Australian CURRICULUM Review

TECHNOLOGIES

CONSULTATION CURRICULUM

Design and Technologies – All elements 7–10

AUSTRALIAN CURRICULUM, ASSESSMENT AND REPORTING AUTHORITY

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F–10 AUSTRALIAN CURRICULUM: TECHNOLOGIES

ABOUT THE LEARNING AREA

Introduction

The Australian Curriculum: Technologies Foundation to Year 10 comprises two subjects:

- Design and Technologies, in which students use design thinking and technologies to generate and produce designed solutions for authentic needs and opportunities
- Digital Technologies, in which students use computational thinking and information systems to define, design and implement digital solutions for authentic problems.

The Australian Curriculum: Technologies is written on the basis that all students will study the two subjects from Foundation to the end of Year 8.

In Years 9 and 10, student access to Technologies subjects will be determined by state and territory authorities or individual schools. Subjects may continue with Design and Technologies and Digital Technologies, as outlined in the Australian Curriculum: Technologies, or subjects relating to specific aspects of the curriculum such as technologies contexts or digital specialisations.

The curriculum for each of Design and Technologies and Digital Technologies describes the distinct knowledge, understanding and skills of the subject. Students will have the opportunity to develop a comprehensive understanding of traditional, contemporary and emerging technologies. There is flexibility for schools to develop teaching programs that integrate both Technologies subjects and other learning areas. This may be particularly important for primary school programs.

Rationale

Technologies enrich and impact on the lives of people and societies globally. They can play an important role in transforming, restoring and sustaining societies and natural, managed and constructed environments. Australia needs enterprising individuals who can make discerning decisions about the development and use of technologies, and who can independently and collaboratively develop solutions to complex challenges and contribute to sustainable patterns of living.

The Australian Curriculum: Technologies ensures that all students benefit from learning about and working with traditional, contemporary and emerging technologies that shape the world in which we live. By applying their knowledge and practical skills and processes when using technologies and other resources students will create innovative solutions. They will work independently and collaboratively to develop knowledge, understanding and skills to respond creatively to current and future needs and opportunities.

The practical nature of the Technologies learning area engages students in critical and creative thinking, including understanding interrelationships in systems when solving complex problems. A systematic approach to experimentation, problem-solving, prototyping and evaluation instils in students the value of planning and reviewing processes to realise ideas.

All young Australians should develop capacity for action and a critical appreciation of the processes through which technologies are developed and how technologies can contribute to societies. Students need opportunities to consider the use and impact of technological solutions on equity, ethics, and personal and social values. In creating solutions, as well as responding to the designed world, students consider desirable sustainable patterns of living, and contribute to preferred futures for themselves and others.

Aims

The Australian Curriculum: Technologies aims to develop the knowledge, understanding and skills to ensure that, individually and collaboratively, students:

- investigate, design, plan, manage, create and evaluate solutions
- are creative, innovative and enterprising when using traditional, contemporary and emerging technologies, and understand how technologies have developed over time
- make informed and ethical decisions about the role, impact and use of technologies in their own lives, the economy, environment and society for a sustainable future
- engage confidently with and responsibly select and manipulate appropriate technologies − materials, data, systems, components, tools and equipment − when designing and creating solutions
- analyse and evaluate needs, opportunities or problems to identify and create solutions.

Organisation of the learning area

Content structure

The Australian Curriculum: Technologies is presented in two-year band levels from Year 1 to Year 10, with Foundation being presented as a single year.

Band level descriptions

Band level descriptions provide an overview of the learning that students should experience at each level. They highlight the important interrelationships of the content strands and of the content strands to the core concepts for each band level.

Achievement standards

Achievement standards describe the expected quality of learning that students should typically demonstrate by the end of each band. To provide flexibility for schools an achievement standard has been written for the Technologies learning area, Foundation to Year 8, as well as for each subject. Some schools may wish to report holistically on Technologies learning in Foundation to Year 8, while others may prefer to report on each subject.

Content descriptions

Content descriptions specify the essential knowledge, understanding and skills that young people are expected to learn, and that teachers are expected to teach, in each band. The content descriptions are organised into strands and sub-strands.

Content elaborations

Content elaborations provide teachers with suggestions and illustrations of ways to teach the content descriptions. They are optional material only; they are not a set of complete or comprehensive content points that all students need to be taught. They illustrate and exemplify content descriptions with a diverse range of examples.

Strands and sub-strands

Content in Design and Technologies and Digital Technologies is organised under two related strands:

- Knowledge and understanding
- Processes and production skills.

Under each strand, curriculum content is further organised into sub-strands.

Table 1 shows the strand and sub-strand structure for the two subjects in the Technologies learning area.

Students apply skills from the processes and production skills strand to the content from the knowledge and understanding strand. The similar strand structure supports an integrated approach to teaching Technologies.

Table 1: Design and Technologies and Digital Technologies content structure

Technologies		
	Design and Technologies	**Digital Technologies**
Strand	**Knowledge and understanding**	
Sub-strands	Technologies and society	
	Technologies contexts:	Digital systems
	Engineering principles and systems	
	Materials and technologies specialisations	
	Food and fibre production	
	Food specialisations	
		Data representation
Strand	**Processes and production skills**	
Sub-strands		Acquiring, managing and analysing data
	Creating designed solutions by:	*Creating digital solutions by:*
	Investigating and defining	Investigating and defining
	Generating and designing	Generating and designing
	Producing and implementing	Producing and implementing
	Evaluating	Evaluating
	Collaborating and managing	Collaborating and managing
		Considering privacy and security

Core concepts

Core concepts are the big ideas, understandings, skills or processes that are central to the Technologies curriculum. They give clarity and direction about what content matters most in the learning area. In the curriculum development process, core concepts help identify the essential content students should learn to develop a deep and increasingly sophisticated understanding of Technologies across the years of schooling. They ensure content is connected within and across the strands, building in sophistication across the year/band levels.

The word ‘technology’ comes from the ancient Greek word *techne*, meaning to make or to do. Technologies involves the practical application of knowledge, understanding and skills to respond to needs, opportunities or problems. Learning in Technologies is about: creating solutions for preferred futures using systems and data; design thinking, systems thinking and computational thinking; and technologies processes and production skills, project management skills, and enterprise skills and innovation; taking into account interactions impact.

All content descriptions in the Technologies curriculum help develop at least one core concept, and in most cases multiple core concepts. The core concepts for Technologies flow through into subject-specific core concepts as shown in Figure 1.

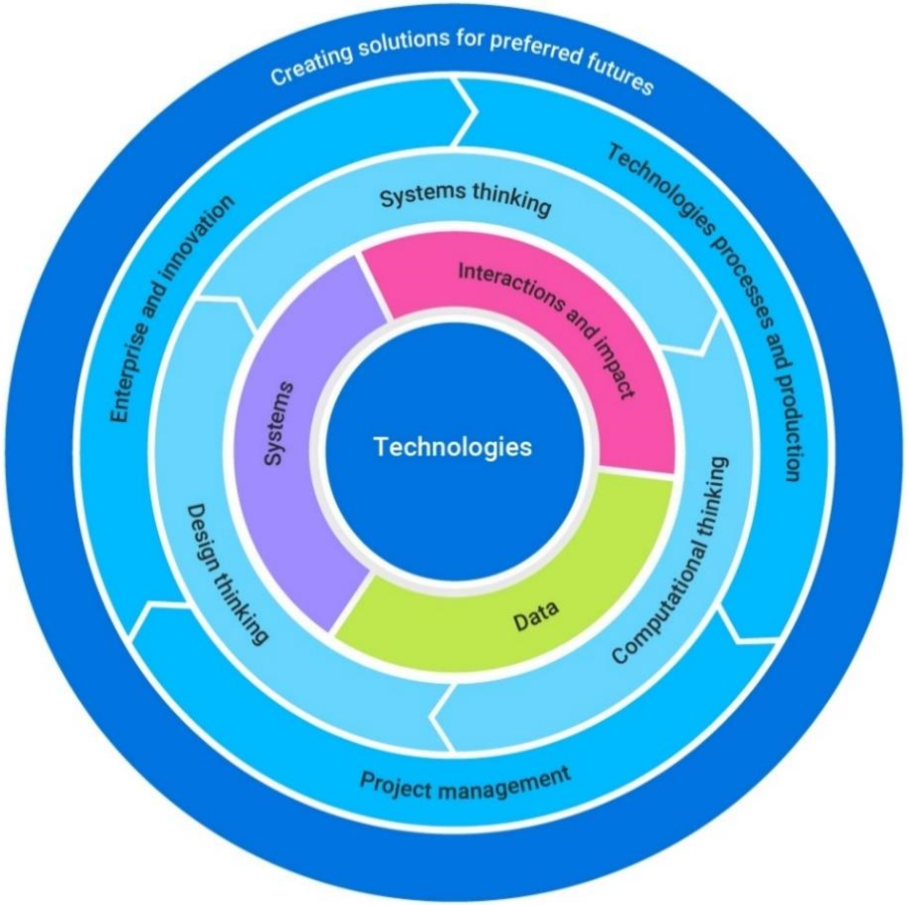

Figure 1: Overview of Technologies core concepts

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Descriptions for the learning area core concepts are provided below. Descriptions for the subject core concepts are provided in the introductory sections of each subject.

- **Creating solutions for preferred futures** is the overarching core concept and involves identifying compelling visions of the future and making considered design decisions taking into account ethics and economic, environmental and social sustainability factors. This is developed through the following core concepts.
- **Systems** comprise the structure, properties, behaviour and interactivity of people and components (inputs, processes and outputs) within and between natural, managed, constructed and digital environments.
- **Data** can be collected, interpreted and represented to help inform decision-making and can be manipulated, stored and communicated by digital systems.
- **Interactions and impact** need to be considered when creating solutions; this involves examining the relationships between components of systems and the effect of design decisions.
- **Systems thinking** helps people to think holistically about the interactions and interconnections that shape the behaviour of systems.
- **Computational thinking** helps people to organise data logically by breaking down problems into parts; defining abstract concepts; and designing and using algorithms, patterns and models.
- **Design thinking** helps people to empathise and understand needs, opportunities and problems; generate, iterate and represent innovative, user-centred ideas; and analyse and evaluate those ideas.
- **Technologies processes and production skills** help people to safely create solutions for a range of purposes and involve investigating and defining, generating and designing, producing and implementing, evaluating, and collaborating and managing.
- **Project management skills** help people to successfully and efficiently plan, manage and complete projects to meet identified criteria for success.
- **Enterprise skills and innovation** help people to identify opportunities to take action and create change; follow through on initiatives; and generate new ideas, processes and solutions.

Key connections

General capabilities

In the Australian Curriculum, general capabilities equip young Australians with the knowledge, skills, behaviours and dispositions to live and work successfully. General capabilities are developed through learning area content; they are not separate learning areas, subjects or isolated skills.

Opportunities to develop general capabilities in learning area content vary. The general capabilities of most relevance and application to Technologies are Digital Literacy, Critical and Creative Thinking, Personal and Social capability and Ethical Understanding.

Literacy and numeracy are fundamental to all learning. While literacy and numeracy development are core to the curriculum in English and Mathematics, literacy and numeracy skills are required and applied in all learning areas, including Technologies.

General capabilities are identified in content descriptions when they are developed or applied through learning area content. They are also identified in content elaborations when they offer opportunities to add depth and richness to student learning.

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Literacy

Learning in Technologies requires students to apply literacy knowledge and skills to listen to, interpret, evaluate, respond to and create a range of increasingly challenging procedural, explanatory and persuasive texts, including design tasks, manuals and instructions, patterns and recipes and specifications.

In Technologies students integrate and evaluate content presented in diverse media and formats, interpret, analyse, and assess descriptions, reports and data and navigate texts to locate information and assess complex visual text. Students recognise and appropriately use technical symbols, icons and key terms which may have generic uses as well as context-specific uses in technical topics.

Students create clear and coherent informative, explanatory and persuasive texts using precise vocabulary and terminology, appropriate structures and formats and a range of visual and diagrammatic elements. Their texts will be developed and organised using a format and style appropriate to particular tasks and audiences. They will produce and publish a range of texts where information and ideas are accurate, relevant to the context, supported by evidence and examples and cited, where needed, including annotated engineering or technical drawings, software instructions and programs, project outlines, briefs and management plans.

Digital Literacy

The Australian Curriculum: Digital Technologies explicitly supports the systematic development of Digital Literacy across the curriculum. Digital literacy is context dependent and involves students developing the knowledge and skills needed to learn effectively within the digital world. Effective development of digital literacy allows students to operate and manage digital systems and practise digital safety and wellbeing while investigating, creating and communicating. While specific elements of Digital Literacy are typically addressed in Digital Technologies learning programs, concepts and skills are consolidated and extended across all subjects.

Together, Digital Literacy and Digital Technologies provide the opportunity for students to become discerning users, productive creators, critical analysts and effective developers of digital solutions.

Critical and Creative Thinking

Students develop critical and creative thinking as they imagine, generate, iterate and critically evaluate ideas. They develop reasoning and the capacity for abstraction through challenging problems. Students analyse problems, refine concepts and reflect on the decision-making process by engaging in systems, design and computational thinking. They identify, explore and clarify technologies information and use that knowledge in a range of situations.

Students think critically and creatively about possible, probable and preferred futures. They consider how data, information, systems, materials, tools and equipment (past and present) impact on our lives, and how these elements might be better designed and managed. Experimenting, drawing, modelling, designing and working with equipment and software helps students to build their visual and spatial thinking and to create solutions, products, services and environments.

Personal and Social capability

Students develop personal and social capability as they engage in project management and design and production activities in a collaborative workspace. They direct their own learning, plan and carry out investigations, and become independent learners who can apply design thinking, and technologies understanding and skills when making decisions. Students develop social skills through working cooperatively in teams, sharing resources and processes, making group decisions, resolving conflict and showing leadership. Designing and innovation involve a degree of risk-taking, and as students work with the uncertainty of sharing new ideas, they develop resilience.

Students consider past and present impacts of decisions on people, communities and environments and develop social responsibility through understanding of, empathy with and respect for others. They develop an understanding of diversity by researching and identifying user needs.

Students reflect on the impact that digital tools and environments such as social media can have on their personal well-being and apply appropriate strategies in face-to-face and digital environments.

Numeracy

Students develop the capacity to interpret and use mathematical knowledge and skills in a range of real-life situations. They use number to calculate, measure and estimate; interpret and draw conclusions from statistics; measure and record throughout the process of generating and iterating ideas; develop, refine and test concepts; and cost and sequence when making products and managing projects. In using software, materials, tools and equipment, students work with the concepts of number, geometry, scale, proportion, measurement and volume. They use 3-dimensional models, create accurate technical drawings, work with digital models and use computational thinking in decision-making processes when designing and creating best-fit solutions.

Ethical Understanding

Students develop the capacity to understand and apply ethical and socially responsible principles when collaborating with others and creating, sharing and using technologies. Using an ethical lens, they investigate past, current and future local, national, regional and global technological priorities. When engaged in systems thinking, students evaluate their findings against criteria that include ethical issues. They explore complex issues associated with technologies and consider possibilities and ethical implications.

Students learn about safe and ethical procedures for investigating and working with people, animals, data and materials. They consider the rights of others and their responsibilities in using sustainable practices that protect the planet and its life forms. They learn to appreciate and value the part they play in the social and natural systems in which they live.

Students consider their own roles and responsibilities as discerning citizens and learn to detect bias and inaccuracies. Understanding the protection of data, intellectual property and individual privacy helps students to be respectful creators.

Cross-curriculum priorities

Cross-curriculum priorities support the Australian Curriculum to be a relevant, contemporary and engaging curriculum that reflects regional, national and global contexts. Cross-curriculum priorities are incorporated through learning area content; they are not separate learning areas or subjects. They provide opportunities to enrich the content of the learning areas where most appropriate and authentic, allowing students to engage with and better understand their world.

Opportunities to apply cross-curriculum priorities to learning area content vary. The cross-curriculum priorities of most relevance and meaning to the Technologies learning area are Sustainability and Aboriginal and Torres Strait Islander Histories and Cultures.

The cross-curriculum priority of Sustainability is embedded in content descriptions where it is core to the delivery of the content in Design and Technologies and Digital Technologies.

The Aboriginal and Torres Strait Islander Histories and Cultures cross-curriculum priority is identified in content elaborations in Design and Technologies and Digital Technologies where it offers opportunities to add depth and richness to student learning.

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Sustainability

When students identify and analyse a problem, need or opportunity; generate ideas and concepts; and create solutions in Technologies, they give consideration to sustainability by anticipating and balancing economic, environmental and social impacts. The curriculum focuses on the knowledge, understanding and skills necessary to design for effective sustainability action, taking into account issues such as resource depletion and climate change. The learning area gives students opportunities to explore their own and competing viewpoints, values and interests. Understanding systems enables students to work with complexity, uncertainty and risk; make connections between disparate ideas and concepts; self-critique; and propose creative solutions that enhance sustainability. Students learn to appreciate local and global impact of design decisions. They reflect on past and current practices and assess new and emerging technologies from a sustainability perspective.

Aboriginal and Torres Strait Islander Histories and Cultures

In Design and Technologies students can explore the design and technologies of the oldest continuous living cultures in the world. Through varied and engaging contexts students learn how proven designed solutions from long ago endure today and can at times inspire contemporary solutions.

The engineering principles and systems employed by Aboriginal and Torres Strait Islander Peoples today, and in the past, provide culturally relevant and engaging contexts for all students to investigate how First Nations Australians have been successful at sustaining the world's oldest continuous living cultures. Students can investigate how Aboriginal and Torres Strait Islander Peoples' knowledges of natural materials have developed over millennia and have culminated in deep knowledge of their properties and performance. Likewise, students can explore successful systems that Aboriginal and Torres Strait Islander Peoples have developed to join materials for the design and production of a diverse range of essential, effort-reducing technologies. Students can investigate the diverse food and fibre production techniques developed by Aboriginal and Torres Strait Islander communities before colonisation and see how this capacity has sustained Aboriginal Australia for at least 60,000 years and through numerous major climatic and environmental shifts. They can explore how First Nations Australians have long successfully developed complete diets that meet nutritional requirements and see how foods were and continue to be investigated for their nutritional and medicinal qualities. They can also investigate techniques used to improve palatability and remove toxins; and nutritional, environmental and economic benefits of developing traditional Aboriginal food and fibre sources.

Through Digital Technologies students can gain insights into how Aboriginal and Torres Strait Islander Peoples are often at the forefront of adopting digital systems, and also learn how they often endure the inequities of digital system performance and capabilities, especially when living on Country/Place far from the nation's city centres. Students can explore how many Aboriginal and Torres Strait Islander communities are embracing digital tools as a means to maintain, control, protect and further develop culture through the digitisation of cultural expressions. They can examine the complexities of data and the need for ethical protocols when using systems to acquire, manage and analyse data. Students can explore how Aboriginal and Torres Strait Islander ranger groups use computational thinking in their contributions to preferred futures such as restoring damaged environments and the monitoring and protection of endangered and vulnerable species. Through the context of material culture production techniques such as weaving, students can be introduced to designing algorithms and exploring how such practices can be converted into programmable automation.

Learning area connections

The Australian Curriculum: Technologies provides opportunities to integrate or connect content to other learning areas or subjects, in particular:

- Digital Technologies with Mathematics and Media Arts
- Design and Technologies with Science and Health and Physical Education.

Read more

Digital Technologies and Mathematics

Digital Technologies has a strong connection to the Mathematics learning area, in particular a shared focus on data. For example, data collection and interpretation across Foundation to Year 6, which include numeric data such as data counted in whole numbers and categorical data such as symbols and charts.

Data representation refers to the way data is symbolised, visually treated or provided in audio. The connections with Mathematics support students to gain the knowledge, understanding and skills that underpin patterns and data visualisation, while Digital Technologies focuses on how digital systems represent data.

Digital Technologies and Media Arts

Digital Technologies and Media Arts share a focus on user experience and user interface. Creating spoken, print, graphic or electronic communications for an audience is important in the design process for both subjects. These activities often involve numerous people in their construction and are usually shaped by digital systems used in their production. While there is no direct link between content descriptions, Media Arts provides an appropriate area for application of the knowledge and skills taught across Digital Technologies.

Design and Technologies and Science

Design and Technologies and Science share a focus through the Design and Technologies knowledge and understanding sub-strand: technologies contexts, and the Science understanding sub-strands. The relationships are:

- engineering principles and systems to physical sciences
- materials and technologies specialisations to chemical sciences
- food and fibre production to biological sciences
- food specialisations to chemical sciences.

Design and Technologies and Health and Physical Education

Aspects of food and nutrition are addressed in the Health and Physical Education focus area of food and nutrition. In the Design and Technologies sub-strand, technologies context: food specialisations, students learn about preparing food for healthy eating and the technologies associated with processing food for human consumption.

Key considerations

Safety

Identifying and managing risk in the Technologies learning area addresses the safe use of technologies as well as risks that can affect project timelines. It covers all necessary aspects of health, safety and injury prevention and, in any technologies context, the use of potentially dangerous materials, tools and equipment. It includes ergonomics, online safety, data security, and ethical and legal considerations when communicating and collaborating online.

Technologies learning experiences may involve the use of potentially hazardous substances and hazardous equipment. It is the responsibility of the school to ensure that duty of care is exercised in relation to the health and safety of all students and that school practices meet the requirements of the *Work Health and Safety Act 2011* and Work Health and Safety Regulation 2017, in addition to relevant state or territory health and safety guidelines.

In implementing projects with a focus on food, care also must be taken with regard to food safety and specific food allergies that may result in anaphylactic reactions. The Australasian Society of Clinical Immunology and Allergy has published guidelines for prevention of anaphylaxis in schools, preschools and childcare. Some states and territories have their own specific guidelines that should be followed.

When state and territory curriculum authorities integrate the Australian Curriculum into local courses, they will include more specific advice on safety. For more information about relevant guidelines, contact your state or territory curriculum authority.

Privacy and security

Identifying and managing the implications of and concerns related to the collection and generation of data through automated and non-automated processes addresses the risks that can affect secure engagement with digital systems.

Privacy includes recognising the risks that are faced online and the mitigation strategies involved in managing them. In Australia, guidance on best practice for privacy is informed by the Australian Privacy Principles, the cornerstone of the privacy protection framework in the *Privacy Act 1988*. Thirteen principles govern standards, rights and obligations around:

- the collection, use and disclosure of personal information
- accountability
- integrity of personal information
- the right of individuals to access their personal information.

For more information visit: https://www.oaic.gov.au/privacy/australian-privacy-principles/

Security covers the development of appropriate technical, social, cognitive, communicative and decision-making skills to address online and network security risks. It includes data security, and ethical and legal considerations when working with and designing digital systems. When engaging with and designing digital systems, identifying and managing security threats and mitigation in a data-intensive world is paramount.

For more information about relevant guidelines, contact your state or territory curriculum authority.

Animal ethics and biosecurity

Any teaching activities that involve caring for, using or interacting with animals must comply with the Australian code of practice for the care and use of animals for scientific purposes 2013, the Australian Animal Welfare Standards and Guidelines, the National Livestock Identification System and other biosecurity measures, in addition to relevant state or territory guidelines. The Australian Government and state and territory governments may have extra legislation for animal ethics, protection of native animals and biosecurity that could affect how schools use animals.

When state and territory curriculum authorities integrate the Australian Curriculum into local courses, they will include more specific advice on the care and use of, or interaction with, animals. Schools must ensure they are aware of and comply with all state, territory and Commonwealth legislation or regulation about the use of animals in schools. For more information about relevant guidelines or to access your animal ethics committee, contact your state or territory curriculum authority.

Australian code of practice for the care and use of animals for scientific purposes,

www.nhmrc.gov.au/about-us/publications/australian-code-care-and-use-animals-scientific-purposes

Australian Animal Welfare Standards and Guidelines www.animalwelfarestandards.net.au

National Livestock Identification System www.nlis.com.au

Information correct as at 7 April 2021

DESIGN AND TECHNOLOGIES F–10

Rationale

In an increasingly technological and complex world, it is important to develop knowledge and confidence to analyse and creatively respond to design challenges. Knowledge, understanding and skills involved in the design, development and use of technologies are influenced by and can play a role in enriching and transforming societies and our natural, managed and constructed environments.

The Australian Curriculum: Design and Technologies enables students to become creative and responsive designers. When they consider ethical, legal, aesthetic and functional factors and the economic, environmental and social impacts of technological change, and how the choice and use of technologies contributes to a sustainable future, they are developing the knowledge, understanding and skills to become discerning decision-makers.

Design and Technologies actively engages students in creating quality designed solutions for identified needs and opportunities across a range of technologies contexts. Students manage projects independently and collaboratively from conception to realisation. They apply design and systems thinking and design processes to investigate, generate and refine ideas; and plan, produce and evaluate designed solutions. They develop a sense of pride, satisfaction and enjoyment from their ability to develop innovative designed products, services and environments.

Design and Technologies gives students authentic learning challenges that foster curiosity, confidence, persistence, innovation, creativity, respect and cooperation. It motivates young people and engages them in a range of learning experiences that are transferable to family and home, constructive leisure activities, community contribution and the world of work.

Aims

The Australian Curriculum: Design and Technologies aims to develop the knowledge, understanding and skills to ensure that, individually and collaboratively, students:

- develop confidence as critical users of technologies and designers and producers of designed solutions
- investigate, generate and analyse ethical and innovative designed solutions for sustainable futures
- use design and systems thinking to generate design ideas and communicate these to a range of audiences
- produce designed solutions suitable for a range of technologies contexts by selecting and manipulating a range of materials, systems, components, tools and equipment creatively, competently and safely; and managing processes

- evaluate processes and designed solutions and transfer knowledge and skills to new situations
- understand the roles and responsibilities of people in design and technologies occupations and how they contribute to society.

Organisation

Content structure

Content in the Australian Curriculum: Design and Technologies is organised under two related strands:

- Knowledge and understanding – the use, development and impact of technologies and design ideas across a range of technologies contexts
- Processes and production skills – the skills needed to create designed solutions.

Together, the two strands provide students with knowledge, understanding and skills through which they can safely and ethically design, plan, manage, produce and evaluate products, services and environments. Teaching and learning programs should balance and integrate both strands. Students learn about technologies and society through different technologies contexts (knowledge and understanding) as they create designed solutions (processes and production skills).

The knowledge and understanding strand comprises five sub-strands. One sub-strand focuses on technologies and society and the other four are technologies contexts. The band level descriptions show how many times each prescribed technologies context is addressed. Schools decide which technologies contexts are addressed in Years 9 and 10 (elective subject).

The processes and production skills strand comprises five sub-strands: investigating and defining, generating and designing, producing and implementing, evaluating, and collaborating and managing.

Table 2 shows the strand and sub-strand structure for Design and Technologies. Figure 2 illustrates the relationship between the Design and Technologies strands and the sub-strands.

Table 2: Design and Technologies content structure

Strand	**Knowledge and understanding**
Sub-strands	Technologies and society
	Technologies contexts:
	Engineering principles and systems
	Materials and technologies specialisations
	Food and fibre production
	Food specialisations
Strand	**Processes and production skills**
Sub-strands	*Creating designed solutions by:*
	Investigating and defining
	Generating and designing
	Producing and implementing
	Evaluating
	Collaborating and managing

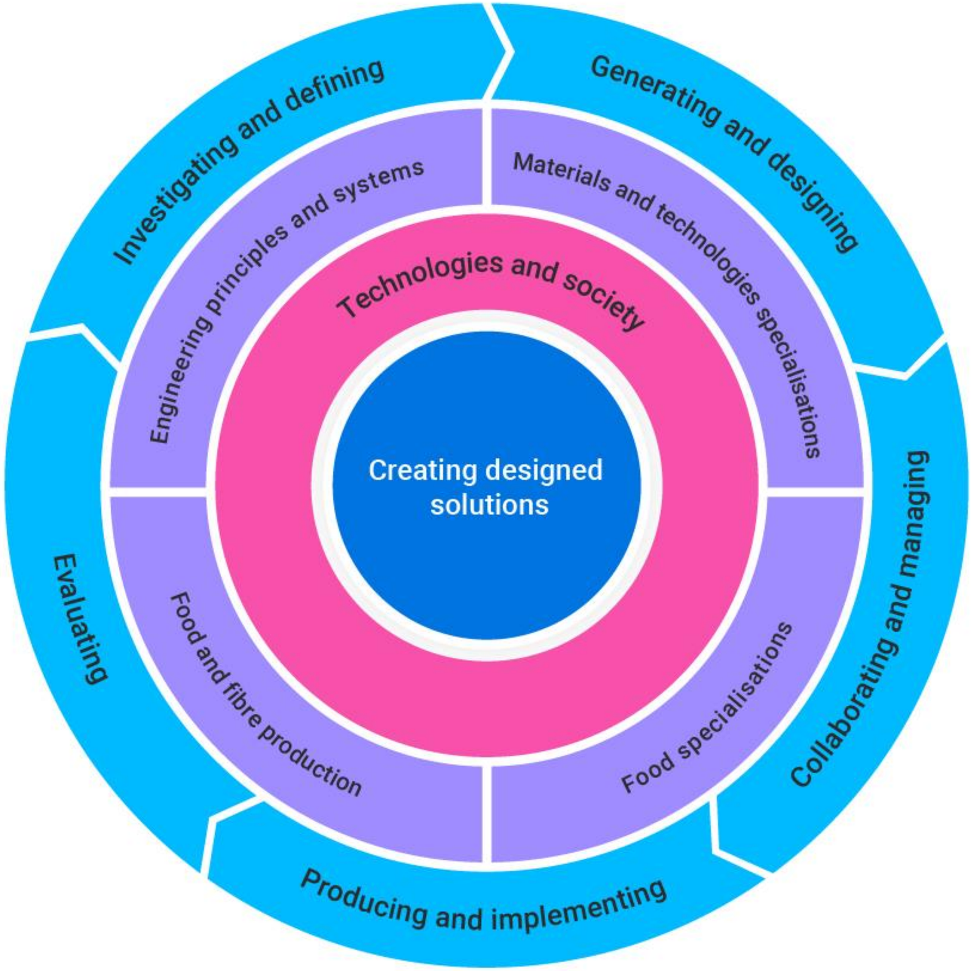

Figure 2: Relationship between the Design and Technologies strands and sub-strands

Technologies contexts and types of designed solutions

Students should have the opportunity to produce three types of designed solutions (products, services and environments). These 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.

In Foundation students will have the opportunity to produce at least one type of designed solution.

Across Years 1 to 4 students will have the opportunity to produce at least three types of designed solutions (products, services and environments) through the prescribed technologies contexts.

Across Years 5 to 8 students will have the opportunity to produce at least three types of designed solutions (products, services and environments) through the prescribed technologies contexts for each band.

Technologies contexts Foundation to Year 10

Foundation

In Foundation the technologies context is selected by the school. From Year 1 to Year 8 students will have the opportunity to create designed solutions at least once in each of the prescribed technologies contexts at least once in each band.

Years 1 and 2

By the end of Year 2 students will have had the opportunity to create designed solutions at least once in each of the two combined technologies contexts:

- Engineering principles and systems; Materials and technologies specialisations
- Food and fibre production; Food specialisations.

Years 3 and 4

By the end of Year 4 students will have had the opportunity to create designed solutions at least once in each of the two combined technologies contexts:

- Engineering principles and systems; Materials and technologies specialisations

- Food and fibre production; Food specialisations.

Years 5 and 6

By the end of Year 6 students will have had the opportunity to create designed solutions at least once in each of these three technologies contexts:

- Engineering principles and systems
- Materials and technologies specialisations
- Food and fibre production; Food specialisations.

Years 7 and 8

By the end of Year 8 students will have had the opportunity to create designed solutions at least once in each of the four technologies contexts:

- Engineering principles and systems
- Materials and technologies specialisations
- Food and fibre production
- Food specialisations.

Years 9 and 10

By the end of Year 10 students will have had the opportunity to create designed solutions for one or more of the four technologies contexts.

Strands and sub-strands

Read more

Knowledge and understanding strand

This strand focuses on developing the underpinning knowledge and understanding of technologies (materials, systems, components, tools and equipment) across technologies contexts and the relationship between technologies and society.

Content is further organised into five sub-strands.

Sub-strand: Technologies and society

The technologies and society sub-strand focuses on how people use and develop technologies taking into account sustainability (social, economic, environmental), ethical, legal, aesthetic and functional factors and the impact of technologies on individuals; families; local, regional and global communities; the economy; and the environment – now and into the future.

Technologies contexts

Technologies contexts provide a framework within which students can gain knowledge and understanding about the characteristics and properties of technologies and systems and how they can be used to create innovative designed solutions.

The prescribed technologies contexts for Years 1 to 8 are described below.

Sub-strand: **Engineering principles and systems**

Engineering principles and systems is focused on how forces can be used to create light, sound, heat, movement, control or support in systems. Knowledge of these principles and systems enables the design and production of sustainable engineered solutions.

Students need to understand how sustainable engineered products, services and environments can be designed and produced as some resources diminish. They will progressively develop knowledge and understanding of how forces and the properties of materials affect the behaviour and performance of designed engineering solutions.

Sub-strand: **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. We live in and depend on the constructed environment for communication, housing, employment, healthcare, recreation and transport; however, we also face increasing concerns related to long-term sustainability.

Students need to develop the confidence to make decisions about processes and solutions that are ethical and sustainable. They can do this by learning about and working with materials and production processes. Students will progressively develop knowledge and understanding of the characteristics and properties of a range of materials, either when investigating particular materials or through producing designed solutions for a technologies specialisation; for example, architecture, electronics, fashion or graphics technologies.

Sub-strand: 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 and an uncertain climate and competition for resources such as land and water.

Students need 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.

Sub-strand: 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 technologies; food selection and preparation; and contemporary technology-related food issues. There are increasing community concerns about food issues, including the nutritional quality of food and the environmental impact of food manufacturing processes.

Students need to understand the importance of a variety of foods, have sound understanding of nutrition principles and food safety, and develop skills in food preparation when making food decisions to help better prepare them for their future lives. They will progressively develop knowledge and understanding about food and food safety, and how to make informed and appropriate food preparation choices when experimenting with and preparing food sustainably.

Processes and production skills strand

The processes and production skills strand is based on design thinking, design processes and production processes and skills. This strand reflects a process of design and would typically be addressed through identifying needs or opportunities and may involve developing a design brief.

It focuses on creating designed solutions by:

- Investigating and defining
- Generating and designing
- Producing and implementing
- Evaluating
- Collaborating and managing.

These are the skills that students will use throughout a design project and they form the sub-strands for this strand. If students have been taught content from these sub-strands in one context, the students do not need to be taught the same content again using a different technologies context but rather they apply their skills to a different technologies context.

Sub-strand: Investigating and defining

Investigating and defining involves students analysing, exploring and investigating information, needs and opportunities. As creators and citizens they will critically reflect on the intention, purpose and operation of technologies and 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. They progressively develop effective investigation strategies and consider the contribution of technologies to their lives and make judgements about them. Students develop criteria for success in response to needs and opportunities and may respond to or develop design briefs.

Sub-strand: Generating and designing

Generating and designing involves students in developing and communicating design ideas for a range of audiences. Students generate ideas, make choices, weigh up options, consider alternatives and document various design ideas and possibilities. They use critical and creative thinking strategies to generate, evaluate and document ideas to meet needs or opportunities that have been identified by an individual, a group or a wider community. 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, simulate and design ideas that focus on well- considered designed solutions.

Sub-strand: Producing and implementing

Producing and implementing involves students learning and applying a variety of skills and techniques to make designed solutions designed to meet specific purposes and user needs. They apply knowledge about components, materials and their characteristics and properties to ensure their suitability for use. They learn about the importance of adopting safe work practices. They develop accurate production skills to achieve quality designed solutions. Students develop the capacity to select and use appropriate materials, systems, components, tools and equipment; and use work practices that respect 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.

Sub-strand: Evaluating

Evaluating involves students evaluating and making judgements throughout a design process and about the quality and effectiveness of their designed solutions and others' solutions. They identify criteria for success for needs or opportunities in the investigating and defining stage and then use these criteria to consider the implications and consequences of actions and decision-making. They determine effective ways to test and judge their ideas, concepts and, finally, their designed solutions. They reflect on processes and transfer their learning to other design needs or opportunities.

Sub-strand: 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 steps in a project through to more complex project management activities that consider various factors such as time, cost, risk assessment and management and quality control.

Core concepts

Core concepts are the big ideas, understandings, skills or processes that are central to the Design and Technologies curriculum. They give clarity and direction about what content matters most in Design and Technologies. In the curriculum development process, core concepts help identify the essential content students should learn to develop a deep, and increasingly sophisticated, understanding of Design and Technologies across the years of schooling.

Underpinning the Design and Technologies curriculum are the core concepts of the Technologies learning area. The core concepts that are specific to Design and Technologies make up the four sub-strands related to the four technologies contexts:

- **engineering principles and systems:** to design and create engineered solutions involves knowledge and understanding of forces, motion and energy and the properties and performance of materials.
- **materials and technologies specialisations:** to design and create solutions involves knowledge and understanding of characteristics and properties of a range of materials and production technologies.
- **food and fibre production:** to design and create food and fibre production solutions to support current and future access to food and fibre products involves knowledge and understanding of the sustainable management of the environments in which they are produced.
- **food specialisations:** to design and create solutions to maintain and enhance individual, community and planet health involves knowledge and understanding of food to make informed and healthy food selection and preparation choices.

Table 3 outlines the alignment between the Design and Technologies strands and sub-strands to the learning area and subject-specific core concepts.

Table 3: Relationships between Design and Technologies strands and sub-strands and core concepts (Denotes subject-specific core concepts)*

Content strands and sub-strands		Related core concepts
Strand	**Knowledge and understanding**	Creating solutions for preferred futures
Sub-strands	Technologies and society	Enterprise skills and innovation
	Technologies contexts:	Systems
	Engineering principles and systems	Engineering principles and systems*
	Materials and technologies specialisations	Materials and technologies specialisations*
	Food and fibre production	Food and fibre production*
	Food specialisations	Food specialisations*
Strand	**Processes and production skills**	Creating solutions for preferred futures
Sub-strands	*Creating designed solutions by:*	
	Investigating and defining	Technologies processes and production skills
	Generating and designing	Design thinking
	Producing and implementing	Systems thinking
	Evaluating	Computational thinking
	Collaborating and managing	Enterprise skills and innovation
		Interactions and impact
		Project management skills

CURRICULUM ELEMENTS

Years 7 and 8

Band level description
By the end of Year 8 students will have had the opportunity to create designed solutions at least once in the following four technologies contexts: • Engineering principles and systems • Materials and technologies specialisations • Food and fibre production • Food specialisations. Students should have opportunities to design and produce products, services and environments. There are rich connections to other subjects, for example Science, Geography and Health and Physical Education. Students investigate and select from a range of technologies − materials, systems, components, tools and equipment. They consider how the characteristics and properties of technologies can be combined to design and produce sustainable designed solutions to problems for individuals and the community, considering ethical, economic, environmental and social sustainability factors. Students use creativity, innovation and enterprise skills with increasing independence and collaboration. They respond to feedback from others and evaluate design processes used and designed solutions for preferred futures. Students investigate design and technology professions and the contributions that each makes to society locally, regionally and globally through creativity, innovation and enterprise. They critique the advantages and disadvantages of design ideas and technologies. Using a range of technologies including a variety of graphical representation techniques to communicate, students generate and clarify ideas through sketching, modelling, perspective and orthogonal drawings. They use a range of symbols and technical terms in a variety of contexts to produce patterns, annotate concept sketches and drawings, using scale, pictorial and aerial views to draw environments. With greater autonomy, students identify the sequences and steps involved in design tasks. They develop plans to manage design tasks, including safe and responsible use of materials and tools, and apply their plans to successfully complete these tasks. Students establish safety procedures that minimise risk and manage a project with safety and efficiency in mind when making designed solutions.

Design and Technologies achievement standard

By the end of Year 8 students analyse how people design products, services and environments to meet present and future needs. For each of the four prescribed technologies contexts they analyse how the features of technologies influence and impact design decisions, and create designed solutions based on evaluation of needs or opportunities. Students develop criteria for success including sustainability and use these to evaluate the suitability of ideas, processes and designed solutions. They create, adapt, justify and iterate design ideas and communicate to audiences using suitable technologies, technical terms and graphical representation techniques. Students independently and collaboratively document and manage production processes to safely produce effective designed solutions for the intended purpose.

Technologies learning area achievement standard*

By the end of Year 8 students explain how people design products, services and environments to meet present and future needs. For each of the four prescribed technologies contexts students explain how the features of technologies influence and impact on design decisions, and they create designed solutions based on evaluation of needs or opportunities. They use computational thinking to independently and collaboratively design and create effective digital solutions to real-world problems and opportunities by creating a variety of algorithmic designs and implementing them using a general-purpose programming language. They use a range of tools to make predictions and draw conclusions based on acquired, stored and validated data. Students develop criteria for success including sustainability and use these to judge the suitability of ideas, processes and solutions. They create, adapt and iterate design ideas and communicate to audiences using suitable technologies, technical terms and graphical representation techniques. Students explain how digital systems represent, transmit and secure data. They independently and collaboratively plan to document and manage production processes and to safely produce effective designed solutions for the intended purpose. Students identify cyber security threats and risks and explain how to protect against threats and manage the risks of sharing and curating their digital footprint.

* To provide flexibility for schools an achievement standard has been written for the Technologies learning area, Foundation to Year 8, as well as for each subject. Some schools may wish to report holistically on Technologies learning in Foundation to Year 8, while others may prefer to report on each subject.

Strand	Sub-strand	Content description *Students learn to:*	Content elaboration *This may involve students:*
Knowledge and understanding	Technologies and society	analyse ways in which products, services and environments evolve locally, regionally and globally (AC9TDE8K01)	locating information and describing factors that influence the design of services, for example a natural disaster warning system for a community (AC9TDE8K01_E1)
			investigating traditional and contemporary design and technologies, including from countries across Asia, and predicting how they might change or be sustained in the future in response to technological, environmental or economic change, for example the production of contemporary textile designs using traditional batik techniques and modern dyes (AC9TDE8K01_E2)
			comparing the design and production of products, services and environments in Australia and a country in the Asia region and identifying needs and new opportunities for design and enterprise, for example design, promotion and marketing of a Western Australian wheat variety especially bred and grown for the making of udon noodles in Japan (AC9TDE8K01_E3)
			investigating influences impacting on manufactured products and processes such as historical developments, societal change, new materials, control systems and biomimicry, for example researching the development of Velcro, which was inspired by burrs, or researching contemporary designers who use new materials to design and produce innovative products (AC9TDE8K01_E4)
		analyse how social, ethical and sustainability factors impact on the development of technologies and designed solutions for preferred futures (AC9TDE8K02)	analysing competing factors, including social and ethical factors, that influence the design of services for remote Aboriginal and Torres Strait Islander communities, for example a natural disaster warning system for the Koeybuway and Moegibuway Peoples of Saibai Island, who are vulnerable to flooding and rising sea levels (AC9TDE8K02_E1)
			considering the ethical and social requirements for designing solutions for cultural groups with their involvement and consultation, for example designing a solution with community members from other cultural backgrounds or those who usually communicate in a language other than English (AC9TDE8K02_E2)
			investigating how ethics and social, economic and environmental sustainability factors impact on design and technologies and design decisions, for example researching current information on

			animal welfare when designing an animal shelter or researching intellectual property or offshore manufacturing in countries across Asia when designing a 3D printed product (AC9TDE8K02_E3)
			considering the rights and responsibilities of those working in design and technologies occupations, for example taking into account Aboriginal and Torres Strait Islander protocols and Indigenous cultural and intellectual property rights (AC9TDE8K02_E4)
			investigating traditional and contemporary design and technologies, including from countries of Asia, and the need for more sustainable patterns of living, and predicting how they might change in the future in response to social, technological, environmental or economic change (AC9TDE8K02_E5)
	Technologies contexts	By the end of Year 8 students will have had the opportunity to create designed solutions at least once in each of the four technologies contexts.	
	Technologies context: Engineering principles and systems	analyse how force, motion and energy are used to manipulate and control simple, engineered systems (AC9TDE8K03)	analysing how wind generators harness the motion of propellers to create energy, and how this energy is used to power remote communities in the Torres Strait Islands of Queensland, Waiben (Thursday Island) (AC9TDE8K03_E1)
			investigating the technologies in a control system for an identified need or opportunity and user, for example the Corriong or Millow (Phillip Island) penguin weighbridge that enables collection of data about penguin weight and foraging duration (AC9TDE8K03_E2)
			experimenting to select the most appropriate principles and systems on which to base design ideas, for example structural components to be tested for strength (AC9TDE8K03_E3)
			testing functionality of an idea by producing prototypes and jigs, including the use of rapid prototyping tools such as 3D printers (AC9TDE8K03_E4)
			calculating an engineered system's outputs, for example speed, brightness of light, volume of sound to determine when the system might fail (AC9TDE8K03_E5)

			experimenting with control systems to understand motion, for example programming a microcontroller or a simple, object-based programming application to control a system such as a remote-controlled car or simple robotic arm (AC9TDE8K03_E6)
			investigating components, tools and equipment in terms of force, motion or energy, for example testing the durability of batteries or determining the effective range of wireless devices (AC9TDE8K03_E7)
	Technologies context: Materials and technologies specialisations	analyse how characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions (AC9TDE8K04)	investigating the significance of hafting in Aboriginal and Torres Strait Islander Peoples' traditional toolkit, including how the characteristics and properties of materials are combined to create a designed solution, for example modern hatchets have seen little innovation since the hafted stone hatchet that combines the benefits of a lever and a wedge to create durable tools that reduce effort (AC9TDE8K04_E1)
			investigating aspects of technologies specialisations, for example in architecture, critiquing the design of an existing building to identify features of passive design or, in fashion, evaluating the sustainability of different fibres (AC9TDE8K04_E2)
			investigating a broad range of technologies − materials, systems, components, tools and equipment − when designing for a range of technologies contexts, for example analysing the benefits and disadvantages of building an animal shelter such as a dog kennel with wood, metal and synthetic fabric in terms of function, tools and equipment needed to produce it and expected durability (AC9TDE8K04_E3)
			considering the ways in which the characteristics and properties of technologies will impact on designed solutions, for example the choice of building materials and housing design in Australia and the countries of Asia; the properties of textile fibres and fabrics that determine end use (AC9TDE8K04_E4)

			explaining safe work practices for using specific equipment or materials, for example producing a safety information video that details risk management practices for using tools or equipment including considering how the properties of some materials suit certain designs and may cause harm if manipulated in an unsafe way in the classroom or within a community such as ventilation when sanding timber (AC9TDE8K04_E5)
			describing the use of various hand tools and equipment that could be used to produce simple furniture, for example a simple stool or smartphone stand that can be assembled from bending and interlocking cardboard pieces or from wood using a laser cutter or other digital tools (AC9TDE8K04_E6)
	Technologies context: Food and fibre production	analyse how food and fibre are produced in managed environments and how these can become sustainable (AC9TDE8K05)	analysing traditional Aboriginal and Torres Strait Islander Peoples' food and fibre sources for potential species that offer benefits in sustainability, such as reducing irrigation and processing (AC9TDE8K05_E1)
			comparing land and water management methods in contemporary Australian food and fibre production with countries of Asia, for example minimum-tillage cropping, water-efficient irrigation and smart farm monitoring and controlling systems for optimised farm operation and crop protection, and the impact of cash crops versus staples on social sustainability (AC9TDE8K05_E2)
			investigating the management of plant and animal growth through natural means or with the use of chemical products, for example comparing the use of herbicides or medicines when producing food and fibre products and recognising the need to increase food production using cost-efficient, ethical and sustainable production techniques (AC9TDE8K05_E3)
			describing physical and chemical characteristics of soil and their effects on plant growth when producing food and fibre products, for example comparing the effect on soil characteristics of traditional and regenerative farming practices (AC9TDE8K05_E4)
			investigating different animal-feeding strategies such as grazing and supplementary feeding, and their effects on quality when producing food and fibre products, for example meat tenderness, wool-fibre diameter (micron), milk fat and protein content (AC9TDE8K05_E5)

			recognising the importance of food and fibre production to Australia's food security and economy, including exports and imports to and from countries across Asia when critiquing and exploring food and fibre production, for example Tasmanian Candy Abalone (wild-caught dried abalone) (AC9TDE8K05_E6)
	Technologies context: Food specialisations	analyse how properties of foods determine preparation and presentation techniques when designing solutions for healthy eating (AC9TDE8K06)	analysing how Aboriginal and Torres Strait Islander Peoples prepare foods for healthy eating, for example using cooking methods that improve edibility, such as removing bitterness to make yams more palatable, roasting bunya nuts to improve texture and flavour, and on many occasions, carefully selecting wood for roasting and smoking to complement the flavour of foods (AC9TDE8K06_E1)
			explaining how food preparation techniques impact on the sensory properties, such as flavour, appearance, texture and aroma of food, for example the browning of cut fruit, the absorption of water when cooking rice, and the selection of timbers when smoking foods (AC9TDE8K06_E2)
			investigating the relationship between food preparation techniques and the impact on nutrient value including how a recipe can be modified to enhance health benefits, for example steaming vegetables, leaving skin on vegetables or removing skin from chicken (AC9TDE8K06_E3)
			analysing food preparation techniques used in different cultures including those from countries across Asia and the impact of these on nutrient retention, aesthetics, taste and palatability, for example stir-frying (AC9TDE8K06_E4)
Processes and production skills	Investigating and defining	analyse needs or opportunities for designing, and investigate and select materials, components, tools, equipment and processes to create designed solutions (AC9TDE8P01)	considering Aboriginal and Torres Strait Islander community needs when identifying opportunities for designing, for example considering the needs of local groups when designing remote community housing or energy supply solutions (AC9TDE8P01_E1)
			considering community needs when identifying opportunities for designing, for example gardens for a community centre, cost-effective food service for a sport club (AC9TDE8P01_E2)
			experimenting with traditional and contemporary technologies when developing designs, and discovering the advantages and disadvantages of each approach, for example comparing a hand-sewn product with one produced using a sewing machine (AC9TDE8P01_E3)

			investigating emerging technologies and their potential impact on design decisions, for example flame-retardant fabrics, self-healing materials, virtual reality or aquaponics (AC9TDE8P01_E4)
			examining, testing and evaluating a variety of suitable materials, components, tools and equipment for each design project, for example the durability differences between natural hardwood and plantation softwood timbers, which determine their suitability for interior or exterior use (AC9TDE8P01_E5)
			evaluating the viability of using different techniques and materials in remote, isolated areas or less developed countries and selecting appropriate materials to acknowledge sustainability needs by using life cycle thinking (AC9TDE8P01_E6)
	Generating and designing	generate, develop, test and communicate design ideas, plans and processes using technical terms and technologies including graphical representation techniques (AC9TDE8P02)	using a variety of strategies such as brainstorming, sketching, 3D modelling and experimenting to generate innovative design ideas to present to others (AC9TDE8P02_E1)
			considering which ideas to further explore and investigating the benefits and drawbacks of ideas including identifying factors that may hinder or enhance project development, for example using digital polling to capture the views of different groups in the community to inform the production of a solution designed with intercultural understanding (AC9TDE8P02_E2)
			developing models, prototypes or samples using a range of materials, tools and equipment to test the functionality of ideas (AC9TDE8P02_E3)
			producing annotated concept sketches and drawings, using: technical terms, scale, symbols, pictorial and aerial views to draw environments; production drawings, orthogonal drawings; patterns and templates to explain product design ideas (AC9TDE8P02_E4)
			documenting and communicating the generation and development of design ideas for an intended audience, for example developing a digital portfolio with images and text which clearly communicate each step of a design process (AC9TDE8P02_E5)

	Producing and implementing	select and justify choices of materials, components, tools, equipment and techniques and apply safe procedures to effectively make designed solutions (AC9TDE8P03)	developing innovative ways of manipulating technologies by comparing and choosing the most appropriate options to design a solution using traditional or contemporary materials, components, tools, equipment and techniques and considering alternatives including emerging technologies that could be substituted to reduce waste or time (AC9TDE8P03_E1)
			practising techniques to improve expertise, for example handling animals, cutting and joining materials (AC9TDE8P03_E2)
			developing technical production skills (techniques) and safe independent working practices to produce quality solutions designed for sustainability (AC9TDE8P03_E3)
			identifying and managing risks in the development of various projects, for example working safely, responsibly, cooperatively and ethically on design projects; assessing and responding to uncertainty and risk in relation to long-term health and environmental impacts, for example ensuring appropriate protective equipment is worn or ventilation is appropriate where solvents, glues or 3D printers are used (AC9TDE8P03_E4)
			considering how to improve technical expertise required to use tools or equipment needed to design a solution, for example using an online tutorial to learn to use software for design or production (AC9TDE8P03_E5)
	Evaluating	develop criteria for success independently that include sustainability to evaluate design ideas, processes and solutions (AC9TDE8P04)	developing criteria for success to evaluate designed solutions in terms of aesthetics, functionality and sustainability, for example recording design goals from people interviewed as prospective users of the finished product, service or environment or including life cycle assessment criteria (AC9TDE8P04_E1)
			evaluating designed solutions and processes and transferring new knowledge and skills to future design projects, for example considering project planning skills learned in producing an engineered product and using them in future projects (AC9TDE8P04_E2)

	Collaborating and managing	develop project plans to individually and collaboratively manage time, cost and production of designed solutions (AC9TDE8P05)	interpreting drawings to plan resources and production steps needed to produce products, services or environments for specific purposes, for example identifying resource requirements from specifications on a labelled drawing and collaboratively developing a detailed procedure (AC9TDE8P05_E1)
			identifying risks and how to avoid them, organising time, evaluating decisions and managing resources to ensure successful project completion, for example using digital tools to keep track of tasks, resources, expenses and deadlines (AC9TDE8P05_E2)
			investigating the time needed for each step of production, for example estimating time allocations on a planning template for the different stages of the design process needed to produce a clock, acoustic speaker or desk lamp using prior knowledge, research and testing (AC9TDE8P05_E3)

Years 9 and 10

Band level description
By the end of Year 10 students will have had the opportunity to design and produce at least four designed solutions focused on one or more of the four technologies contexts content descriptions. There is one optional content description for each of the following: Engineering principles and systems, Materials and technologies specialisations, Food and fibre production and Food specialisations. Students should have opportunities to experience creating designed solutions for products, services and environments. Students use design and technologies knowledge and understanding, processes and production skills and design thinking to produce designed solutions for identified needs or opportunities of relevance to individuals and regional and global communities. Students work independently and collaboratively. Problem-solving activities acknowledge the complexities of contemporary life and make connections to related specialised occupations and further study. Increasingly, study has a global perspective, with opportunities to understand the complex interdependencies involved in the development of technologies and enterprises. Students specifically focus on preferred futures, taking into account ethics; legal issues; social values; and economic, environmental and social sustainability factors, and use strategies such as life cycle thinking. Students use critical thinking, creativity, innovation and enterprise skills with increasing confidence, independence and collaboration. They analyse data, critique design ideas and technologies, respond to feedback, and evaluate design processes used to inform designed solutions for preferred futures. Using a range of technologies including a variety of graphical representation techniques to communicate, students generate and represent original ideas and production plans in 2-dimensional and 3-dimensional representations. These techniques will be specific to the technologies context and may include perspective, scale, orthogonal and production drawings with sectional and exploded views. Students produce rendered, illustrated views for marketing and use graphic visualisation software to produce dynamic views of virtual products. Students identify the steps involved in planning the production of designed solutions. They develop detailed project management plans, incorporating elements such as sequenced time, cost and action plans, to manage a range of design tasks safely. They apply management plans, changing direction when necessary, to successfully complete design tasks. Students identify and establish safety procedures that minimise risk and manage projects with safety and efficiency in mind, maintaining safety standards and management procedures to ensure success.

Design and Technologies achievement standard

By the end of Year 10 students analyse how people working in design and technologies occupations consider factors that impact on design decisions and the technologies used to produce products, services and environments. They analyse the contribution of emerging technologies, innovation and enterprise skills to society. For one or more of the technologies contexts, students create designed solutions based on an evaluation of needs or opportunities and evaluate the features of technologies and their appropriateness for purpose. They identify the requirements for designed solutions to realise the preferred futures they have described. Students develop criteria for success, including sustainability, and use these to evaluate and refine their ideas, processes and designed solutions. They create, adapt and iterate design ideas and processes of increasing complexity and justify their decisions. They communicate and document projects for a range of audiences. Students independently and collaboratively develop and apply production and project management plans when producing designed solutions, adjusting processes when necessary. They select and use appropriate technologies skilfully and safely to produce quality designed solutions suitable for the intended purpose.

Strand	Sub-strand	Content description *Students learn to:*	Content elaboration *This may involve students:*
Knowledge and understanding	Technologies and society	analyse and make judgements about factors, including social, ethical, security and sustainability, that impact on designed solutions for global preferred futures and the complex design and production processes involved (AC9TDE10K01)	examining social and sustainability factors influencing the design and production of a solution developed by Aboriginal and Torres Strait Islander Peoples, such as the sustainable production of culturally significant pigments, for example in many places throughout Australia white and red pigments are not freely available and must be manufactured through a complex process of calcination by firing rocks or clays in a kiln. Calcining rock to produce iron oxide pigments continues to be used commercially throughout the world (AC9TDE10K01_E1)
			evaluating design and technology professions and their contributions to society locally, nationally, regionally and globally, for example engineers involved in social change causes (AC9TDE10K01_E2)
			recognising the impact of past designed solutions when creating solutions for preferred futures, for example the design of public transport systems that use renewable energy and the design of rural community environments to reduce fire risk (AC9TDE10K01_E3)

			considering the factors that influence design and professional designers and technologists, including time, access to skills, knowledge, finance, expertise, for example Australian designers working with rapid prototyping manufacturers in countries in the Asia region (AC9TDE10K01_E4)
			explaining how product life cycle thinking can influence decision-making related to design and technologies, for example rethinking products to provide for re-use, selecting a material for a product that has a lower carbon footprint (AC9TDE10K01_E5)
			critiquing mass production systems taking into account ethics and sustainability considerations, for example the mass production of food, clothing and shoes and why manufacturers produce different versions of the same product and support complete product life cycle strategies (AC9TDE10K01_E6)
		analyse and make judgements about how products, services and environments evolve with consideration of preferred futures and the impact of emerging technologies on design decisions (AC9TDE10K02)	investigating how the knowledges of Aboriginal and Torres Strait Islander Peoples have led to the discovery of potential innovative solutions, for example biodegradable polymers using spinifex grass to reduce landfill and strengthen latex, plastics and concrete (AC9TDE10K02_E1)
			exploring the ways commercial enterprises respond to the challenges and opportunities of technological change, for example e-commerce, and considering their carbon footprint (AC9TDE10K02_E2)
			explaining the consequences of social, ethical and sustainability decisions for products, services and environments, for example a managed public environment, the design of roads to include aerial bridges for wildlife and signage powered with solar technologies (AC9TDE10K02_E3)
			constructing scenarios of how the future may unfold and what opportunities and impacts there may be for society and particular groups in a preferred future, for example by using forecasting and backcasting techniques (AC9TDE10K02_E4)
			recognising real-world problems and understanding basic needs when considering designed solutions, for example Engineers Without Borders School Outreach program allows students to design solutions to problems occurring in a country in the Asia region; or artists from countries in South-East Asia creating posters for the world to take action in a pandemic (AC9TDE10K02_E5)

Technologies contexts	By the end of Year 10 students will have had the opportunity to create designed solutions for one or more of the four technologies contexts.	
Technologies context: Engineering principles and systems	analyse and make judgements on how the characteristics and properties of materials are combined with force, motion and energy to control engineered systems (AC9TDE10K03)	investigating the engineering innovations of Aboriginal and Torres Strait Islander Peoples, such as spear throwers and bow and arrow, and how the characteristics and properties of materials are used, such as rigidity, flexibility and hardness (AC9TDE10K03_E1)
		explaining the way common machines or engineered systems interact and combine properties of materials, force, motion and energy efficiently, for example examining the structure and function of cranes on building sites or in a system, or examining the structure and function of car safety features such as seatbelts, airbags and crumple zones (AC9TDE10K03_E2)
		calculating forces, reactions and loads in structures and analysing the relationship between materials of properties, forces and safety in engineered systems such as bridges (AC9TDE10K03_E3)
		critiquing the effectiveness of the combinations of materials, forces, energy and motion in an engineered system such as a 3D printer (AC9TDE10K03_E4)
Technologies context: Materials and technologies specialisations	analyse and make judgements on how characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions (AC9TDE10K04)	analysing how Aboriginal Peoples identified the superior thermal properties of possum fur in their development of products such as cloaks and blankets including making judgements on how these fibres are sourced and how these knowledges continue to be used today as seen in the emerging market of high-performance thermal clothing made from blended possum and wool fibre (AC9TDE10K04_E1)
		critiquing the design of an existing product to identify environmental consequences of material selection and investigating emerging materials and their impact on design decisions, for example examining the properties of common plastic bags and researching innovative materials that could be used as a sustainable alternative such as bioplastics or renewable materials such as seaweed (AC9TDE10K04_E2)

			justifying decisions when selecting from a broad range of technologies − materials, systems, components, tools and equipment, for example selecting low-emission paints and locally sourced materials (AC9TDE10K04_E3)
			analysing and explaining the ways in which the properties and characteristics of materials have been considered in the design of a product with specific requirements, such as minimising weight to reduce transport costs in rural Australia (AC9TDE10K04_E4)
			investigating emerging materials and their impact on design decisions, for example researching products such as sustainable bioplastic material made from discarded potato peels which can be used for a variety of applications including buttons and eyeglasses (AC9TDE10K04_E5)
	Technologies context: Food and fibre production	analyse and make judgements on the ethical, secure and sustainable production and marketing of food and fibre enterprises (AC9TDE10K05)	analysing Aboriginal grain sources, such as acacia, for their nutrient content, including energy, fat and protein and suitability as an ethical and sustainable food source in famine-prone, semi-arid, and tropical regions, as compared with cereal crops such as wheat and rice (AC9TDE10K05_E1)
			examining emerging production technologies and methods in terms of productivity, profitability and sustainability, for example taking account of animal welfare considerations in food and fibre production enterprises, vertical farming, recirculation technologies in aquaculture (AC9TDE10K05_E2)
			investigating how digital tools could be used to enhance food production systems, for example global positioning system for managing animals, crop sensors or automated animal-feeding or milking systems (AC9TDE10K05_E3)
			investigating the interdependence of plants and animals and comparing the environmental impacts of intensive and extensive production systems and their contribution to food and fibre production, for example the impact of pesticide use on bee populations (AC9TDE10K05_E4)
			considering the meaning of food and water security and how they may influence design decisions for creating preferred futures (AC9TDE10K05_E5)

			examining the marketing chain of a range of agricultural products and outlining the effect of product processing and advertising on demand and price including the impact of cash crops on communities (AC9TDE10K05_E6)
	Technologies context: Food specialisations	analyse and make judgements on how the principles of food preparation, preservation, safety, presentation and sensory and functional properties influence the creation of food solutions for healthy eating (AC9TDE10K06)	analysing how Aboriginal and Torres Strait Islander Peoples have long understood techniques to turn inedible plant products into food sources with high nutritional value, for example throughout much of northern Australia, cycad nuts have been detoxified to prepare them for safe consumption (AC9TDE10K06_E1)
			experimenting with food preservation methods such as freezing and dehydrating to determine changes to food structure and how these impact on designing healthy food solutions, for example dehydrating fruit for a lunchbox (AC9TDE10K06_E2)
			conducting 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, comparing freshly squeezed juice with commercial juices or locally grown fruit with imported fruit (AC9TDE10K06_E3)
			determining how the causes of food spoilage can be addressed when preparing, cooking, presenting and storing food items, for example developing a comprehensive checklist of considerations for safe and hygienic food storage and preparation including danger-zone temperatures for a food service (AC9TDE10K06_E4)
			considering factors that influence the preparation and presentation of foods using a range of techniques to ensure optimum nutrient content, flavour, texture and visual appeal, for example designing and producing a healthy snack for the canteen and using food photography and digital tools to promote the item in a healthy eating campaign (AC9TDE10K06_E5)

Processes and production skills	Investigating and defining	analyse needs or opportunities for designing and develop design briefs, and investigate, analyse and select materials, systems, components, tools and equipment to create designed solutions (AC9TDE10P01)	analysing Aboriginal and Torres Strait Islander Peoples' traditional grains for their potential for providing nutritional and commercial solutions and developing a design brief to highlight the materials, systems, components and tools or equipment needed (AC9TDE10P01_E1)
			analysing the design of new products to identify how well design ideas respond to sustainability issues, for example swimming pool covers, ultraviolet lights and lamps for disinfection, or disposable household products (AC9TDE10P01_E2)
			analysing a range of design and technologies ideas, for example assessing those that draw on the intellectual property of others, including Indigenous cultural and intellectual property rights (AC9TDE10P01_E3)
			considering the needs of community groups to identify rich design tasks, for example interviewing community members to develop the initial brief and then during specific phases of the design process to determine the best possible designed solution for the community (AC9TDE10P01_E4)
			examining tools, techniques, equipment and relationships of properties for complementary materials for product development, for example examining compressive and tensile strengths of materials (AC9TDE10P01_E5)
	Generating and designing	generate, develop, test and communicate design ideas, plans and processes by applying design thinking, creativity, innovation and enterprise skills (AC9TDE10P02)	using techniques including combining and modifying ideas and exploring functionality to generate solution concepts and reimagining designs to feature emerging technologies, for example designing wearable technology that could assist or provide independence to elderly people (AC9TDE10P02_E1)
			undertaking functional, structural and aesthetic analysis of benefits and constraints of design ideas, for example assessing how a design is suitable for different communities and environments including those in countries across Asia (AC9TDE10P02_E2)
			considering competing variables that may hinder or enhance project development, for example weight, strength and price of materials; laws; sustainability; social protocols, user needs and community consultation processes (AC9TDE10P02_E3)

			producing drawings, models and prototypes to explore design ideas, for example using technical drawing techniques, digital imaging programs, 3D printers or augmented reality modelling software; producing multiple prototypes that show an understanding of key aesthetic considerations in competing designs (AC9TDE10P02_E4)
			communicating using appropriate technical terms and recording the generation and development of design ideas for an intended audience including justification of decisions, for example developing a digital portfolio with images and text which clearly communicate each step of a design process (AC9TDE10P02_E5)
	Producing and implementing	work flexibly to effectively and safely test, select, justify and use appropriate technologies and processes to make designed solutions (AC9TDE10P03)	refining technical skills and using production skills with independence to produce quality designed solutions and reducing risks in production with appropriate, safe working practices required for a specific design project (AC9TDE10P03_E1)
			using materials, components, tools, equipment and techniques safely and considering alternatives to maximise sustainability, for example using timber because it stores carbon and offsets the demand for alternative products (AC9TDE10P03_E2)
			experimenting with innovative combinations and ways of manipulating traditional and contemporary materials, components, tools, equipment and techniques, and recording findings in a collaborative space to debate the merits of each with peers (AC9TDE10P03_E3)
			modifying production processes to respond to unforeseen challenges or opportunities, for example when producing bulk quantities of recipes, the impact of lower-than-average rainfalls on crop growth or using materials with unexpected faults (AC9TDE10P03_E4)

	Evaluating	develop criteria for success that include sustainability to iteratively evaluate design ideas, processes and solutions (AC9TDE10P04)	establishing specific criteria for success for evaluating designed solutions, for example determining necessary function of a product, service or environment such as an acceptable load for an engineered structure to carry and making a judgement about whether these have been met after stress testing or user testing (AC9TDE10P04_E1)
			evaluating and justifying the use and best combination of traditional, contemporary and emerging technologies during project development, including consideration of sustainability, for example considering farming methods that improve soil quality including those methods used in South-East Asia (AC9TDE10P04_E2)
			reflecting on learning including processes or choices made at various stages of a design process and modifying plans when needed with consideration of criteria for success (AC9TDE10P04_E3)
			evaluating design ideas for their long-term application, functionality and impact (AC9TDE10P04_E4)
	Collaborating and managing	develop project plans for intended purposes and audiences to individually and collaboratively manage projects, taking into consideration time, cost, risk, processes and production of designed solutions (AC9TDE10P05)	producing, explaining and interpreting drawings and planning production timelines using digital tools, for example establishing materials and equipment needs using spreadsheets, or creating production flowcharts to ensure efficient, safe and sustainable workflows (AC9TDE10P05_E1)
			collaborating to develop production plans for equitable distribution of work including discussing roles, tasks and deadlines and considering flexibility and contingencies (AC9TDE10P05_E2)
			investigating manufacturing processes to identify strategies to enhance production, for example identifying techniques to reduce use, cut costs, speed up processes or to form beneficial partnerships with others in production (AC9TDE10P05_E3)