Years 7 to 10

Technologies

Design and Technologies

September 2022

Scope and sequence

Revised to align with the Australian Curriculum V9.0 (2022)

V2.0

Government of South Australia
Department for Education

Design and Technologies: Year 7 to 10

Content

Context statement

Design and Technologies is about building on students' curiosity and creativity. It involves student's identifying compelling visions of the future and making considered design decisions taking into account diversity; ethics; and economic, environmental and social sustainability factors.

It enables students to create products, services or environments that address authentic problems. Learning in Design and Technologies occurs across 2 strands:

- Knowledge and Understanding: learning about technologies in society and the contexts which produce designed solutions
- Process and Productions skills: the ways people plan and solve problems.

Developing the disposition to approach problems with curiosity and a determination to find solutions requires 2 distinct thinking strategies:

Design Thinking

Design Thinking is the process of imagining, creating, realising, and evaluating solutions. It involves:

- developing empathy for the end user
- investigating and defining problems
- generating and designing innovative, user-centred ideas and solutions
- producing, creating, and evaluating solutions
- evaluating, responding to user feedback, and redesigning (such iteration may occur at any stage of the design cycle)

In Design and Technologies there is a focus on design thinking, however it is acknowledged that there are aspects of **computational thinking** such as pattern recognition, decomposition, algorithmic design, and abstraction that may be beneficial when imagining, creating, and realising solutions.

Systems Thinking

Systems Thinking is a way of viewing problems and solutions from a micro and macro level and assessing their impact. Students need to be able to deconstruct systems to view them through functional, legal, ethical and sustainability lenses. It is about understanding the ways that systems work individually and together to solve problems to create preferred futures.

When using these thinking strategies together, students can develop powerful solutions.

This document is designed to:

- provide clarity and context for teaching Design and Technologies in South Australia
- identify the discipline specific knowledge, skills and understanding learners need at each year level
- guide educators to teach and model Design and Systems thinking
- support educators to understand the concepts, processes, and tools to respond to design challenges
- examples of knowledge, learning or skills in each context or sub-strand are not limited to the examples provided but are there to guide educators to make connections between the content descriptions and their sites context and resources.

Achievement standards

Years 7 to 8	Years 9 to 10
By the end of Year 8, students: • explain how people design, innovate, and produce products, services, and environments for preferred futures • For each of the four prescribed technologies contexts they ◦ explain how the features of technologies impact on design decisions, and ◦ create designed solutions based on analysis of needs or opportunities. • create and adapt design ideas, processes, and solutions, and justify their decisions against developed design criteria that include sustainability. • communicate design ideas and solutions to audiences using technical terms and graphical representation techniques, including using digital tools. • independently and collaboratively document and manage production processes to safely produce designed solutions.	By the end of Year 10, students: • explain how people consider factors that impact on design decisions and the technologies used to design and produce products, services, and environments for sustainable living. • explain the contribution of innovation, enterprise skills and emerging technologies, to global preferred futures. • For one or more of the technologies contexts, students ◦ explain the features of technologies and their appropriateness for purpose, ◦ create designed solutions based on an analysis of needs or opportunities. • create, adapt, and refine design ideas, processes and solutions and justify their decisions against developed design criteria that include sustainability. • communicate design ideas, processes, and solutions to a range of audiences, including using digital tools. • independently and collaboratively develop and apply production and project management plans, adjusting processes when necessary. • select and use technologies skilfully and safely to produce designed solutions.

Scope and sequence

Strand: Knowledge and Understanding

Sub-strand	Year 7	Year 8	Year 9	Year 10
Technologies and society Technologies and society challenges students to consider: • how people use and develop technologies focussing on sustainability, ethical, legal, aesthetic, and functional factors • the impact of technologies on individuals, families, and local, regional, and global communities • the impact of technologies on the economy; and the environment in the context of global preferred futures.	**Explain how people in design and technologies occupations consider factors such as sustainability to design and produce products, services, and environments.** • **outline** how sustainability factors influence the development of solutions • **investigate** how sustainable development can meet global needs • **discuss** how ethical or legal issues impact on technological solutions • **investigate** 3d printing and laser cutting • **outline** how work has changed over time • **consider** the ways in which First Nation peoples have managed resources sustainably for the benefit of their communities • **examine** the impact of engineering solutions on individuals and communities	**Analyse how people in design and technologies occupations consider ethical and sustainability factors to design and produce products, services, and environments.** • **discuss** how the concept of product life cycle impacts on the environment • **compare** the environmental impact of similar manufacturing processes across countries • **identify** ethical or legal factors that should be considered when we create solutions • **examine** the advantages of prototyping • **examine** the effects of mass production on the quality of life of workers • **investigate** the impact the introduction of appropriate technologies has on individuals and communities • **examine** how engineering solutions have the potential to make life better	**Analyse how people in design and technologies occupations consider ethical and sustainability factors to improve products, services, and environments.** • **examine** how upcycling can influence the design and production of a solution • **reverse engineer** items that are mass-produced, focussing on sustainability considerations • **analyse** the ethical and legal factors that influence the types of modifications that can be made to a solution • **investigate** how rapid prototyping has streamlined product development • **consider** the human rights of those working in manufacturing and supply chains • **investigate** how the technological knowledge of First Nations Australians and other cultures has contributed to the creation of innovative solutions • **investigate** the impact advanced technologies have had on individuals, communities, and work	**Analyse how people in design and technologies occupations consider ethical, security and sustainability factors to innovate and improve products, services, and environments** • **compare** mass-production and lean production methods in relation to sustainability • **illustrate** the environmental impact required to produce a solution • **critically analyse** the ethical and legal factors that influence design and manufacture • **analyse** and discuss the impact generative design will have on future solutions • **examine** how work practices have changed as advanced technologies are adopted • **analyse** the way modern industrial design influences First Nations Australians and other cultural approaches to innovative solutions • **evaluate** the impact new technology trends might have on engineered solutions to assist everyday lives

Sub-strand	Year 7	Year 8	Year 9	Year 10
	Explain the development of technologies on designed solutions for global preferred futures. • **reflect** on the use of technology to create preferred futures • **explore** how creativity has driven technological change • **identify** how manufacturing processes and materials can impact solutions • **identify** technological factors that influence design • **outline** opportunities for collaboration in design thinking • **investigate** how cultural groups have combined natural materials and processes to develop solutions	**Analyse the impact of innovation and the development of technologies on designed solutions for global preferred futures.** • **investigate** how technologies have evolved in response to needs, opportunities and preferred futures • **discuss** how technology enhances creativity • **investigate** emerging materials and their impact on design decisions • **explain** how advances in technology can affect design • **examine** how ideas can be communicated between concept and manufacturing process • **consider** the impact of appropriate technology on a community	**Analyse the impact of innovation and emerging technologies on designed solutions for global preferred futures.** • **examine** an emerging technology and its potential impact on global preferred futures • **consider** factors that impact innovation • **investigate** the drivers of technological change • **evaluate** the uses of new technologies to create solutions • **examine** techniques for bridging the gap between concept and manufacture process • **appraise** an application of appropriate technology as a solution for a global preferred future	**Analyse the impact of innovation, enterprise and emerging technologies on designed solutions for global preferred futures.** • **determine** the impact disruptive technologies have had on society • **explain** how creativity, innovation and enterprise contribute to society • **analyse** the opportunities of technological change • **justify** the uses of new technologies to create solutions • **examine** a range of project management methods to achieve designed solutions • **compare** a renewable and appropriate technology
Technologies contexts Students should have the opportunity to produce ***three*** types of designed solutions in several technologies' contexts. The different types of designed solutions have been specified to give students opportunities to engage with a broad range of design thinking and production skills. The combination of technologies contexts and types of designed solutions is a school decision. Designed solutions are created for preferred futures. **Types of designed solutions** A ***product*** is a physical or tangible result of a design process that meets a need. This may include a proof of concept, prototype, or manufactured article. A ***service*** is a less tangible result of a design process and is usually explained	By the end of Year 8 students should have had the opportunity to create a designed solution (product, service, or environment), for each of the four technologies contexts: • Food and fibre production • Food specialisations • Engineering principles and systems • Materials and technologies specialisations.		By the end of Year 10 students should have had the opportunity to create designed solutions (product, service or environment), focused on one or more of the four technologies contexts. The types of designed solutions are a school decision. The four technologies contexts are: • Food and fibre production • Food specialisations • Engineering principles and systems • Materials and technologies specialisations.	

Sub-strand	Year 7	Year 8	Year 9	Year 10
through plans, flow charts, diagrams, procedures or working drawings. An ***environment*** is a real or virtual space or place that can be natural, managed, constructed or digital. It is the result of a design process.				
Food and fibre production Food and fibre are the human-produced or harvested resources used to sustain life and are produced in managed environments such as farms, gardens and plantations or harvested from wild populations. Challenges for world food and fibre production include an increasing world population, an uncertain climate and competition for resources such as land and water. This poses challenges for economic, environmental, and social sustainability, and ethical considerations. Students should have the opportunity to engage in these challenges by understanding the processes of food and fibre production and by investigating innovative and sustainable ways of supplying agriculturally produced raw materials. They will progressively develop knowledge and understanding about the managed systems that produce food and fibre through creating designed solutions. *Food and fibre is one of four contexts which underpin Design and Technologies.*	**Explain how food and fibre are produced in managed environments and how these can become sustainable** • **identify** regions in Australia where major food, plants and animals are produced • **identify** the components that need to be managed sustainably in a food or fibre production system, including soil, organisms, and water • **identify** the key principles for management of food or fibre environments, for example: dairies, beehives • **identify** mainstream food production systems such as broadacre cropping, red meat industries • **discuss** the concept of animal welfare and what it means for primary production • **define a** production chain from raw material to marketable product • **identify** digital tools that are used to manage food and fibre systems	**Analyse how food and fibre are produced in managed environments and how these can become sustainable** • **describe** regions in Australia facing challenges in current agricultural practices • **examine** the components that need to be managed sustainably in a food or fibre production system, including soil, organisms, and water • **compare** how one or more food or fibre environments are managed, for example: kitchen gardens and orchards, poultry • **examine** emerging or innovative production techniques like vertical farming and alternate species including those utilised by First Nations peoples • **consider** how primary producers balance high productivity with animal welfare and biosecurity in managed systems (like egg production) • **investigate** a production chain from raw material to marketable product • **illustrate** how digital tools could be used to enhance food production systems, for example, automated animal feeding • **define** the influence consumers have on food and fibre production	**Analyse and make judgements on the ethical and sustainable production of food and fibre enterprises** • **examine**, prioritise, and discuss solutions for the challenges facing agriculture in Australia such as: climate variability, pests, diseases, and weeds • **model** the components that need to be managed sustainably in a food or fibre production system, including soil, organisms, and water • analyse food and fibre systems from different perspectives, for example, biosecurity • **experiment** with one emerging and innovative technology solution • **analyse** animal welfare principles in a food or fibre production system • **analyse** and plan a production chain from raw material to marketable product • **investigate** how digital tools could be used to enhance food production systems, for example, crop sensors • **investigate** the influence consumers have on food and fibre production, marketing, and labelling	**Analyse and make judgements on the ethical, secure and sustainable production and marketing of food and fibre enterprises** • **analyse** primary production practices for their suitability as profitable, secure, and sustainable food sources in different regions and under changing climate conditions in Australia • **use** the components that need to be managed sustainably in a food or fibre production system to develop a solution • **critically analyse** the management of a food or fibre environment • **apply** one emerging and innovative production technique to the creation of a solution • **design** a solution that balances the demand for high standards of animal welfare and productivity • **critically analyse** a production chain from raw material to marketable product • **apply** the use of a digital tools to enhance the design of a food or fibre production system • **critically** analyse the influence of market forces like consumers and trade agreements on food and fibre production, marketing, and profitability

Sub-strand	Year 7	Year 8	Year 9	Year 10
Food specialisations Food specialisations includes the application of nutrition principles (as described in Health and Physical Education) and knowledge about the characteristics and properties of food; food systems and technologies; food selection and preparation; and contemporary technology-related food issues. There is increasing community interest and awareness about accessing quality nutritious food from ethical and sustainable food systems, and the need to empower individuals and communities to make informed food selection and preparation choices to meet their needs. Students should have the opportunity to understand the importance of having access to and eating a variety of foods, and a sound understanding of nutrition principles. They need to develop an understanding of contemporary technology-related food issues, such as the supply and consumption of food that reflects ethical and sustainable practices; and skills in food preparation when making food decisions to support healthy eating. They will progressively develop knowledge and understanding about food, food systems and technologies, and how to make informed and appropriate food preparation choices when experimenting with and preparing food. *Food specialisations is one of four contexts which underpin Design and Technologies.*	**Explain how properties of foods influence selection and preparation for healthy eating.** • **identify** and explain the Australian guide to healthy eating. • **examin**e a range of technologies and equipment, and how to operate safely to prepare food, including kitchen utensils, ovens and stovetops and electrical appliances • **explain** food safety practices and systems including maintaining personal hygiene, clean equipment and workspaces, and safe food storage • **explore** a variety of foods used in diverse cultural practices to expand food experiences • **examine** the benefits of knowledge and skill when producing healthy beverages, snacks, and meals • **examine** how food affects our senses considering appearance, aroma, taste, and texture • **conduct** and discuss sensory and nutritional assessment testing of a range of foods to determine how these characteristics might be used to enhance food solutions, for example: taste testing a variety of milks or comparing freshly squeezed juice with commercial juices	**Analyse how properties of foods determine preparation and presentation techniques when designing solutions for healthy eating.** • **identify** and explain the Australian guide to healthy eating • **investigate** equipment to safely produce healthy food • **understand** and apply food safety requirements when working with food to prevent cross-contamination and growth of micro-organisms • **examine** how cultural groups use healthy food and cooking methods, and technologies to support healthy eating • **examine** the benefits of being decisive and accomplished at producing healthy beverages, snacks, and meals • **explain** how food preparation techniques impact on our sensory properties considering appearance, aroma and taste and texture • **investigate** the nutritional requirements of age groups and identify a variety of food solutions for their health • **examine** and conduct a sensory and nutritional assessment testing of a range of foods to determine how these characteristics might be used to enhance food solutions, for example: fresh and preserved fruit, vegetables, breads, crackers, cheeses, yoghurts	**Analyse how properties of foods influence the design and preparation of sustainable food solutions for healthy eating.** • **identify** and explain the Australian dietary guidelines including low sugar and high fibre • **understand** and apply safe practices including maintaining personal hygiene, clean workspaces, food safety systems • **understand** the influence immigration has had on accessing quality Australian food products • **understand** the influence First Nation people have had on accessing quality Australian food products • **research** and apply a range of specialist techniques in food preparation, including vegetable, protein, and egg cookery • **compare** with healthy snacks with factory products • **compare** healthy meals with convenience products or takeaway meals • **investigate** and conduct a sensory and nutritional assessment testing of a range of foods to determine how these characteristics might be used to enhance food solutions, for example: ○ pasta, noodles, couscous, cereal and grain products, lentils, chickpeas, low food milk proteins, soups and stir-fry • **compare** a range of healthy food solutions offered by profit and non-profit organisation	**Analyse and make judgements on how the sensory and functional properties of food influence the design and preparation of sustainable food solutions for healthy eating.** • **examine** Australian dietary guidelines concepts • **investigate,** and apply safe practices including maintaining personal hygiene, clean workspaces, and food safety systems • **develop** and demonstrate the use of a food safety plan/checklist to demonstrate understanding of systems thinking • **conduct** a sensory and nutritional assessment of a range of foods to determine how these characteristics might be used to enhance healthy food solutions, for example: sauces, dressings, fermented foods, plant-based proteins, sugar alternatives, fresh and dried herbs and spices • **investigate** the nutritional requirement of age groups, identify healthy options and justify healthy designed solutions • **examine** food innovations and enterprises and how they may influence healthy and sustainable food solutions for example: accreditation of organic foods, plant-based foods to reduce environmental impact, food delivery systems, insect proteins, university research projects, non-dairy milk classification, names and Australian standards, virtual cooking classes • **consider** factors that influence the sustainable food production, service, and environment for example

			• **examine and understand** current food packaging and labelling requirements • **examine** macro-nutrients and some micronutrients to understand why specific vitamins and minerals are legally required to be added to staple foods (mandatory fortification) including bread, cereals, and milk • **examine a** healthy food challenge and compare a variety of appropriate food solutions for products, services, or environments for example: ○ designing and producing a vegetarian packed lunch for a teen who catches the bus to work ○ designing and producing a digital service to support individuals or families with a food allergy or an intolerance ○ designing and producing an environment for sharing a community meal for families facing financial hardship	○ designing and producing a healthy food product for delivery ○ designing and producing a service about a digital healthy eating campaign / solution ○ designing and producing a healthy eating environment for customers or clients • **investigate** a range of food industry training pathways and occupations with specialist food preparation skills such as: pastry, choux pastry, dumpling folding, cultural cuisine specialist techniques, breads, yeast cookery, cake decorating • **examine** and experiment with food preservation methods such as pickling, jams, freezing and dehydrating to determine changes to food structure • **explain** how food preservation methods impact on designing healthy, sustainable, and ethical food solutions and food security • **investigate** ways innovative technologies may influence health, work, and sustainability, for example: The Internet of Things, food supply chains and networks for food security, use of augmented reality in food labelling, 3D printing of foods

Sub-strand	Year 7	Year 8	Year 9	Year 10
Engineering principles and systems Engineering principles and systems is focused on how energy and forces (for example, chemical, mechanical, friction, electromagnetic, electrostatic, and gravitation) can be used to influence light, sound, heat, and movement within products, systems, and environments. Engineering provides opportunities for students to make sense of and integrate scientific and mathematical principles and concepts through the application of engineering design processes and practical skills. Enabling the design and production of sustainable engineered solutions. Students should have the opportunity to understand how sustainable engineered products, services and environments can be designed and produced as some resources diminish and environments change. Students will progressively develop knowledge and understanding of how forces and the properties of materials affect the behaviour and performance of engineering solutions. *Engineering Principles and Systems is one of four contexts which underpin Design and Technologies.*	**Explain how force, motion and energy are used to manipulate engineered systems.** • **recognise** how electrical energy, motion and forces operate • **investigate** how simple machines work (inclined planes, wedges, or levers) • **describe** what components are needed to power and make a simple electric circuit • **understand** what happens when motion, force or energy is applied to a sensor • **describe and understand** how an embedded system can be used to control environments using sensor inputs	**Analyse how force, motion and energy are used to manipulate, and control engineered systems.** • **test** structural components for strength • **compare** the behaviour of engineered solutions when motion, force or energy is applied • **consider** how gears and pulleys work • **experiment** with a range of electronic components to design and make a system that performs a simple function • **examine** the way motion, force or energy are used to manipulate and control electromechanical systems • **examine** how an embedded system can be powered, programmed, and applied	**Analyse how the characteristics and properties of materials are combined with force, motion and energy to control engineered systems** • **analyse** the relationship between material properties and engineering design. • **analyse** what happens when motion, force or energy is applied to an engineered solution • **analyse** how more advanced mechanical systems are used in familiar products enabling changes in movement and force • **apply** a range of electronic components to design and make a system that performs a simple function • **analyse** the way motion, force or energy are used to manipulate and control electromechanical systems • **experiment** with an embedded system to control a solution	**Analyse and apply the characteristics and properties of materials and components to control engineered systems.** • **reverse engineer** a product to see what materials were used, its form and function, and how it was assembled • calculate the result when motion, force or energy is applied to engineered solutions • utilise a mechanical system to solve a problem • **apply** a range of electronic components to design and make a system that performs a complex function • **create** an electromechanical solution that interacts with the environment • **apply** an embedded system to control a solution

Sub-strand	Year 7	Year 8	Year 9	Year 10
Materials and technologies specialisations Materials and technologies specialisations focus on a broad range of traditional, contemporary, and emerging materials and specialist areas that typically involve extensive use of technologies. Society depends on designed products, services and environments for communication, housing, employment, healthcare, recreation, and transport; however, society also faces increasing concerns related to long-term sustainability. Students should have the opportunity to develop the confidence to make decisions about processes and solutions that are ethical and sustainable. Students can do this by learning about and working with materials, components, and production processes. Students progressively develop knowledge and understanding of the characteristics and properties of a range of materials, either when investigating materials or through producing designed solutions. *Materials and technologies specialisations is one of four contexts which underpin Design and Technologies.*	**Explain how characteristics and properties of materials, systems, components, tools, and equipment can be combined to create designed solutions.** • **identify** a range of materials, including recycled materials • **recognise** a range of components, including flat pack systems • **explain** a range of production processes including upcycling • **use** a range of tools and equipment to achieve a solution • **develop** an understanding of how characteristics and properties of materials affect the behaviour and performance of solutions • **recognise** how natural materials are used by cultures to create sustainable solutions, including First Nation peoples • **recognise** traditional and emerging materials as viable options in a solution	**Analyse how characteristics and properties of materials, systems, components, tools, and equipment can be combined to create designed solutions.** • **select** from a broad range of technologies – materials, systems, components, tools, and equipment to achieve a solution • **recognise** how materials are joined and enhance the structural integrity of a solution • **recognise** how physical and chemical changes can enhance the performance of materials • **explain** how characteristics and properties of materials affect the behaviour and performance of solutions • **analyse** the benefits and disadvantages of producing a solution with a variety of natural and synthetic materials • **compare** traditional and emerging materials as viable options in a solution	**Analyse and make judgements on how characteristics and properties of materials, systems, components, tools, and equipment can be combined to create designed solutions.** • **analyse** and select a broad range of technologies – materials, systems, components, tools, and equipment to achieve a solution • **compare** how materials are joined and enhance the structural integrity of a solution • **compare** physical and chemical changes to enhance the performance of materials • **apply** characteristics and properties of materials to affect the behaviour and performance of solutions • **apply** the use of natural and synthetic materials to the production of a solution • **apply** components and materials to create solutions using systems thinking e.g., flat-pack products • **use** traditional and emerging materials in a solution	**Analyse and make judgements on how characteristics and properties of materials, systems, components, tools, and equipment can be combined to create designed solutions.** • **justify** decisions when selecting from a broad range of technologies – materials, systems, components, tools, and equipment to achieve a solution • **recommend** and apply production methods to enhance how materials are joined and enhance the structural integrity of a solution • **recommend** and apply production methods to enhance the performance of materials • **analyse** characteristics and properties of materials to enhance the behaviour and performance of solutions • **experiment** with the use of natural and synthetic materials to the production of a solution as an approach to preferred futures • **consider** the use of components and materials to create solutions using systems thinking e.g., flat-pack products as a viable alternative to traditional construction techniques • **consider** the options of using traditional and emerging materials in a solution

Strand: Process and Production (Creating solutions using Design Thinking)

Sub-strand:	Year 7	Year 8	Year 9	Year 10

Investigating and defining
 	
Investigating and defining involves students exploring, reviewing, and analysing information, in response to needs and opportunities.
 	
As designers, students critically reflect on the intention, purpose, and use of technologies to create designed solutions.
 	
Analysing encourages students to examine values, and question and review processes and systems.
 	
Students reflect on how decisions they make may have implications for the individual, society, and the local and global environment, now and in the future. Students explore and investigate technologies, systems, products, services, and environments as they consider needs and opportunities.
 	
Students progressively develop effective research strategies and critically consider the contribution of technology to society.
 	
Students develop design criteria in response to needs and opportunities and may respond to or develop design briefs.
 	
Evidence of investigating and defining can be found in
• *the design folio as students document the investigation of the solution*
• *the prototype or solution*
• *Evaluating*
	Recognise a need or **opportunity. Respond to or develop a design brief, and identify materials, components, tools, equipment, and processes to create designed solutions.**
	
	• **recognise** a problem or need locally or within a community
	• **recognise** factors that could influence the design of a solution
	• **discuss** the strengths and weaknesses of existing solutions
	• **respond** to or create a design brief that:
	  ○ provides a clear outline of the situation
	  ○ provides constraints and other considerations
	  ○ develops specific criteria for success
	• **discuss** a logical production plan for creation of a solution
	• **compare** some existing solutions, and consider similar design features of each that will impact on the solution
	• **survey** some suitable materials that could be used in a solution
	• **choose**, with guidance, appropriate tools, techniques and equipment for solution development and production
	• **develop** the skills needed to use equipment and tools to create models, prototypes, samples, and the solution
	• **revisit** the design brief and production plan and its criteria as more information becomes available
		Identify a need or opportunity. Respond to or develop a design brief, and identify materials, components, tools, equipment, and processes to create designed solutions.
		
		• **identify** a problem or need locally or within a community
		• **consider** factors that might influence the design of a solution
		• **investigate** the strengths and weaknesses of existing solutions
		• **create** a design brief that
		  ○ provides a clear outline of the situation
		  ○ provides constraints and other considerations
		  ○ develops specific criteria for success
		• **discuss** and document a logical production plan for creation of a solution using a design thinking strategy
		• **contrast** existing solutions, and consider different design features of each that will impact on the solution
		• **compare** a range of suitable materials that could be used in a solution
		• determine, with guidance, appropriate tools, techniques and equipment for solution development and production
		• **develop** the skills needed to use equipment and tools to create models, prototypes, samples, and the solution
		• **revise** the design brief and production plan and its criteria as more information becomes available
			Analyse a need or opportunity. Develop a design brief, and investigate and select materials, systems, components, tools, equipment, and processes to create designed solutions.
			
			• **analyse** a problem or need locally, within a community, or globally
			• **analyse** the factors that impact design decisions when designing a solution
			• **analyse** existing solutions as part of a broader design thinking strategy
			• **create** an initial design brief based on an established need, including
			  ○ a clear outline of the situation
			  ○ constraints and other considerations
			  ○ specific criteria for success
			• **create** and document a logical production plan for creation of a solution using an empathetic design thinking model and setting realistic milestones
			• **analyse** a range of existing solutions, and consider design features that will impact on the solution
			• **examine** and evaluate a variety of suitable materials that could be used in a solution
			• **select** and make use of, with guidance, a range appropriate tools, techniques and equipment for solution development and production
			• **develop** the skills needed to use equipment and tools to create models, prototypes, samples, and the solution
				Critically analyse a need or opportunity. Develop a design brief, and investigate and select materials, systems, components, tools, equipment, and processes to create designed solutions.
				
				• **critically analyse** a problem or need locally, within a community, or globally
				• **critically analyse** the factors that impact design decisions when designing a solution
				• **critically analyse** existing solutions as part of a broader design thinking strategy
				• **create** and validate an initial design brief based on an established need, including
				  ○ a clear outline of the situation
				  ○ constraints and other considerations
				  ○ specific criteria for success
				• **create** and document an in depth, logical production plan for creation of a solution using an empathetic design thinking model and setting realistic milestones
				• **critically analyse** a range of existing solutions, and consider design features that will impact on the solution
				• **examine**, test, and evaluate a variety of suitable materials that could be used in a solution
				• **select** and justify the use of appropriate tools, techniques and equipment for solution development and production
				• **develop** the skills needed to use equipment and tools to create models, prototypes, samples, and the solution

Sub-strand:	Year 7	Year 8	Year 9	Year 10
	• **list** the human consequences for society, and the local and global environment, now and in the future	• **identify** the human consequences for society, and the local and global environment, now and in the future	• **refine** the design brief and production plan and its criteria as more information becomes available • **explain** the human consequences for society, and the local and global environment, now and in the future	• **refine** the design brief and production plan and its criteria as more information becomes available • **analyse** the human consequences for society, and the local and global environment, now and in the future

Generating and designing
Students develop and communicate design ideas for a range of audiences. Students generate and iterate ideas, make choices, analyse options, consider alternatives, and document various design ideas and possibilities.
Students use critical and creative thinking strategies to generate, evaluate and document ideas to meet needs or opportunities.
Generating creative and innovative ideas involves thinking differently; it entails proposing new approaches to existing solutions and identifying new design opportunities considering preferred futures. Generating and developing ideas involves identifying various competing factors that may influence and dictate the focus of the idea.
Students evaluate, justify, and synthesise what they learn and discover. They use graphical representation techniques when they draw, sketch, model, and simulate ideas that focus on designed solutions.
Evidence of generating and designing can be found in
• *the design folio as students document the design of the solution*
• *the prototype or solution*
• *Evaluating*
	Generate, iterate, and communicate design ideas processes and solutions using technical terms and graphical representation techniques, including using digital tools.
	• **identify** a range of possible solutions based on the initial design brief, constraints, and the concept of preferred futures
	• **revise** the initial design brief including any new criteria to measure the success of the solution
	• **generate** annotated sketches (hand or digital) of design ideas
	• **communicate** design ideas to various audiences seeking improvements and feedback
	• **test** elements of the solution if required
	• **develop** a design folio which outlines engagement with a design process
		Generate, test, iterate and communicate design ideas, processes and solutions using technical terms and graphical representation techniques, including using digital tools.
		• **develop** a range of possible solutions based on the initial design brief, constraints, and the concept of preferred futures
		• **revise** the initial design brief including any new criteria to measure the success of the solution
		• **generate** annotated sketches (hand or digital) of design ideas including
		  ○ freehand sketches
		  ○ perspective drawings or
		  ○ orthogonal drawings
		  ○ production drawings
		  ○ other ways of communicating design ideas specific to the selected context
		• **communicate** design ideas to various audiences seeking improvements and feedback
		• **test** elements of the solution if required
		• **develop** a design folio which clearly communicates the logical application of a design process to arrive at a working solution
			Apply skills to generate, test, iterate and communicate design ideas, processes, and solutions, including using digital tools.
			• **analyse** the initial design brief and constraints to formulate appropriate solutions that demonstrate:
			  ○ creativity
			  ○ innovation
			  ○ consideration of preferred futures
			• **revise** the initial design brief including any new criteria to measure the success of the solution
			• **generate** annotated sketches (hand or digital) of design ideas including
			  ○ freehand sketches
			  ○ perspective drawings or
			  ○ orthogonal drawings
			  ○ production drawings
			  ○ other ways of communicating design ideas specific to the selected context
			• **express** product design ideas using relevant technical language
			• **evaluate** generated design ideas and possible solutions, then justify a chosen solution
			• **communicate** design ideas to various audiences seeking improvements and feedback
				Apply innovation and enterprise skills to generate, test, iterate and communicate design ideas, processes, and solutions, including using digital tools.
				• **critically analyse** the initial design brief and constraints to formulate appropriate solutions that demonstrate:
				  ○ creativity
				  ○ innovation
				  ○ consideration of preferred futures
				• **revise** the initial design brief including any new criteria to measure the success of the solution
				• **generate** annotated sketches (hand or digital) of design ideas including
				  ○ freehand sketches
				  ○ perspective drawings or
				  ○ orthogonal drawings
				  ○ production drawings
				  ○ other ways of communicating design ideas specific to the selected context
				• **express** product design ideas using relevant technical language
				• **evaluate** generated design ideas and possible solutions, then justify a chosen solution
				• **communicate** design ideas using appropriate technical terms seeking improvements and feedback

Sub-strand:	Year 7	Year 8	Year 9	Year 10
			• **test** components of the solution by virtual or real prototyping • **develop** a design folio which clearly communicates the logical application of a design process to arrive at a working solution	• **test** components of the solution by virtual or real prototyping • **record** the generation and development of design ideas and processes for an intended audience including justification of decisions

Producing and implementing
Producing and implementing involves students learning and applying a variety of skills and techniques to make designed solutions to meet specific purposes and user needs.
Students apply knowledge about components, materials and their characteristics and properties to ensure their suitability for use.
Students learn about the importance of adopting safe work practices and develop accurate production skills to achieve quality designed solutions.
Students develop the capacity to select and use appropriate materials, systems, components, tools, equipment and processes, cognoscente of the need for sustainability.
The use of modelling and prototyping to accurately develop simple and complex simulated or physical models supports the production of successful designed solutions.
Evidence of producing and implementing may be found in
• *the folio as students document the production of the solution*
• *the prototype or solution*
• *Evaluating*
	Select and use suitable materials, components, tools, and equipment to safely create designed solutions.
	• **understand** the importance of implementing safe work practices and operating procedures
	• **effectively** and safely use materials, components, tools, equipment, and techniques to produce a solution
	• **reduce** risks associated with production activities by maintaining a safe attitude in practical work areas
	• **develop** appropriate production practices to achieve quality solutions
	• **document** and explain the production of a solution including choices made in material and production techniques
		Select, justify, and use suitable materials, components, tools, equipment, skills and processes to safely create designed solutions.
		• **understand** the importance of implementing safe work practices and operating procedures
		• **effectively** and safely use a broad range of materials, components, tools, equipment, and techniques to produce a solution
		• **reduce** risks associated with production activities by maintaining a safe attitude in practical work areas
		• **develop** appropriate production practices to achieve quality solutions
		• **develop** creative ways of manipulating technologies by comparing and combining the most appropriate options to create a solution
		• **document** and explain the production of a solution including choices made in material and production techniques
			Select, justify, test, and use suitable technologies, skills, and processes to safely create designed solutions.
			• **understand** the importance of implementing safe work practices and operating procedures
			• **competently** and safely select and use a broad range of materials, components, tools, equipment, and techniques to produce solutions
			• **reduce** risks associated with production activities by maintaining a safe attitude in practical work areas
			• **develop** accurate production practices to achieve quality designed solutions
			• **test** and/or troubleshoot issues during production, recording solutions.
			• **document** an annotated visual record of the production of the solution that can includes:
			  ○ production process
			  ○ practice pieces or samples
			  ○ testing
			  ○ record of discussions that resulted in improvement of the solution
				Select, justify, test, and use suitable technologies, skills and processes to safely create designed solutions.
				• **understand** the importance of implementing safe work practices and operating procedures
				• **competently** use production skills to safely produce solutions using an extensive range materials, components, tools, equipment, and techniques
				• **reduce** risks associated with production activities by maintaining a safe attitude in practical work areas
				• **develop** accurate production practices to achieve quality designed solutions
				• **effectively** select a broad range of materials, components, tools, equipment, and techniques to produce a solution in collaboration with the teacher
				• **document** and explain the production of the solution including:
				  ○ choices made in material and production techniques
				  ○ production process
				  ○ practice pieces or samples
				  ○ testing or troubleshooting
				  ○ record of discussions that resulted in improvement of the solution
				  ○ unforeseen challenges

Sub-strand:	Year 7	Year 8	Year 9	Year 10
Evaluating Evaluating involves students reviewing design ideas, processes, and solutions, seeking feedback, and making judgements throughout a design process. It is about reflecting on the quality and effectiveness of their designed solutions and others' solutions. Students identify design criteria in the investigating and defining stage and then use these criteria to consider the implications and consequences of actions and decision-making throughout the process. They determine effective ways to test, judge and improve their ideas, concepts and, designed solutions. They reflect on processes and amend criteria as appropriate. Students transfer this learning to other design projects. *Evaluation is iterative. It can occur at any stage of the design cycle. Evidence of evaluation forms part of the design folio.* Students are encouraged to utilise multimodal options to demonstrate evidence of learning.	**Negotiate design criteria, including sustainability, to evaluate design ideas, processes, and solutions.** • **develop** or **use** pre-determined success criteria based on the design brief and constraints • **evaluate** the solution against the success criteria • **reflect** on the original analysis, problems encountered during construction and how they were solved • **reflect** on initial reasoning or missing information that resulted in an unexpected outcome	**Develop design criteria collaboratively including sustainability to evaluate design ideas, processes, and solutions.** • **develop** success criteria based on the design brief and constraints • **evaluate** the processes used to create the solution • **evaluate** the solution against the success criteria • **reflect** on the original analysis, problems encountered during construction and how they were solved • **reflect** on initial reasoning or missing information that resulted in an unexpected outcome	**Develop design criteria independently, including sustainability to evaluate design ideas, processes, and solutions.** • **establish** explicit success criteria based on the design brief and constraints • **evaluate** the processes used to create the solution • **evaluate** the solution against the success criteria • **reflect** on the original analysis, problems encountered during construction and how they were solved • **reflect** on initial reasoning or missing information that resulted in an unexpected outcome • **seek** and **document** feedback about the final solution from others using success criteria to inform reasoning • **propose** how the solution could be improved	**Develop design criteria independently, including sustainability to evaluate design ideas, processes, and solutions.** • **establish** explicit primary and secondary success criteria based on the design brief and constraints • **justify** the selection and use of processes during project development • **reflect** on the original success criteria, problems encountered during construction and how they were solved • **appraise** the solution success against primary and secondary success criteria • **analyse** the impact of the product or system on individuals, society and/or environment regarding preferred futures • **respond** to evaluation feedback from others in a meaningful way

Collaborating and managing
Collaborating and managing involves students learning to work collaboratively and to manage time and other resources to effectively create designed solutions. Progressively, students develop the ability to communicate and share ideas throughout the process, negotiate roles and responsibilities and make compromises to work effectively as a team. Students work individually and in groups to plan, organise and monitor timelines, activities, and the use of resources. They progress from planning
	Develop project plans to manage time, resources, and production of designed solutions individually and collaboratively.
	
	• **use** a design brief to respond to all design tasks
	• document:
	  ○ active individual involvement how team roles will be negotiated
		Develop project plans to manage time, cost, and production of designed solutions individually and collaboratively.
		
		• **use** or create a design brief to respond to all design tasks
		• document:
		  ○ active individual involvement
		  ○ how team roles will be negotiated
			Develop project plans for a specified purpose and audience to manage time and cost individually and collaboratively, taking into consideration the process and production of designed solutions.
			
			• **create** a design brief to respond to all design tasks
			• document:
			  ○ active individual involvement
			  ○ assigning roles to a group
				Develop project plans for intended purposes and audiences to manage projects individually and collaboratively, taking into consideration time, cost, risk, processes, and production of designed solutions.
				
				• **create** a design brief to address all design tasks
				• document:
				  ○ evidence of working independently and cooperatively to develop ideas and produce a solution

Sub-strand:	Year 7	Year 8	Year 9	Year 10
steps in a project through to more complex project management activities that consider various factors such as time, cost, risk assessment, management, and quality control. *The project plan forms part of the design folio.* Students are encouraged to utilise multimodal options to demonstrate evidence of learning.	○ processes to be used to achieve outcomes ○ timelines and deadlines for milestones ○ contingency plans ○ how decisions in the group were determined • **explain** the production of the product, service, or environment including choices made in material and production techniques • **record** discussions had with individuals (teachers, students, or team members) that resulted in improvement of the solution • **screenshot** information or ideas communicated online	○ processes to be used to achieve the outcomes ○ timelines and deadlines for milestones ○ contingency plans ○ how decisions in the group are determined • **explain** the production of the product, service, or environment including choices made in material and production techniques • **record** discussions had with individuals (teacher, students, or team members) that resulted in improvement of the solution • **document** examples of problem-solving that occurred during production or implementation • **screenshot** information or ideas communicated online	○ processes to be used to achieve the outcomes ○ timelines and deadlines for milestones ○ contingency plans ○ anticipated costs ○ evidence of practical skills practice ○ how decisions in the group are determined • **annotate** a visual record of production that details: ○ testing ○ practice pieces, components, or samples ○ the production processes • **document** and **detail** discussions held with peers, clients or customers that impacted positively on the production process and final product, service, or environment. • **screenshot** information or ideas communicated online	○ assigning roles to a group ○ processes to be used to achieve the outcomes ○ timelines and deadlines for milestones ○ contingency plans ○ anticipated costs ○ evidence of practical skills practice • **produce** sketches and workshop drawings as planning tools • **establish** materials and equipment needs, cost of materials or ingredients lists • **create** simple production flowcharts to ensure safe, efficient, and sustainable workflows • **identify** strategies to enhance production, for example: ○ techniques to reduce use, cut costs, speed up processes ○ forming beneficial partnerships with others in production • **screenshot** information or ideas communicated online