**Aim**

**Science**

***Working Scientifically – Stage 3***

***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.*

***Working Technologically – Stage 3***

*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.*

*The aim of the Science and Technology K–6 Syllabus is to:*

* *foster students' sense of wonder and expand their natural curiosity about the world around them in order to develop their understanding of, interest in, and enthusiasm for science and technology*
* *develop students' competence and creativity in applying the processes of Working Scientifically and Working Technologically to appreciate and understand the Natural Environment and Made Environment*
* *enhance students' confidence in making evidence-based decisions about the influences of science and technology in their lives*
* *enable students to confidently respond to needs and opportunities when designing solutions relevant to science and technology in their lives.*

**Science**

**

**Values and Attitudes**

***Values and Attitudes***

***Students:***

* *develop interest and positive, informed values and attitudes towards science and technology*
* *recognise the importance and relevance of science and technology in their lives now and for the future.*

***Skills Knowledge and Understanding***

***Students:***

* *develop knowledge, understanding of and skills in applying the processes of Working Scientifically*
* *develop knowledge, understanding of and skills in applying the processes of Working Technologically*
* *develop knowledge of the Natural Environment through understanding about the Physical World, Earth and Space, and Living World*
* *develop knowledge and understanding of the Natural Environment and the Made Environment through the Material World*
* *develop knowledge and understanding of the Made Environment through Built Environments, Information and Products.*

**Content**

**Science**

**Stage Statement – Stage 3**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Term 1** | **Term 2** | **Term 3** | **Term 4** |
| **GE3-1**  **describes the diverse features and characteristics of places and environments** |
| develop knowledge and understanding of the features and characteristics of places and environments across a range of scales |  |  |  |  |
| develop knowledge and understanding of interactions between people, places and environments |  |  |  |  |

*By the end of Stage 3 students show informed attitudes to issues related to the current and future use and influence of science and technology. They are interested and willing to engage in local, national and global issues that are relevant to their lives and the maintenance of a sustainable future. They are able to discuss how science and technology directly affect people's lives and are used to solve problems.*

*Students initiate, use and apply the processes of Working Scientifically and Working Technologically with a greater level of independence. They are more self-reliant in undertaking a range of scientific investigations and design projects, and in collaboratively completing the tasks. Students select and safely use a variety of equipment, materials and resources identifying potential risks. They identify where improvements to their methods, techniques or research could enhance the quality of the information gathered. Students use a range of representations to present, document and communicate methods, findings and ideas, including tables, graphs, diagrams and multi-modal texts, using digital technologies where relevant.*

*When Working Scientifically, students follow instructions, pose questions for investigations, predict likely outcomes and demonstrate honesty and accuracy in collecting, recording and analysing data and information. In planning and conducting fair tests they are able to identify variables to be changed and measured, and check results by repeating observations and measurements. They construct tables and graphs to organise data and identify patterns. They use evidence to draw conclusions and develop explanations.*

*When Working Technologically, students plan and implement a design process to meet the needs and wants of users/audiences. They explore and define the design task, establishing design criteria and considering constraints when planning the process. Students select and apply appropriate methods to develop and generate ideas and apply established criteria to evaluate and modify them. They develop plans, specifications and production sequences to produce solutions for built environments, information and products. They evaluate their solutions using self and peer assessment, and identify the strengths and limitations of the process used.*

*As students continue to observe and investigate aspects of the Natural Environment, they explain how natural events cause rapid changes to the Earth's surface. They describe key features of the solar system and the contribution of people from a range of cultures over time to the advancement of science. Students explain everyday phenomena associated with the transfer of light and requirements for the transfer and transformation of electricity. They identify how energy from a variety of sources can be used to generate electricity and how science knowledge is used to inform personal and community decisions. Students describe how features of living things help them to survive in their environment and how the growth and survival of living things is affected by changes in the physical conditions of their environment.*

*Students identify the observable properties of solids, liquids and gases. They compare and classify different types of observable changes to materials, considering how their properties determine their use.*

*Within the Made Environment students explain how production systems are used to manufacture products. They explore changes that have occurred in the design of products over time and the social and environmental factors that influence the design of products. Students investigate how systems in built environments are designed to meet the needs of people, in response to social and environmental influences. They explain how systems can be used to transfer information and support communication, and how social influences impact on the design of a range of emerging information products.*

|  |
| --- |
| **Science Objectives and Outcomes** |
|  | **Term 1** | **Term 2** | **Term 3** | **Term 4** |
| **Values and Attitudes** |
| **Objectives – Students will:** |
| develop interest and positive, informed values and attitudes towards science and technology |  |  |  |  |
| * recognise the importance and relevance of science and technology in their lives now and for their future
 |  |  |  |  |
| **Stage ES1-S3 Outcomes** |  |  |  |  |
| **STe-1VA, ST1-1VA, ST2-1VA, ST3-1VA** shows interest in and enthusiasm for science and technology, responding to their curiosity, questions and perceived needs, wants and opportunities |  |  |  |  |
| **STe-2VA, ST1-2VA, ST2-2VA, ST3-2VA** demonstrates a willingness to engage responsibly with local, national and global issues relevant to their lives, and to shaping sustainable futures |  |  |  |  |
| **Te-3VA, ST1-3VA, ST2-3VA, ST3-3VA** develops informed attitudes about the current and future use and influence of science and technology based on reason |  |  |  |  |
| **Skills** |
| **Objectives – Students will:** |
| * develop knowledge, understanding of and skills in applying the processes of Working Scientifically
 |  |  |  |  |
| **Stage 3 - Outcome** |
| **ST3-4WS** investigates by posing questions, including testable questions, making predictions and gathering data to draw evidence-based conclusions and develop explanations |  |  |  |  |
| **Objectives – Students will:** |
| * develop knowledge, understanding of and skills in applying the processes of Working Technologically
 |  |  |  |  |
| **Stage 3 - Outcome** |
| **ST3-5WT** 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 |  |  |  |  |
| **Knowledge and Understanding** |
| **Objectives – Students will:** |
| develop knowledge of the Natural Environment through understanding about the Physical World, Earth and Space, and Living World |  |  |  |  |
| **Stage 3 - Outcome** |
| **ST3-6PW** describes how scientific understanding about the sources, transfer and transformation of electricity is related to making decisions about its use |  |  |  |  |
| **ST3-7PW** uses scientific knowledge about the transfer of light to solve problems that directly affect people’s lives |  |  |  |  |
| **ST3-8ES** describes how discoveries by people from different cultures and times have contributed to advancing scientific understanding of the solar system |  |  |  |  |
| **ST3-9ES** explains rapid change at the Earth’s surface caused by natural events, using evidence provided by advances in technology and scientific understanding |  |  |  |  |
| **ST3-10LW** describes how structural features and other adaptations of living things help them to survive in their environment |  |  |  |  |
| **ST3-11LW** describes some physical conditions of the environment and how these affect the growth and survival of living things |  |  |  |  |
| **Objectives – Students will:** |
| * develop knowledge and understanding of the Natural Environment and the Made Environment through the Material World
 |  |  |  |  |
| **Stage 3 - Outcome** |
| **ST3-12MW** identifies the observable properties of solids, liquids and gases, and that changes made to materials are reversible or irreversible |  |  |  |  |
| **ST3-13MW** describes how the properties of materials determine their use for specific purposes |  |  |  |  |
| **Objectives – Students will:** |
| develop knowledge and understanding of the Made Environment through Built Environments, Information and Products |  |  |  |  |
| **Stage 3 - Outcome** |
| **ST3-14BE** describes systems in built environments and how social and environmental factors influence their design |  |  |  |  |
| **ST3-15I** describes how social influences impact on the design and use of information and communication systems |  |  |  |  |
| **ST3-16P** describes systems used to produce or manufacture products, and the social and environmental influences on product design |  |  |  |  |
|  |

**Content**

**Skills**

**WOrking Scientifically**

|  |
| --- |
| **Investigates by posing questions, including testable questions, making predictions and gathering data to draw evidence-based conclusions and develop explanations** |
|  | **Term 1** | **Term 2** | **Term 3** | **Term 4** |
| **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) |  |  |  |  |
|  |

 **Stage Three**

**WOrking Technologically**

**Skills**

**Stage Three**

|  |
| --- |
| **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** |
|  | **Term 1** | **Term 2** | **Term 3** | **Term 4** |
| **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 |  |  |  |  |
|  |

**Physical world**

**Knowledge and Understanding –**

 **Natural Environment**

|  |
| --- |
| **- 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** |
|  | **Term 1** | **Term 2** | **Term 3** | **Term 4** |
| **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, e.g. switches and light globes |  |  |  |  |
| observe and describe how some devices transform (change) electricity to heat energy, light, sound or movement, e.g. 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, e.g. 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 decision sabout 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, e.g. 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, e.g. mirrors, magnifiers, spectacles and prisms (ACSHE083, ACSHE100) |  |  |  |  |
|  |

**Stage Three**

|  |
| --- |
| **- 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** |
|  | **Term 1** | **Term 2** | **Term 3** | **Term 4** |
| **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 |  |  |  |  |
|  |



**Knowledge and Understanding –**

 **Natural Environment**

**Earth and Space**

**Stage Three**

|  |
| --- |
| **- 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** |
|  | **Term 1** | **Term 2** | **Term 3** | **Term 4** |
| **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, e.g. 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, e.g. 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, e.g. 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, e.g. 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 |  |  |  |  |
|  |

**Knowledge and Understanding – Natural Environment**

**living world**

**Stage Three**

|  |
| --- |
| **- 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** |
| ›  | **Term 1** | **Term 2** | **Term 3** | **Term 4** |
| **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, e.g. shape and ability to flow |  |  |  |  |
| demonstrate that air has mass and takes up space, e.g. 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, e.g. 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, e.g. 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, e.g. 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, e.g. 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 |  |  |  |  |
|  |

**Knowledge and Understanding –**

 **Natural Environment**

**MAterial World**

**Stage Three**

|  |
| --- |
| **Describes systems in built environments and how social and environmental factors influence their design ST3-14BE**  |
|  | **Term 1** | **Term 2** | **Term 3** | **Term 4** |
| **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, e.g. 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, e.g. 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, e.g. 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, e.g. the use of recycled materials, natural lighting and solar energy |  |  |  |  |
| develop designs and solutions to meet specific social or environmental needs of users, e.g. an energy-efficient building or high-traffic airport terminal/train station |  |  |  |  |
|  |

**Knowledge and Understanding –**

 **Natural and Made Environment**

**built environments**

**Stage Three**

|  |
| --- |
| **Describes how social influences impact on the design and use of information and communication systems ST3-15I** |
| ›  | **Term 1** | **Term 2** | **Term 3** | **Term 4** |
| **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, e.g. a database, spread sheet and multimedia designs |  |  |  |  |
| communicate with others in different social and/or cultural contexts when designing an information solution, e.g. 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, e.g. 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 |  |  |  |  |
|  |

**information**

**Knowledge and Understanding –**

**Made Environment**

**Stage Three**

|  |
| --- |
| **Describes systems used to produce or manufacture products, and the social and environmental influences on product design ST3-16P** |
| ›  | **Term 1** | **Term 2** | **Term 3** | **Term 4** |
| **Systems are used to produce or manufacture products.** **Students:** |
| investigate a system to produce or manufacture a product, e.g. 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, e.g. 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, e.g. a PET bottle, a car or newspaper |  |  |  |  |
| redesign a product to respond to a specific social or environmental consequence, e.g. redesign the packaging of a food product to reduce garbage |  |  |  |  |
|  |

**Knowledge and Understanding –Made Environment**

**products**

 **Stage Three**