Australian CURRICULUM Review

TECHNOLOGIES

CONSULTATION CURRICULUM

Digital Technologies – All elements 7–10

AUSTRALIAN CURRICULUM, ASSESSMENT AND REPORTING AUTHORITY

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TABLE OF CONTENTS

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.

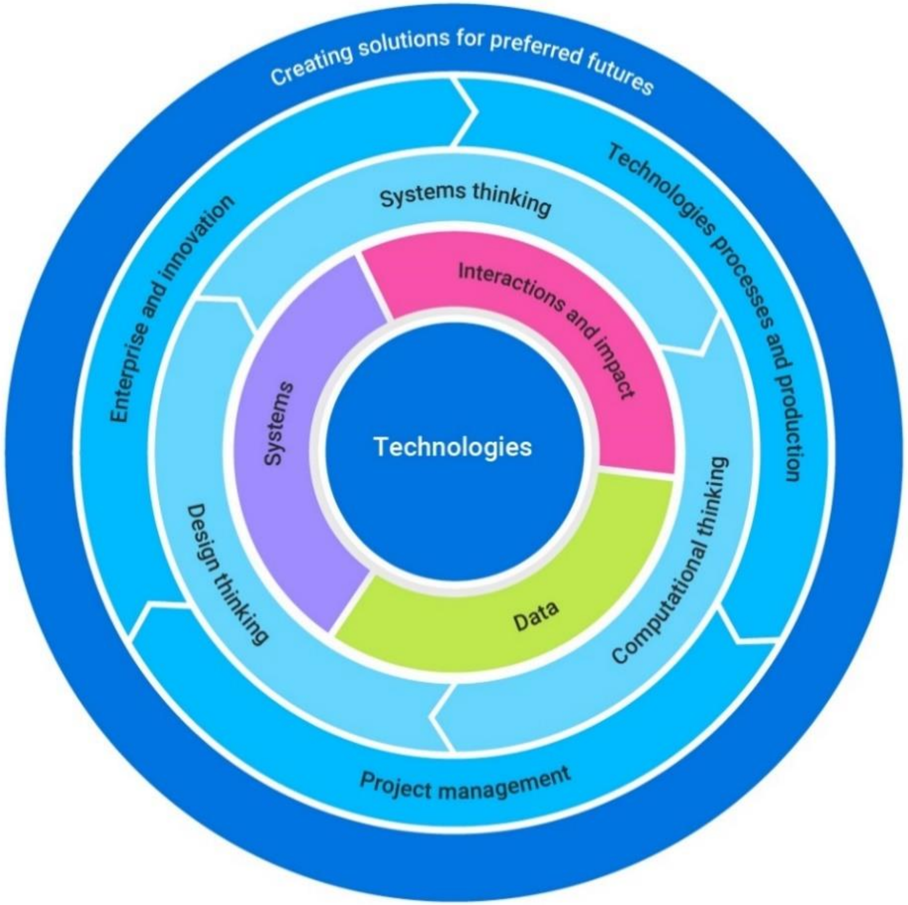

Figure 1: Overview of Technologies core concepts

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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

DIGITAL TECHNOLOGIES F–10

Rationale

In a world that is increasingly digitised and automated, it is critical to the strength and sustainability of the economy, the environment and society that digital solutions are purposefully designed to include user empowerment, autonomy and accountability. With this, emerging technologies also present transformative opportunities to address the circular economy. This requires deep knowledge and understanding of digital systems (a component of an information system) and how to manage risks. Digital systems such as mobile and desktop devices and networks are transforming learning, recreational activities, home life and work. Digital systems support new ways of collaborating and communicating and require skills such as computational and systems thinking. These technologies are an essential problem-solving toolset in our knowledge-based society.

The Australian Curriculum: Digital Technologies empowers students to shape change by influencing how contemporary and emerging information systems and practices are applied to meet current and future needs. A deep knowledge and understanding of information systems enables students to be creative and discerning decision-makers when they select, use and manage data, information, processes and digital systems to meet needs and shape preferred futures.

Digital Technologies provides students with practical opportunities to use design thinking and to be innovative developers of digital solutions and knowledge. The subject helps students to become innovative creators of digital solutions, effective users of digital systems and critical consumers of information conveyed by digital systems.

Digital Technologies gives students authentic learning challenges that foster curiosity, confidence, persistence, innovation, creativity, respect and cooperation. These are all necessary when using and developing information systems to make sense of complex ideas and relationships in all areas of learning. Digital Technologies helps students to be creative and innovative learners, who are active, ethical citizens capable of being informed members of the community.

Aims

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

- design, create, manage and evaluate sustainable and innovative digital solutions to meet and redefine current and future needs
- use computational thinking (abstraction; data collection, representation and interpretation; specification; algorithms; and implementation) to create digital solutions

- confidently use digital systems to efficiently and effectively automate the transformation of data into information and to creatively communicate ideas in a range of settings
- apply protocols and legal practices that support safe, ethical and respectful communications and collaboration with known and unknown audiences
- apply systems thinking to monitor, analyse, predict and shape the interactions within and between information systems and the impact of these systems on individuals, societies, economies and environments.

Organisation

Content structure

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

- Knowledge and understanding – the information system components of data and digital systems (hardware, software and networks)
- Processes and production skills – the skills needed to create digital solutions.

Together, the two strands provide students with knowledge, understanding and skills through which they can safely and ethically use the capacity of information systems (people, data, processes, digital systems and their interactions) to systematically transform data into solutions that respond to the needs of individuals, society, the economy and the environment. Teaching and learning programs will typically integrate these two strands, as content in processes and production skills often draws on understanding of concepts in the knowledge and understanding strand.

Strands and sub-strands

Under each strand, curriculum content is further organised in sub-strands. The knowledge and understanding strand comprises two sub-strands. One sub-strand focuses on digital systems and the other on data representation.

The processes and production skills strand comprises seven sub-strands: acquiring, managing and analysing data; investigating and defining; generating and designing; producing and implementing; evaluating; collaborating and managing; and considering privacy and security.

Table 4 shows the strand and sub-strand structure for Digital Technologies. Figure 3 illustrates the relationship between the Digital Technologies strands.

Table 4: Digital Technologies content structure

Strand	**Knowledge and understanding**
Sub-strands	Digital systems
	Data representation
Strand	**Processes and production skills**
Sub-strands	Acquiring, managing and analysing data
	Creating digital solutions by:
	Investigating and defining
	Generating and designing
	Producing and implementing
	Evaluating
	Collaborating and managing
	Considering privacy and security

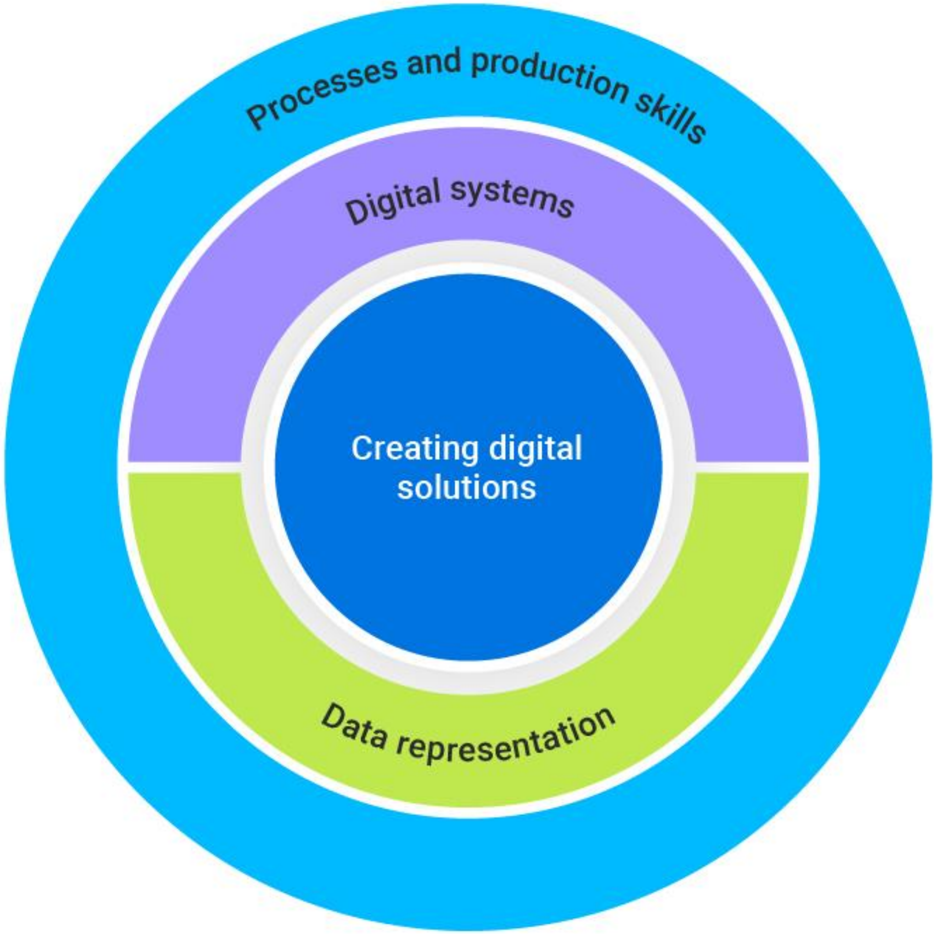

Figure 3: Relationship between the Digital Technologies strands and sub-strands

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Knowledge and understanding strand

This strand focuses on developing the underpinning knowledge and understanding of information systems through the two sub-strands of digital systems and data representation.

Sub-strand: Digital systems

This sub-strand focuses on the components of digital systems: hardware, software and networks. In the early years, students learn about a range of hardware and software and progress to an understanding of how data is transmitted between components within a system, and how the hardware and software interact to form networks.

Sub-strand: Data representation

This sub-strand looks at how data is represented and structured symbolically for use by digital systems. Different types of data are studied from Foundation to Year 8 including text, numeric, images (still and moving) and sound with relational data being introduced in Years 9 and 10.

Processes and production skills strand

The Digital Technologies processes and production skills strand is based on computational thinking and design processes. This strand reflects skills that would typically be addressed as part of the user stories and design criteria for creating digital solutions.

Students create digital solutions that use data; require interactions with users and within systems; and have impacts on people, the economy and environments. Solutions may be developed using combinations of readily available and student-designed hardware and software applications. Examples of solutions are instructions for a robot, an adventure game, and products featuring interactive multimedia including digital stories, animations and websites.

The Digital Technologies processes and production skills strand entails:

- Acquiring, managing and analysing data

and creating digital solutions by:

- Investigating and defining
- Generating and designing

- Producing and implementing
- Evaluating
- Collaborating and managing
- Considering privacy and security.

These are the skills that students will use throughout a Digital Technologies project and they comprise the sub-strands for this strand.

Sub-strand: Acquiring, managing and analysing data

Acquiring, managing and analysing data involves students exploring the properties of data, how it is acquired and interpreted using a range of digital systems and peripherals, and analysing data when creating information. Students use computational thinking elements such as pattern recognition, abstraction and evaluation. They progress from exploring data acquisition strategies and looking for patterns to validating the data and data integrity.

Sub-strand: Investigating and defining

Investigating and defining involves students creating solutions and defining problems clearly by identifying appropriate data and requirements. When designing, students consider how users will interact with the solutions, and check and validate their designs to increase the likelihood of creating working solutions. Defining and communicating a problem precisely and clearly is an important part of specification.

Sub-strand: Generating and designing

Generating and designing involves students developing computational thinking by creating algorithms which clearly define steps which may lead to creating a digital solution. Students progressively move from following algorithms in their daily activities to designing algorithms and validating them against test cases. They make choices, weigh up options and consider alternatives. Students use critical and creative thinking and systems 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 problems and identifying new design opportunities considering preferred futures. It also involves identifying errors that may occur within an algorithm and how control structures can improve the flow through a program.

Sub-strand: Producing and implementing

Students apply their algorithms as a program through systems to make products or content which have been designed to meet specific user needs. They apply knowledge about components and how digital systems use and display data to ensure the success of their program. Students develop accurate production skills to achieve quality digital solutions. They develop the capacity to select and use appropriate systems, components, tools and equipment; and use techniques and materials that respect the need for sustainability. They use modelling and prototyping to accurately develop simple and complex physical models that support the production of successful digital solutions.

Sub-strand: Evaluating

Students evaluate and make judgements throughout the design process and about the quality and effectiveness of their digital solution. They identify design criteria and develop user stories to support success of the digital solution. In the early years, the teacher may guide the development of these criteria and user stories.

Progressively, students develop criteria which become increasingly more comprehensive. Students consider the implications and consequences of actions and decision-making. They determine effective ways to test and judge their digital solutions. They reflect on processes and transfer their learning to other solutions and opportunities.

Sub-strand: Collaborating and managing

Students learn to work collaboratively and to manage time and other resources to effectively create digital solutions. Progressively, students develop the ability to communicate ideas and information and share ideas throughout the process, negotiate roles and responsibilities and independently and collaboratively manage agile projects to create interactive solutions.

Students share information online by creating websites and interacting safely using appropriate information system protocols and agreed behaviours. They are progressively guided by trusted adults to account for risks when working individually and collaboratively.

Sub-strand: Considering privacy and security

Considering privacy and security involves students developing appropriate techniques for managing data which is personal, and effectively implementing security protocols. In the early years, this begins with knowledge that data can be personal, collated and connected and progressively moves to students developing skills in managing the collection of their own or another user’s data. Students investigate how online applications and networked systems curate their data and explore strategies to manage their digital footprint.

Students learn the importance of effective security protocols. They effectively access school or personal accounts and progress from using simple usernames and passwords in the early years to using unique passphrases and multi-factor authentication which considers cyber security threats.

Core concepts

Core concepts are the big ideas, understandings, skills or processes that are central to the Digital Technologies curriculum. They give clarity and direction about what content matters most in Digital 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 Digital Technologies across the years of schooling.

Underpinning the Digital Technologies curriculum are the core concepts of the Technologies learning area. The core concepts specific to Digital Technologies are:

- **digital systems**: processing data in binary, made up of hardware, controlled by software, and connected to form networks
- **data representation:** data being represented and structured symbolically for storage and communication, by people and in digital systems
- **data collection**: numerical, categorical or structured values acquired or calculated to create information
- **data interpretation:** extracting meaning from data
- **abstraction:** reducing complexity by hiding details so that the main idea, problem or solution can be defined and focus can be on a manageable number of aspects
- **specification:** defining a problem precisely and clearly, identifying the requirements, and breaking the problem into manageable pieces
- **algorithms:** the precise sequences of steps and decisions needed to solve a problem, often involving iterative (repeated) processes
- **implementation:** the automation of an algorithm, typically by writing a computer program or using appropriate software
- **privacy and security**: the protection of data when it is stored or transmitted through digital systems.

Table 5 outlines the alignment between the Digital Technologies strands and sub-strands to the learning area and subject-specific core concepts.

Table 5: Relationships between Digital Technologies strands and sub-strands and core concepts

Content strands and sub-strands		Related core concepts
Strand	**Knowledge and understanding**	
Sub-strands	Digital systems Data representation	Systems; Digital systems* Data; Data representation*
Strand	**Processes and production skills**	Creating solutions for preferred futures
Sub-strands	Acquiring, managing and analysing data	Data; Data collection*; Data interpretation*
	Creating designed solutions by:	Systems thinking; Design thinking; Computational thinking (Abstraction*; Specification*; Algorithms*; Implementation*); Technologies processes and production skills; Project management skills; Enterprise skills and innovation; Interactions and impact; Privacy and security*
	Investigating and defining	
	Generating and designing	
	Producing and implementing	
	Evaluating	
	Collaborating and managing	
	Considering privacy and security	

** Subject-specific core concepts*

Read more

Digital systems

Digital systems focuses on the components of digital systems: hardware and software (computer architecture and the operating system), and networks and the internet (wireless, mobile and wired networks and protocols). This concept is addressed in both strands. The broader definition of an information system that includes data, people, processes and digital systems relates to the interactions and impact concept.

Data collection, representation and interpretation

The concepts that are about data focus on the properties of data, identifying and describing patterns, and how it is interpreted in context to produce information. These concepts in Digital Technologies build on content in the statistics and probability strands in the Mathematics curriculum. The Digital Technologies curriculum provides a deeper understanding of data and its representation, and computational skills for interpreting data. The data concepts provide rich opportunities for authentic data exploration in other learning areas while developing data processing and visualisation skills.

Data collection describes the numerical, categorical and textual facts measured, acquired or calculated as the basis for creating information and its binary representation in digital systems. It is addressed in the processes and production skills strand. Data representation describes how data is represented and structured symbolically for storage and communication, by people and in digital systems, and is addressed in the knowledge and understanding strand.

Data interpretation describes the processes of extracting meaning from data and is addressed in the processes and production strand.

Abstraction

Abstraction involves hiding details of an idea, problem or solution that are not relevant, to focus on a manageable number of aspects. It is a natural part of communication: people rarely communicate every detail because many details are not relevant in a given context. The idea of abstraction can be acquired from an early age. For example, when students are asked how to make toast for breakfast, they do not mention all steps explicitly, assuming that the listener is an intelligent implementer of the abstract instructions.

Central to managing the complexity of information systems is the ability to ‘temporarily ignore’ the internal details of the subcomponents of larger specifications, algorithms, systems or interactions. In digital systems, everything must be broken down into simple instructions.

Specification, algorithms and implementation

The concepts specification, algorithms and implementation focus on the precise definition and communication of problems and their solutions. This process begins with the description of tasks and concludes in the accurate definition of computational problems and their algorithmic solutions. These concepts draw from logic, algebra and the language of mathematics, and can be related to the scientific method of recording experiments.

Specification describes the process of defining and communicating a problem precisely and clearly. For example, explaining the need to direct an object, human or robot to move in a particular way.

An algorithm is a precise description of the steps and decisions needed to solve a problem. Algorithms will need to be tested before the final solution can be implemented. Anyone who has followed or given instructions, or navigated using directions, has used an algorithm. These generic skills can be developed without programming. For example, students can follow the steps in a recipe or describe directions to locate items.

Implementation describes the automation of an algorithm, typically by using appropriate software or writing a computer program.

These three concepts are addressed in the processes and production skills strand.

Privacy and security

The privacy and security concept focuses on the implications of and concerns related to the collection and generation of data through automated and non-automated processes. It allows for the evaluation of the social and economic implications of privacy in the context of safety and ethics. This concept is applied in the processes and production skills strand; in particular, through the acquiring, managing and analysing data; evaluating; and collaborating and managing sub-strands.

CURRICULUM ELEMENTS

YEARS 7 AND 8

Band level description
By the end of Year 8 students will have had opportunities to create a range of digital solutions, such as interactive web applications or programmable multimedia assets or simulations of relationships between objects in the real world. They develop further understanding and skills in computational thinking such as decomposing problems and prototyping; and engaging students with a wider range of information systems as they broaden their experiences and involvement in national, regional and global activities. Students analyse the properties of networked systems and their suitability and use for the transmission of data types. They acquire, analyse, validate and evaluate various types of data, and appreciate the complexities of storing and transmitting those data in digital systems. Students use structured data to model objects and events that shape the communities they actively engage with. They further develop their understanding of the vital role that data plays in their lives, and how the data and related systems define and are limited by technical, environmental, economic and social constraints. They further develop abstractions by identifying common elements while decomposing apparently different problems and systems to define requirements and recognise that abstractions hide irrelevant details for particular purposes. When defining problems, students identify the key elements of the problems and the factors and constraints at play. They design increasingly complex algorithms that allow data to be manipulated automatically and explore different ways of showing the relationship between data elements to help computation, such as using pivot tables, graphs and clearly defined markup or rules. They progress from designing the user interface to considering user experience factors such as user expertise, accessibility and usability requirements. They broaden their programming experiences to include general-purpose programming languages and incorporate subprograms into their solutions. They predict and evaluate their developed and existing solutions, considering time, tasks, data and the safe and sustainable use of information systems, and anticipate any risks associated with the use or adoption of such systems. Students plan and manage individual and team projects with some autonomy. They consider ways of managing the exchange of ideas, tasks and files and techniques for monitoring progress and feedback. When communicating and collaborating online, students develop an understanding of different social contexts, for example acknowledging cultural practices and meeting legal obligations.

Digital Technologies achievement standard

By the end of Year 8 students use computational thinking to independently and collaboratively create effective digital solutions measured against negotiated success criteria. They design solutions to real-world problems and opportunities by creating a variety of algorithmic designs and implement them using a general-purpose programming language. Students use a range of tools to make predictions and draw conclusions based on acquired, stored and validated data. They explain how digital systems represent, transmit and secure data. Students identify and explain how to protect against cyber security threats, manage the risks of sharing and curate their digital footprint.

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 implement 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	Digital systems	explain how hardware specifications affect performance and select appropriate hardware for particular tasks and workloads (AC9TDI8K01)	considering how remote Aboriginal and Torres Strait Islander communities frequently share access to mobile phone and internet services, and how the hardware specifications of these devices affect performance, for example where immediate and extended families share and access data through a single mobile phone or device (AC9TDI8K01_E1)
			building and justifying a component list for a computer that is fit for purpose, for example for everyday email and web browsing or for high-end gaming considering the impact of resources used (AC9TDI8K01_E2)
		investigate how data is transmitted and secured in wired and wireless networks including the internet (AC9TDI8K02)	explaining how cellular radio towers and mobile phones work together to create mobile networks and comparing the reliability and speed of data flows through wi-fi, wired and mobile networks (AC9TDI8K02_E1)
			exploring data transmission methods, for example binary voltage changes, changes to a radio wave, or varying the intensity or colour of light in an optical fibre (AC9TDI8K02_E2)
	Data representation	investigate how digital systems represent text, image and audio data using integers (AC9TDI8K03)	investigating how a humanoid robot or similar digital system converts audio data to integers as it records, stores and outputs sound, for example the programming of an Acknowledgement of Country in a local Aboriginal or Torres Strait Islander language (AC9TDI8K03_E1)
			investigating how the colours in images and videos are represented in digital systems, for example manipulating red, green and blue colours in an image editor (AC9TDI8K03_E2)
			exploring the function of analog to digital and digital to analog converters, noting how sample sizes and times influence the quality of the representation, for example a low sample rate will make an audio file smaller but sound quality will be very poor as a result (AC9TDI8K03_E3)
			investigating the different representation of bitmap and vector graphics and its consequences, for example pixilation in magnified bitmap and vector images, considering impact of file size (AC9TDI8K03_E4)

		explain how and why digital systems represent integers in binary (AC9TDI8K04)	recognising that computers can only work with a language that uses ones and zeros, therefore we need a way of translating from the computer alphabet to our own and vice versa, for example using an ASCII table to translate an English word or phrase as a binary number sequence (AC9TDI8K04_E1)
			exploring secure transmission of data by restricting encryption to numerical values of letters of the alphabet and control characters, and investigating how Unicode overcomes the ASCII problem of dealing with languages that require more than 128 characters (AC9TDI8K04_E2)
			representing whole numbers in binary, for example counting in binary from zero to 15, or writing a friend's age in binary (AC9TDI8K04_E3)
Processes and production skills	Acquiring, managing and analysing data	acquire, store and validate data from a range of sources using software, including spreadsheets and databases (AC9TDI8P01)	acquiring, storing and validating data, from a reputable source, such as the Australian Bureau of Statistics, to analyse Aboriginal and Torres Strait Islander people's geographic distribution, with the aim to highlight past and emerging trends (AC9TDI8P01_E1)
			acquiring relevant data to draw conclusions, for example assessing the liveability of a city, town or village using a combination of data from valid sources and from a student-designed survey (AC9TDI8P01_E2)
			validating the role of structured data, for example using the attributes of different mammals to build a dichotomous key which can identify a specific type of plant or animal (AC9TDI8P01_E3)
		analyse and visualise data using a range of software, including spreadsheets and databases, to draw conclusions and make predictions by identifying trends (AC9TDI8P02)	acting ethically and respecting intellectual property when acquiring and displaying data belonging to others (AC9TDI8P02_E1)
			visualising data to create information, for example identify trends and outlier data from spreadsheets using plots, or display geocoded data on a map (AC9TDI8P02_E2)

		model and query the attributes of objects and events using structured data (AC9TDI8P03)	identifying and incorporating data attributes for a purpose, for example creating a data dictionary for a flat file database such as membership details for a sporting club and creating the database including filters or other methods to produce reports (AC9TDI8P03_E1)
	Investigating and defining	define and decompose real-world problems with design criteria and by creating user stories (AC9TDI8P04)	making predictions about future population distribution of Aboriginal and Torres Strait Islander Peoples based on identified trends, for example analysing and visualising data using spreadsheets and databases on their population growth in metropolitan areas (AC9TDI8P04_E1)
			examining factors influencing the design of a global positioning system–based application to assist in the identification of Traditional Owners, for example investigating the potential of an application that could assist Australians to identify and contact the traditional Aboriginal and Torres Strait Islander owners of the land they are on (AC9TDI8P04_E2)
			investigating a local or global issue in need of a solution and producing design criteria to effectively meet the needs and opportunities for sustainable living, including collecting data about direct stakeholders, consequences of design choices, budgets and others who may be impacted by a solution, for example locating or acquiring data on electricity use in homes in a local area, analysing the data and publishing findings including recommendations for designed and digital solutions that could be produced, their estimated cost and community impacts (AC9TDI8P04_E3)
			identifying that designed solutions can be decomposed into sub-elements to plan and produce them effectively, for example identifying the elements of game design such as characters, movements, collisions and scoring and their relationships, and considering who will play the game (user) and how they might interact with the game (user story) (AC9TDI8P04_E4)
			using a template such as ‘As a <type of user>, I want <some goal> so that <some reason>’, for example, ‘As a user with a visual impairment I want to be able to get the news on my phone so that I can keep up with my world’ (AC9TDI8P04_E5)
			building a set of rules for a game or system including depicting the system as a sequence of processes and data flows, for example documenting a troubleshooting system which uses artificial intelligence (AC9TDI8P04_E6)

	Generating and designing	design algorithms involving nested control structures and represent them using flowcharts and pseudocode (AC9TDI8P05)	designing the menu structure for an augmented reality experience that utilises user input data, for example how an interpretive tour of Aboriginal and Torres Strait Islander Peoples' uses of local resources including food, fibre or medicinal plants can be tailored to the user's preferences for items such as language and content (AC9TDI8P05_E1)
			using diagrams to describe key decisions, for example creating flowcharts using digital tools to describe a set of computational instructions including branching and iteration to determine the steps taken in an algorithm (AC9TDI8P05_E2)
			using structured English to express algorithmic instructions, for example using conventional statements such as REPEAT and UNTIL in a loop when describing interactive instruction (AC9TDI8P05_E3)
		trace algorithms to predict output for a given input and to identify errors (AC9TDI8P06)	following instructions for making woven baskets or nets by hand, as done by Aboriginal and Torres Strait Islander Peoples, and making predictions of how the instructions would need to be modified to enable the item to be produced through mechanisation as a labour-saving strategy (AC9TDI8P06_E1)
			manually checking the accuracy of an algorithm before it is implemented, for example reading and reviewing (desk checking) the algorithm using test data to see if the instructions produce the expected results (AC9TDI8P06_E2)
		design the user experience of a digital system (AC9TDI8P07)	investigating a range of existing digital solutions for logic, connections and user behaviour; that is, user experience (UX) and visual design of the solution, including branding and user interface (UI), for example discussing observations of UX and UI using popular apps and games as stimulus (AC9TDI8P07_E1)
			applying the principles and elements of design to a series of solutions to evaluate the success of each solution to hold the viewer's attention, for example identifying which colour combinations or framing of visual elements keep different audiences engaged with on-screen activity (AC9TDI8P07_E2)
			comparing the history of graphical user interfaces, for example comparing the iconography of digital systems over time, looking at guidelines for such interfaces, their evolution and whether adherence to such guidelines is common (AC9TDI8P07_E3)

		generate, modify, communicate and evaluate alternative designs (AC9TDI8P08)	producing a website, animation or other interactive experience to help Australians identify and contact the Aboriginal and Torres Strait Islander Traditional Owners of user-provided locations (AC9TDI8P08_E1)
			designing the user interface of a solution using a range of design tools, for example using wireframes or mock-ups to describe the appearance of a solution or mocking up a mobile solution in a slide deck where buttons link to slides showing their effect (AC9TDI8P08_E2)
			evaluating the direct and indirect effects of digital systems, for example privacy, social media bubbles, hacking, cyberware, automation and job reassignment due to increased use of artificial intelligence (AI), effects of bias in AI-driven systems (AC9TDI8P08_E3)
	Producing and implementing	implement algorithms and modify and debug programs involving control structures and functions in a general-purpose programming language (AC9TDI8P09)	using a general-purpose programming language to program a device to recognise particular objects and to complete an action, for example considering the choice of objects and programming needed to create interaction in a simple computer game including the use of colour or a decision to move ahead or reverse direction depending on the proximity of a wall (AC9TDI8P09_E1)
			creating digital solutions that provide user navigation and prompts with controlled repetitions, for example an information kiosk that has layers of buttons and prompts the user three times before returning to the beginning (AC9TDI8P09_E2)
	Evaluating	evaluate existing and student solutions against the design criteria, user stories and possible future impact (AC9TDI8P10)	reviewing student projects, past and present, and comparing various aspects of the design and production of the solutions including revisiting user stories, design criteria and impact (AC9TDI8P10_E1)
			questioning the impact of being wholly dependent on digital tools, for example do digital solutions in low service areas create inequities? (AC9TDI8P10_E2)
			investigating solutions and evaluating alternative designs, for example whether the mobile and laptop versions of a webpage provide users with a similar experience (AC9TDI8P10_E3)

			exploring the history of emerging technologies and their positive and negative impacts on society and the environment, for example researching the development of new versions of hardware and software, plug-ins and apps; and considering the redundancy of physical packing, disks and related materials that do not include e-waste (AC9TDI8P10_E4)
	Collaborating and managing	create, locate and edit content for, and communicate with, a specific audience, selecting from a range of tools and using their advanced functionality and storage conventions (AC9TDI8P11)	communicating with a specific person or group to research a user story, determine design criteria and create a customised digital solution considering future needs and emerging technologies, for example building a database that manages a sporting club in a growing community (AC9TDI8P11_E1)
			collaborating with communities and organisations to explore how their diverse narratives might be incorporated in the design of a game or app (AC9TDI8P11_E2)
		share information publicly online and plan, manage and collaborate on simple agile projects, demonstrating agreed behaviours (AC9TDI8P12)	respecting Aboriginal and Torres Strait Islander cultures through agreed behaviours regarding cultural protocols, including relevant permissions and attributions, along with addressing risks and responsibilities such as privacy, security, accuracy of data and avoiding deficit discourse (AC9TDI8P12_E1)
			itemising the requirements of a planned collaborative online system that is fit for purpose, for example researching and recording device and network specifications, and accessibility, security and privacy provisions needed to set up a simple network such as closed-circuit television AC9TDI8P12_E2)
			exploring the differences between virtual and face-to-face communications, for example equity of access, the contribution of body language to communication, and the ability and ethics of tracking individual contribution afforded by virtual communications (AC9TDI8P12_E3)

	Privacy and security	explain how multi-factor authentication protects an account when the password is compromised and identify phishing and malware threats (AC9TDI8P13)	investigating systems and processes that protect personal privacy and data considering emerging technologies, for example researching methods for identifying and protecting against spyware and malware and systems for ensuring strong passwords and authentication processes (AC9TDI8P13_E1)
			exploring multi-factor authentication in action followed by common set-up procedures, for example multi-factor authentication could be demonstrated in class where students have to physically ask for verification to get into a school site using a unique password (AC9TDI8P13_E2)
			identifying common scams such as the fake parcel delivery scam through tell-tale signs, for example misspellings, inappropriate grammar or the purported site not matching the actual link in URL (AC9TDI8P13_E3)
		investigate and manage the data that existing systems and student solutions collect that contributes to a digital footprint and assess if the data is essential to their purpose (AC9TDI8P14)	investigating the ethical obligations of individuals and organisations regarding ownership and privacy of data and information by researching an online platform and discussing the impact of the data it collects and stores on digital footprint and what it does with that data and information (AC9TDI8P14_E1)
			critiquing their own digital solutions to examine what sort of personal data is collected and whether that collection is warranted and secured (AC9TDI8P14_E2)
			investigating how data collections impact media production and consumption and their impact on our understanding of ourselves, for example media streaming services predicting what television shows or music tracks we might be interested in (AC9TDI8P14_E3)

Years 9 and 10

Band level description

By the end of Year 10 students will have had opportunities to analyse problems and design, implement and evaluate a range of digital solutions, such as database-driven websites and artificial intelligence engines and simulations. They develop further understanding and skills in computational thinking such as precisely and accurately describing problems and the use of modular approaches to solutions. Students also engage with specialised learning in preparation for vocational training or learning in the senior secondary years.

Students consider how human interaction with networked systems introduces complexities surrounding access to, and the privacy and security of, data of various types. They interrogate security practices and techniques used to compress data, and learn about the importance of separating content, presentation and structural elements for data integrity and maintenance purposes. Students explore how bias can affect the results and value of data collection methods and they use structured data to analyse, visualise, model and evaluate objects and events.

They learn how to develop multilevel abstractions, identify standard elements such as searching and sorting in algorithms, and explore the trade-offs between the simplicity of a model and the faithfulness of its representation. When defining problems students consider the functional and non-functional requirements of a solution through interacting with clients and regularly reviewing processes. They consolidate their algorithmic design skills to incorporate testing and review, and further develop their understanding of the user experience to incorporate a wider variety of user needs.

Students develop modular solutions to complex problems, using an object-oriented programming language where appropriate, and evaluate their solutions and existing information systems based on a broad set of criteria including connections to existing policies and their enterprise potential. They consider the privacy and security implications of how data is used and controlled and suggest how policies and practices can be improved to ensure the sustainability and safety of information systems.

Students progressively become more skilled at identifying the steps involved in planning solutions and developing detailed plans that are mindful of risks and sustainability requirements. When creating solutions, individually and collaboratively, students comply with legal obligations, particularly for the ownership of information, and when creating interactive solutions for sharing in online environments.

Digital Technologies achievement standard

By the end of Year 10 students use computational thinking to create innovative digital solutions measured against stakeholder user stories. They plan and manage agile projects, being aware of risks, responsibilities and the effects of curated data on the digital footprint. Students design complex solutions to draw conclusions and make predictions by creating and validating algorithms and modular programs. They model entities and their relationships using structured data. They critically evaluate ideas and solutions against design criteria and user stories. Students design and create online documents using the component parts of text, markup and styling. Students explain how data can be stored; secured; managed; and controlled by hardware, software and encryption. They evaluate cyber security threats and mitigations.

Strand	Sub-strand	Content description *Students learn to:*	Content elaboration *This may involve students:*
Knowledge and understanding	Digital systems	investigate how hardware and software manage, control and secure access to data in networked digital systems (AC9TDI10K01)	explaining the role of hardware and software components in giving Aboriginal and Torres Strait Islander Peoples improved access to financial or healthcare services, for example how telehealth services accelerate diagnosis, reduce travel-related trauma and provide security of confidential health data (AC9TDI10K01_E1)
			exploring how an operating system manages the relationship between hardware, applications and secure access to data considering energy for processes (AC9TDI10K01_E2)
			examining the role of hardware and software components in allowing people to interact with digital systems, for example using a mouse or touchpad or touch screen, speech and accelerometer, acknowledging language barriers, for example in health for people in remote communities (AC9TDI10K01_E3)
			investigating the role of a system clock in the flow of data and in security protection such as mitigating man-in-the-middle attacks (AC9TDI10K01_E4)
			exploring the role of network interfaces, switches, routers and devices such as domain name servers and dynamic host configuration servers to explain how hardware and software work together with agreed protocols to provide secure and reliable data transmission across networks (AC9TDI10K01_E5)

			investigating the ways in which artificial intelligence is a part of the range of solutions used to interpret data, for example using facial recognition in public security systems or identifying and organising photographs of individuals in a smartphone (AC9TDI10K01_E6)
	Data representation	represent documents online as content (text), structure (markup) and presentation (styling) and explain why such representations are important (AC9TDI10K02)	building a simple webpage showing how a markup language can change the styling of text, then investigating ways of further changing the styling using differing Cascading Style Sheets which change based on the viewing device or the user requirements (AC9TDI10K02_E1)
			generating several different reports or analyses from the same database or Python library, each for different audience needs (AC9TDI10K02_E2)
		investigate simple data compression techniques (AC9TDI10K03)	investigating the data compression techniques required in Aboriginal and Torres Strait Islander communities as a way of managing internet access, for example how images must be reduced in size or quality to manage bandwidth and data limits (AC9TDI10K03_E1)
			examining an image with a large proportion of blue sky and discussing whether the image quality would be compromised if all the blue pixels of the sky in one row were to be replaced by one token and the number of pixels it represents (AC9TDI10K03_E2)
			explaining the difference between lossy and lossless compression and the consequences of each, for example the difference between JPEG and PNG images and exploring codecs for audio-visual compression such as MP3, MP4 and WAV formats considering energy requirements of file sizes (AC9TDI10K03_E3)
			investigating artificial intelligence used to improve the perceived quality of compressed images to force the compression algorithm to put emphasis on details that humans consider important (AC9TDI10K03_E4)

Processes and production skills	Acquiring, managing and analysing data	develop techniques to acquire, store and validate data from a range of sources using software, including spreadsheets and databases (AC9TDI10P01)	sourcing and storing secondary data from the Australian Bureau of Statistics in a format that is useful for analysis, for example acquiring data on the population growth or age structure of the Aboriginal and Torres Strait Islander population (AC9TDI10P01_E1)
			identifying strengths and weaknesses of collecting data using different methods, for example online surveys, face-to-face interviews, phone interviews, observation, comments in response to a social media posting, phone logs, browser history and online webcam systems (AC9TDI10P01_E2)
			examining intellectual property and applying appropriate protocols when acquiring and displaying data including validating the source and accuracy (AC9TDI10P01_E3)
			developing strategies and techniques for capturing accurate and balanced datasets and creating visualisations that can be used to help in decision-making (AC9TDI10P01_E4)
		analyse and visualise data interactively using a range of software, including spreadsheets and databases, to draw conclusions and make predictions by identifying trends and outliers (AC9TDI10P02)	using software to visualise and compare data to identify patterns, relationships and trends in data, for example investigating emerging trends such as the rapid population growth and the marked differences in the age structure of the Aboriginal and Torres Strait Islander population (AC9TDI10P02_E1)
			exploring artificial intelligence data analysis where an algorithm is trained by a structured dataset, for example, engaging with online machine learning examples (AC9TDI10P02_E2)
			exploring the impacts of artificial intelligence systems, for example investigating probability-based machine learning and identifying possible unintended outcomes such as those caused by biases in training data and algorithms (AC9TDI10P02_E3)
		model and query entities and their relationships using structured data (AC9TDI10P03)	building an entity relationship diagram for a relational database, for example one that is used for websites such as online stores, natural disaster records or consumer reviews (AC9TDI10P03_E1)
			using structured data to help in decision-making, for example creating a data schema for a relational database and building the database, incorporating query and reporting functionality to solve a problem of student choice (AC9TDI10P03_E2)

	Investigating and defining	define and decompose real-world problems with design criteria and by interviewing stakeholders to create user stories (AC9TDI10P04)	exploring how Aboriginal and Torres Strait Islander Peoples' cultural stories and languages are being preserved with digital systems, for example how communities could record, animate and maintain their connections with culture and language in a contemporary format that resonates with young people to help ensure that vital practices continue (AC9TDI10P04_E1)
			building design criteria that incorporate innovative ideas for sustainability by decomposing a real-world problem to identify immediate and future needs, data flows, stakeholders, timeline and budgetary constraints and considering user experience and user interface (AC9TDI10P04_E2)
			investigating different design criteria to produce effective designed solutions, for example hardware capability, network speed, compatibility with other systems and considering how the requirements of reliability, user experience and robustness could affect the way people use solutions (AC9TDI10P04_E3)
			identifying the range of stakeholders who might use or be indirectly affected by a designed solution, for example using the design thinking process or techniques such as interviewing and reinterviewing to clarify needs, and creating user stories (AC9TDI10P04_E4)
	Generating and designing	design algorithms involving logical operators and represent them as flowcharts and pseudocode (AC9TDI10P05)	producing and testing algorithms considering efficiency, for example creating an algorithm using pseudocode or by manually reviewing an algorithm to test structure and identify errors (AC9TDI10P05_E1)
			considering embedded program debugging, for example breakpoints, stubs and flags (AC9TDI10P05_E2)
			considering event logging, for example writing data about progress of a program to a text file for later examination (AC9TDI10P05_E3)
		validate algorithms and programs by comparing their output against a range of test cases (AC9TDI10P06)	using techniques such as boundary-value analysis, for example to test comparisons, division by zero possibilities (AC9TDI10P06_E1)
			using in-built debugging tools in programming software to identify and correct errors, for example 'trace' in Python or 'console.trace' in JavaScript (AC9TDI10P06_E2)

		design and prototype the user experience of a digital system (AC9TDI10P07)	evaluating aspects of the total user experience; that is, all aspects of the system as perceived by the users, for example a user's initial experience of setting up and using a system, or a user's emotional or cultural response to using a digital system (AC9TDI10P07_E1)
			writing specific, testable acceptance criteria for a designed solution, for example documenting the steps needed to demonstrate success at each interaction when an online banking user wants to recover the password to their account if the password is forgotten (AC9TDI10P07_E2)
			designing documentation, branding and marketing for a digital solution, for example a product demonstration screencast or 'getting started' user guide (AC9TDI10P07_E3)
		generate, modify, communicate and critically evaluate alternative designs (AC9TDI10P08)	reviewing peer projects, past and present, for example reviewing a past student's exemplar, discussing whether it met the design criteria, and predicting how future changes in digital technologies may affect its sustainability (AC9TDI10P08_E1)
	Producing and implementing	implement, modify and debug modular programs, applying selected algorithms and data structures, including in an object-oriented programming language (AC9TDI10P09)	implementing separate modules that perform discrete functions but contribute to meeting the needs of the solution (AC9TDI10P09_E1)
			creating programs which allow users to stay connected to community (AC9TDI10P09_E2)
			defining classes that represent the attributes and behaviour of objects in a program (AC9TDI10P09_E3)
			building a hierarchy of instances based on a class, for example defining the behaviour of a mammal and creating an instance for a particular type of mammal (AC9TDI10P09_E4)
			selecting different types of data structures such as an array, record and object to model structured data (AC9TDI10P09_E5)
			considering different algorithms and selecting the most appropriate based on the problem, for example choosing appropriate data structures and methods considering impact on resources (AC9TDI10P09_E6)

	Evaluating	evaluate existing and student solutions against the design criteria, user stories, possible future impact and opportunities for enterprise (AC9TDI10P10)	building a case study of a solution's impact, for example exploring entrepreneurial opportunities that arise from mobile computing combined with the provision of high-speed internet (AC9TDI10P10_E1)
			using design criteria to review the key qualities of an existing program, for example, exploring the efficiency of execution of the program and its usability (AC9TDI10P10_E2)
			using a series of test cases to verify that a program performs according to the user stories (AC9TDI10P10_E3)
	Collaborating and managing	create, locate and edit interactive content for a diverse audience (AC9TDI10P11)	identifying accessibility issues and exploring how these impact the design of interactive content, for example building an online chatbot that responds to differing languages or understands speech (AC9TDI10P11_E1)
			investigating techniques used by people and organisations to shape how information systems are used to create content appropriate for the audience, for example locating content to support reluctant adopters, editing policies on how the use of social media can advocate or influence behaviours, or creating equipment update policies (AC9TDI10P11_E2)
		plan, manage and document individual and collaborative agile projects accounting for risks and responsibilities (AC9TDI10P12)	respecting Aboriginal and Torres Strait Islander cultures through agreed behaviours regarding cultural protocols, including relevant permissions and attributions, along with addressing risks and responsibilities such as privacy, security, accuracy of data and avoiding deficit discourse (AC9TDI10P12_E1)
			using digital tools for project management including collaborative Gantt charts, timelines and version control repositories to plan and monitor project progress including seeking and responding to feedback to help in consolidating strengths, addressing weaknesses and fulfilling a project's goals while considering security and data privacy (AC9TDI10P12_E2)
			applying techniques to make ethical decisions when faced with dilemmas about security and ownership of data, for example selecting an action that results in the greatest benefit for the greatest number of people (AC9TDI10P12_E3)

	Privacy and security	describe cyber security threats and mitigation, including using multi-factor authentication and password managers (AC9TDI10P13)	explaining cyber security solutions, for example penetration testing and non-malicious hacking (ethical hacking) and other effective methods of data protection that can be used in a home and business setting (AC9TDI10P13_E1)
			exploring the features of a password manager app and create an instructional video for a chosen audience explaining set-up and usage (AC9TDI10P13_E2)
			exploring cyber security concepts such as confidentiality, availability and integrity and identifying risks such as identity theft, disclosure of passwords and passphrases, and fraud (AC9TDI10P13_E3)
		apply the Australian Privacy Principles to critique and manage the data that existing systems and student solutions collect that contribute to a digital footprint (AC9TDI10P14)	exploring the impact on themselves, family and community when sharing images and texts without consent (AC9TDI10P14_E1)
			applying relevant principles from the Australian Privacy Principles documentation to solutions students have created, outlining how their solution will deal with specific principles such as APP10, APP11 and APP13 (AC9TDI10P14_E2)
			examining the Australian Privacy Principles and creating a public campaign poster to highlight the importance of respecting others' privacy (AC9TDI10P14_E3)