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for the Australian curriculum

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(incorporating Science and Technology K–6)
SYLLABUS

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WORKING SCIENTIFICALLY

OUTCOME

A student:

› investigates by posing questions, including testable questions, making predictions and gathering data to draw evidence-based conclusions and develop explanations ST3-4WS

CONTENT

Students question and predict by:

- with guidance, posing questions to clarify practical problems or inform a scientific investigation (ACSIS231, ACSIS232)
- predicting what the findings of an investigation might be (ACSIS231, ACSIS232)
- applying experience from similar situations in the past to predict what might happen in a new situation

Students plan investigations by:

- with guidance, planning appropriate investigation methods to test predictions, answer questions or solve problems including surveys, fieldwork, research and fair tests (ACSIS086, ACSIS103, ACSHE081, ACSHE098)
- deciding which variable should be changed and measured in fair tests while keeping everything else the same (ACSIS087, ACSIS104)
- collaboratively and individually selecting suitable methods for gathering data and information first-hand and from reliable secondary sources

Students conduct investigations by:

- working individually and collaboratively in conducting a range of appropriate investigation methods, including fair tests, to answer questions or solve problems
- using suitable equipment and materials, checking observations and measurements by repeating them where appropriate
- using equipment and materials safely, identifying potential risks (ACSIS088, ACSIS105)
- accurately observing, measuring and recording data, using digital technologies as appropriate (ACSIS087, ACSIS104)
- using formal units and abbreviations for measuring and recording data
- suggesting improvements to the methods used to investigate a question or solve a problem (ACSIS091, ACSIS108)

Students process and analyse data and information by:

- constructing and using a range of representations, including tables, graphs (column, picture, line and divided bar graphs) and labelled diagrams
- using numerical techniques to analyse data and information, including calculating the means and percentages of small sets of data

- drawing conclusions and providing explanations based on data and information gathered first-hand or from secondary sources
- comparing gathered data with predictions, and using as evidence in developing explanations of events and phenomena (ACSIS218, ACSIS221, ACSHE081, ACSHE098)
- reflecting on their gathered evidence in relation to:
  - the process used to gather, process and analyse their data and information
  - their own prior knowledge as well as accepted scientific explanations
  - their own and others' conclusions

Students communicate by:

- constructing and using a range of representations, including tables and graphs, to represent and describe observations, patterns or relationships in data including using digital technologies as appropriate (ACSIS090, ACSIS107)
- using a variety of ways to honestly and accurately communicate ideas, explanations and processes, including multi-modal texts, labelled diagrams, as well as written and oral factual texts as appropriate (ACSIS093, ACSIS110)

Background information

Progression:

In Stage 3 students develop their skills in applying the processes of Working Scientifically through planning and conducting a range of types of investigations. They increase their understanding of the importance of undertaking scientific investigations honestly and accurately to develop shared evidence-based understandings. They further develop their understanding of the relationship between evidence and the process undertaken, reflecting on their evidence in relation to the process used. Students are more self-reliant in asking questions and in planning and conducting their investigations. They pose testable questions relating to simple cause-and-effect relationships and consider fairness and ways to check observations and measurements. They bring a greater understanding of scientific explanations to their work. Students select and refine their application of the investigation methods encountered in previous stages, by considering data and information from secondary sources, comparing field observations made at different sites or times and using systematic approaches to exploration. Students employ additional methods for recording, processing and communicating their findings, consistent with their stage-appropriate progression in literacy and numeracy, including using at an introductory level, the language of science and graphical representations. They select and use digital technologies where relevant to gather, organise, process and communicate information and/or data from a variety of sources for identified purposes and audiences.

In Stage 4 there is an emphasis on planning and conducting investigations in which variables are controlled (fair tests). The terms independent and dependent variables are introduced. Students move into specialised school laboratory environments and learn to use laboratory equipment safely and effectively. They refine their skills in planning and conducting investigations, processing data and/or information and communicating findings. They further develop skills in critical thinking, problem solving and the use of creativity and imagination in investigating scientifically.

WORKING TECHNOLOGICALLY

OUTCOME

A student:

› plans and implements a design process, selecting a range of tools, equipment, materials and techniques to produce solutions that address the design criteria and identified constraints ST3-5WT

CONTENT

Students explore and define a task by:

- exploring needs for, or opportunities to undertake, the task
- identifying the users' needs and wants using techniques, eg observations, surveys, interviews and market research
- developing a design brief individually and in collaboration with others
- developing design criteria that considers, where relevant, function, aesthetics, social and environmental considerations
- planning the process considering constraints where relevant, eg time, finance, resources and expertise

Students generate and develop ideas by:

- selecting and using creative thinking techniques, including mind-mapping, brainstorming, sketching and modelling
- selecting and using research techniques appropriate to the task
- selecting and using techniques for documenting and communicating design ideas to others, eg drawings, plans, flow charts, storyboarding, modelling and presentations, using digital technologies
- identifying a range of appropriate materials for the task
- selecting and using techniques to investigate the suitability of materials
- applying established criteria to evaluate and modify ideas

Students produce solutions by:

- testing the suitability of materials, considering whether the test was fair or not
- developing a plan and specifications to guide production
- using their plans and production sequence
- for a design project, selecting and safely using a range of tools, equipment and related techniques to cut, edit, join, manipulate and shape materials and/or information

Students evaluate by:

- identifying the strengths and limitations of the process used

- self or peer assessing the final product by using the established design criteria

Background information

Progression:

In Stage 3 students continue to implement and record a process of design. They begin to plan this process considering constraints of time, finance, resources and expertise. They select appropriate methods to generate ideas and apply established criteria to evaluate and modify their ideas. Students continue to use communication techniques to present ideas to others and begin to prepare documentation using plans and specifications. They produce their solutions following their own plans and select and use a range of tools, equipment, materials and techniques appropriate for the task. Students continue to evaluate, throughout the process of designing and producing, using established criteria and constraints.

In Stage 4 students are able to apply design processes that reflect an understanding of needs and opportunities. They continue to research and extract information from a variety of sources and begin to use experiments and tests to enhance the development of a design project. They move into specialised school technology workshops/environments and learn to safely and responsibly apply a broad range of contemporary and appropriate tools, materials and techniques in the development of design projects. They further develop their skills in managing their own time by sequencing processes of designing, producing and evaluating.

PHYSICAL WORLD

OUTCOMES

A student:

› describes how scientific understanding about the sources, transfer and transformation of electricity is related to making decisions about its use ST3-6PW

› uses scientific knowledge about the transfer of light to solve problems that directly affect people's lives ST3-7PW

CONTENT

Electrical circuits provide a means of transferring and transforming electricity. (ACSSU097)

Students:

- identify potential risks and demonstrate safe use when using electrical circuits and devices
- demonstrate the need for a circuit to be complete to allow the transfer (flow) of electricity
- construct simple circuits incorporating devices, eg switches and light globes
- observe and describe how some devices transform (change) electricity to heat energy, light, sound or movement, eg hair dryers, light globes, bells and fans

Energy from a variety of sources can be used to generate electricity and this knowledge can inform personal and community-based decisions about using these sources sustainably. (ACSSU219)

Students:

- research and present ideas about the different ways electricity can be generated, eg burning coal or natural gas; solar, hydroelectric, geothermal, wind and wave-generated electricity
- describe how scientific knowledge can be used to inform personal and community decisions about the use and conservation of sustainable sources of energy (ACSHE217, ACSHE220)

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

Students:

- classify materials as transparent, opaque or translucent, based on whether light passes through them, is absorbed, reflected or scattered
- observe and describe how the absorption of light by materials and objects forms shadows, eg building shading
- gather evidence to support their predictions about how light travels and is reflected

- research, using secondary sources to gather information about science understandings, discoveries and/or inventions that depend on the reflection and refraction of light and how these are used to solve problems that directly affect people's lives, eg mirrors, magnifiers, spectacles and prisms (ACSHE083, ACSHE100)

EARTH AND SPACE

OUTCOMES

A student:

› describes how discoveries by people from different cultures and times have contributed to advancing scientific understanding of the solar system ST3-8ES

› explains rapid change at the Earth's surface caused by natural events, using evidence provided by advances in technology and scientific understanding ST3-9ES

CONTENT

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

Students:

- research the key features of the planets of the solar system and compare how long each takes to orbit the sun
- demonstrate using models that the Earth revolves around the sun and the moon revolves around the Earth
- research the important contributions made by people from a range of cultures and organisations, using technologies of the time, to advancing scientific understanding of the solar system such as Aryabhata, Copernicus, Galileo, CSIRO and NASA (ACSHE082, ACSHE099)
- describe how Aboriginal and Torres Strait Islander peoples use observations of the night sky to inform decisions about some everyday activities, eg food gathering and ceremonies

Sudden geological changes or extreme weather conditions can affect Earth's surface. (ACSSU096)

Students:

- describe using examples how natural geological events cause rapid changes to the Earth's surface, eg earthquakes, volcanic eruptions or tsunamis in the Asian region or throughout the world
- research how some discoveries or inventions have increased scientific knowledge and provided evidence about natural events that cause rapid changes at the Earth's surface
- investigate a recent Australian example of the effect on the Earth's surface of extreme weather conditions, eg cyclones, droughts or floods
- identify ways that advances in science and technology have assisted people to plan for and manage natural disasters to minimise their effects, eg detection systems for tsunamis, floods and bush fires

LIVING WORLD

OUTCOMES

A student:

› describes how structural features and other adaptations of living things help them to survive in their environment ST3-10LW

› describes some physical conditions of the environment and how these affect the growth and survival of living things ST3-11LW

CONTENT

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

Students:

- observe and describe the structural features of some native Australian animals and plants
- present ideas and explanations about how the structural features and behaviour of some plants and animals help them to survive in their environment, eg shiny surfaces of leaves on sand dune plants and nocturnal behaviour in some animals
- research the conditions needed for a particular plant to grow and survive in its environment, eg an indoor plant, plants in deserts, drought-resistant wheat or salt-tolerant plants

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

Students:

- identify some physical conditions of a local environment, eg temperature, slope, wind speed, amount of light and water
- make predictions about how changing the physical conditions of the environment impacts on the growth and survival of living things, eg different amounts of light or water on plant growth or the effect of different temperatures on the growth of yeast or bread mould
- use gathered data to develop explanations about how changing the physical conditions of the environment affects the growth and survival of living things

MATERIAL WORLD

OUTCOMES

A student:

- identifies the observable properties of solids, liquids and gases, and that changes made to materials are reversible or irreversible ST3-12MW
- describes how the properties of materials determine their use for specific purposes ST3-13MW

CONTENT

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

Students:

- observe and compare the differences in the properties and behaviour of solids and liquids, eg shape and ability to flow
- demonstrate that air has mass and takes up space, eg in an inflated basketball, bubbles, balloons and beaten egg white

Changes to materials can be reversible, such as melting, freezing, evaporating; or irreversible, such as burning and rusting. (ACSSU095)

Students:

- observe and describe some readily observable reversible changes that materials can undergo, eg by melting and then solidifying chocolate, and dissolving and retrieving salt or sugar from water
- make and test predictions about the effect of temperature on the state of some substances, eg adding and removing heat from water
- observe some irreversible changes that common materials undergo to identify that the changes may result in new materials or products, eg rusting iron, burning paper, cooking a cake and making toffee
- classify some observable changes that materials undergo as reversible or irreversible

The properties of materials determine their use for specific purposes.

Students:

- identify the properties of materials used in a familiar product and relate them to its use
- explore how materials are used in innovative ways for specific purposes, eg the use of soft-fall materials in playgrounds and geotextiles to retain water in landscaping
- describe how scientific and technological knowledge about the properties of materials can be used to inform decisions about use for their specific purposes
- research the reasons for and the benefits of using solid, liquid and gaseous fuels for heating

BUILT ENVIRONMENTS

OUTCOME

A student:

› describes systems in built environments and how social and environmental factors influence their design ST3-14BE

CONTENT

Systems in built environments are designed to meet the needs of people.

Students:

- identify elements that work together as a system to serve and support built environments and how they are designed to meet the needs of people, eg transport systems that provide access for people to get to work or systems that provide electricity to sites
- draw a plan of, or model, a built environment that includes a range of systems to meet the needs and wants of a specific group of users, eg shade for a playground

Social and environmental factors influence the design of built environments.

Students:

- consider ways that the design or use of places and spaces have changed over time and the social and/or environmental factors that have influenced these changes, eg changes in the design and use of a library due to technological developments or the design of buildings after an earthquake
- generate and develop ideas about how built environments might be designed and constructed in the future to incorporate sustainable environmental practices, eg the use of recycled materials, natural lighting and solar energy
- develop designs and solutions to meet specific social or environmental needs of users, eg an energy-efficient building or high-traffic airport terminal/train station

INFORMATION

OUTCOME

A student:

› describes how social influences impact on the design and use of information and communication systems ST3-15I

CONTENT

Systems can be used to transfer information and support communication.

Students:

- explore how information and communication systems can be used to exchange ideas, collaborate with others, organise and present data, eg a database, spreadsheet and multimedia designs
- communicate with others in different social and/or cultural contexts when designing an information solution, eg being a member of a collaborative online learning community

Social influences can impact on the design of information sources and technologies.

Students:

- demonstrate appropriate and responsible use of information sources and technologies considering, where relevant, different points of view and/or stereotyping
- explore a range of emerging information technologies and the ways that communicating with others has changed, eg the use of video-conferencing, blogs and wikis
- discuss issues of safety and privacy of personal information when communicating, selecting and using information sources and technologies

PRODUCTS

OUTCOME

A student:

› describes systems used to produce or manufacture products, and the social and environmental influences on product design ST3-16P

CONTENT

Systems are used to produce or manufacture products.

Students:

- investigate a system to produce or manufacture a product, eg using an assembly line to produce a food product for sale in the school canteen, or the use of robotics in manufacturing a product
- compare the production process in a domestic setting to mass production, eg baking bread in the home to making it in a bakery

Social and environmental factors can influence the design of products.

Students:

- research the environmental impact of an everyday product from its production through to its use and disposal, eg a PET bottle, a car or newspaper
- redesign a product to respond to a specific social or environmental consequence, eg redesign the packaging of a food product to reduce garbage