between variables using spreadsheets, databases, tables, charts, graphs and statistics

Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS204 - Scootle)

Elaborations

using primary or secondary scientific evidence to support or refute a conclusion

constructing a scientific argument showing how their evidence supports their claim

Evaluating

Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS205 - Scootle)

Elaborations

evaluating the strength of a conclusion that can be inferred from a particular data set

distinguishing between random and systematic errors and how these can affect investigation results

identifying alternative explanations that are also consistent with the evidence

Critically analyse the validity of information in primary and secondary sources and evaluate the approaches used to solve problems
(ACSIS206 - Scootle)

Elaborations

acknowledging the need to critically analyse scientific literature for potential cultural bias towards Aboriginal and Torres Strait Islander Peoples

researching the methods used by scientists in studies reported in the media

judging the validity of science-related media reports and how these reports might be interpreted by the public

describing how scientific arguments, as well as ethical, economic and social arguments, are used to make decisions regarding personal and community issues

Communicating

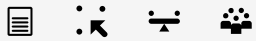
Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS208 - Scootle)

Elaborations

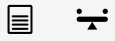
using the internet to facilitate collaboration in joint projects and discussions

constructing evidence based arguments and engaging in debate about scientific ideas

presenting results and ideas using formal experimental reports, oral presentations, slide shows, poster presentations and contributing to group discussions



using a range of representations, including mathematical and symbolic forms, to communicate science ideas



Year 10 Achievement Standards

By the end of Year 10, students analyse how the periodic table organises elements and use it to make predictions about the properties of elements. They explain how chemical reactions are used to produce particular products and how different factors influence the rate of reactions. They explain the concept of energy conservation and represent energy transfer and transformation within systems. They apply relationships between force, mass and acceleration to predict changes in the motion of objects. Students describe and analyse interactions and cycles within and between Earth's spheres. They evaluate the evidence for scientific theories that explain the origin of the universe and the diversity of life on Earth. They explain the processes that underpin heredity and evolution. Students analyse how the models and theories they use have developed over time and discuss the factors that prompted their review.

Students develop questions and hypotheses and independently design and improve appropriate methods of investigation, including field work and laboratory experimentation. They explain how they have considered reliability, safety, fairness and ethical actions in their methods and identify where digital technologies can be used to enhance the quality of data. When analysing data, selecting evidence and developing and justifying conclusions, they identify alternative explanations for findings and explain any sources of uncertainty. Students evaluate the validity and reliability of claims made in secondary sources with reference to currently held scientific views, the quality of the methodology and the evidence cited. They construct evidence-based arguments and select appropriate representations and text types to communicate science ideas for specific purposes.

Glossary

adaptation

A physical or behavioural *characteristic* that is inherited and which results in an individual being more likely to survive and reproduce in its *environment*.

analyse

To consider in detail for the purpose of finding meaning or relationships, and identifying patterns, similarities and differences.

characteristic

A distinguishing aspect (including features and behaviours) of an object material, living thing or event.

chart

A visual display of information.

classify

To arrange items into named categories in order to sort, group or identify them.

collaborate

To work with others to perform a specific task.

conclusion

A judgement based on *evidence.*

contemporary science

New and emerging science *research* and issues of current relevance and interest.

continuous data

Quantitative data with a potentially infinite number of possible values along a continuum.

controlled variable

A *variable* that is kept constant (or changed in constant ways) during an investigation.

convention

An agreed method of representing concepts, information and behaviours.

data

The plural of *datum*; the measurement of an attribute, the volume of gas or the type of rubber. This does not necessarily mean a single measurement: it may be the result of averaging several repeated measurements and these could be quantitative or qualitative.

dependent variable

A *variable* that changes in response to changes to the *independent variable* in an *investigation*.

design

To plan and evaluate the construction of a product or process, including an *investigation.*

digital technologies

Systems that handle digital *data,* including hardware and software, for specific purposes.

discrete data

Quantitative *data* consisting of a number of separate values where intermediate values are not permissible.

environment

All the surroundings, both living and non-living.

evaluate

To examine and judge the merit or significance of something, including processes, events, descriptions, relationships or *data.*

evidence

In science, *evidence* is *data* that is considered reliable and valid, and that can be used to support a particular idea, *conclusion* or decision. Evidence gives weight or value to *data* by considering its credibility, acceptance, bias, status, appropriateness and reasonableness.

experiment / experimental investigation

An *investigation* that involves carrying out a practical activity.

fair test

An *investigation* where one *variable* (the *independent variable*) is changed and all other conditions (controlled variables) are kept the same; what is measured or observed is referred to as the *dependent variable.*

familiar

well-known; something that a student has encountered previously on a number of occasions.

field study / work

An observational or practical *research* undertaken in a normal *environment* of the subject of a study, that is, an *investigation* can be conducted outside the laboratory.

force

A push or pull between objects, which may cause one or both objects to change speed and/or direction of their motion (that is, accelerate) or change their shape. Scientists identify four fundamental *forces*: gravitational, electromagnetic (involving both electrostatic and magnetic forces), weak nuclear forces and strong nuclear forces. All interactions between *matter* can be explained as an action of one or a combination of the four fundamental forces.

formal measurement

Measurement based on an agreed standard unit (metre, second, gram).

formal unit

A unit of measurement based on an agreed fixed standard (metre, second, gram).

guided investigation

An *investigation* partly directed by a teacher.

graph

A visual representation of the *relationship* between quantities plotted with reference to a set of axes.

hypothesis

A tentative idea or explanation for an observation, which can be tested and either supported or refuted by *investigation*.

independent variable

A *variable* that is changed in an *investigation* to see what effect it has on the *dependent variable*.

informal measurement

Measurement that is not based on any agreed standard unit (for example, hand spans, paces, cups).

informal units

Measurements based on *variable* quantities (for example, hand spans, paces, cups).

information research

A study involving collection of information from primary and *secondary sources*.

investigation

A scientific process of answering a question, exploring an idea or solving a problem that requires activities such as planning a course of action, collecting *data*, interpreting data, reaching a *conclusion* and communicating these activities.

law

A statement of a *relationship* based on available evidence.

local environment

Surroundings that can be considered as proximal or *familiar* to the subject of *investigation* (for example, an organism, mountain, student).

material

A substance with particular qualities or that is used for specific purposes.

matter

A physical substance; anything that has mass and occupies space.

model

A representation that describes, simplifies, clarifies or provides an explanation of the workings, structure or relationships within an object, *system* or idea.

multimodal text

A text that combines two or more communication modes, for example, print text, image and spoken word as in film or computer presentations.

natural materials

Products or physical *matter* that come from plants, animals, or earth and have undergone very little modification by humans, minerals and metals that can be extracted from them (without further modification) are considered *natural materials*.

observable

Something that can be seen, heard, felt, tasted or smelled either directly by an individual or indirectly by a measuring device, for example, a ruler, camera or thermometer.

pattern

A repeated occurrence or sequence.

primary sources

Information created by a person or persons directly involved in a study or observing an event.

processed materials

Products of physical *matter* that have been modified from natural *materials* by human intervention or that do not occur at all in the *natural environment*, but have been designed and manufactured to fulfil a particular purpose.

property

An attribute of an object or material, normally used to describe attributes common to a group.

qualitative data

Information that is not numerical in nature.

quantitative data

Numerical information.

reflect on

To think carefully about something, such as past experiences, activities or events.

relate

To identify connections or associations between ideas or relationships or between components of systems and structures.

relationship

A connection or association between ideas or between components of systems and structures.

reliability

An extent to which repeated observations and/or measurements taken under identical circumstances will yield similar results.

reliable data

Data that have been judged to have a high level of *reliability*; *reliability* is the degree to which an assessment instrument or protocol consistently and repeatedly measures an attribute achieving similar results for the same population.

repeat trial

A test within an experimental investigation that is carried out more than once under the same set of conditions.

replicate

An independent experiment that uses the same method in order to validate findings.

report

A written account of an investigation.

research

To locate, gather, record and *analyse* information in order to develop understanding.

scientific language

Terminology that has specific meaning in a scientific context.

scientific literacy

An ability to use scientific knowledge, understanding, and inquiry skills to identify questions, acquire new knowledge, explain science phenomena, solve problems and draw evidence-based conclusions in making sense of the world, and to recognise how understandings of the nature, development, use and influence of science help us make responsible decisions and shape our interpretations of information.

scientist

A person who works within a recognised field of science.

secondary source

Information that has been compiled from *primary sources* by a person or persons not directly involved in the original study or event.

senses

Hearing, sight, smell, touch and taste.

simulation

A representation of a process, event or *system,* which imitates the real situation.

sustainable

Supports the needs of the present without compromising the ability of future generations to support their needs.

survey

An investigation method involving asking questions of a range of respondents.

system

A group of interacting objects, materials or processes that form an integrated whole.

table

An arrangement of *data* or observations in rows and columns.

technology

A development of products, services, systems and environments, using various types of knowledge, to meet human needs and wants.

theory

An explanation of a set of observations that is based on one or more proven hypotheses, which has been accepted through consensus by a group of scientists.

trend

General direction in which something is changing.

tools

Equipment used to make a task easier.

validity

An extent to which tests measure what was intended; an extent to which *data*, inferences and actions produced from tests and other processes are accurate.

variable

A factor that can be changed, kept the same or measured in an investigation, for example, time, distance, light, temperature.