Australian CURRICULUM Review

TECHNOLOGIES

CONSULTATION CURRICULUM

Digital Technologies – All elements F–6

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.

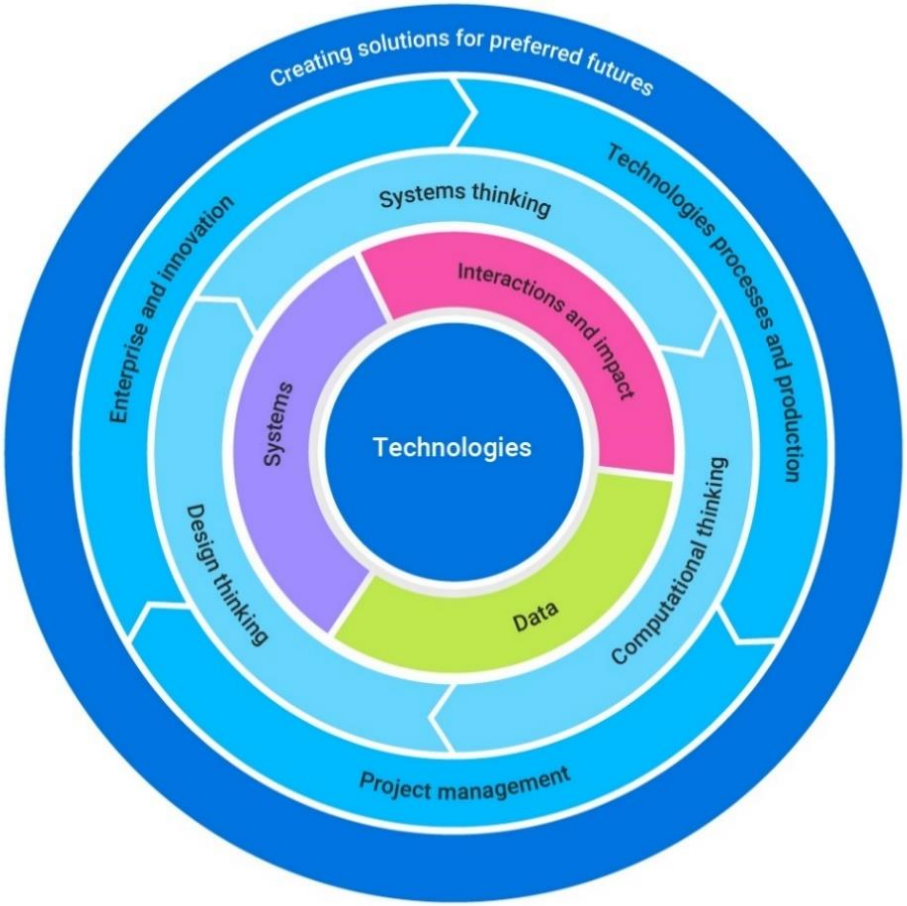

Figure 1: Overview of Technologies core concepts

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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

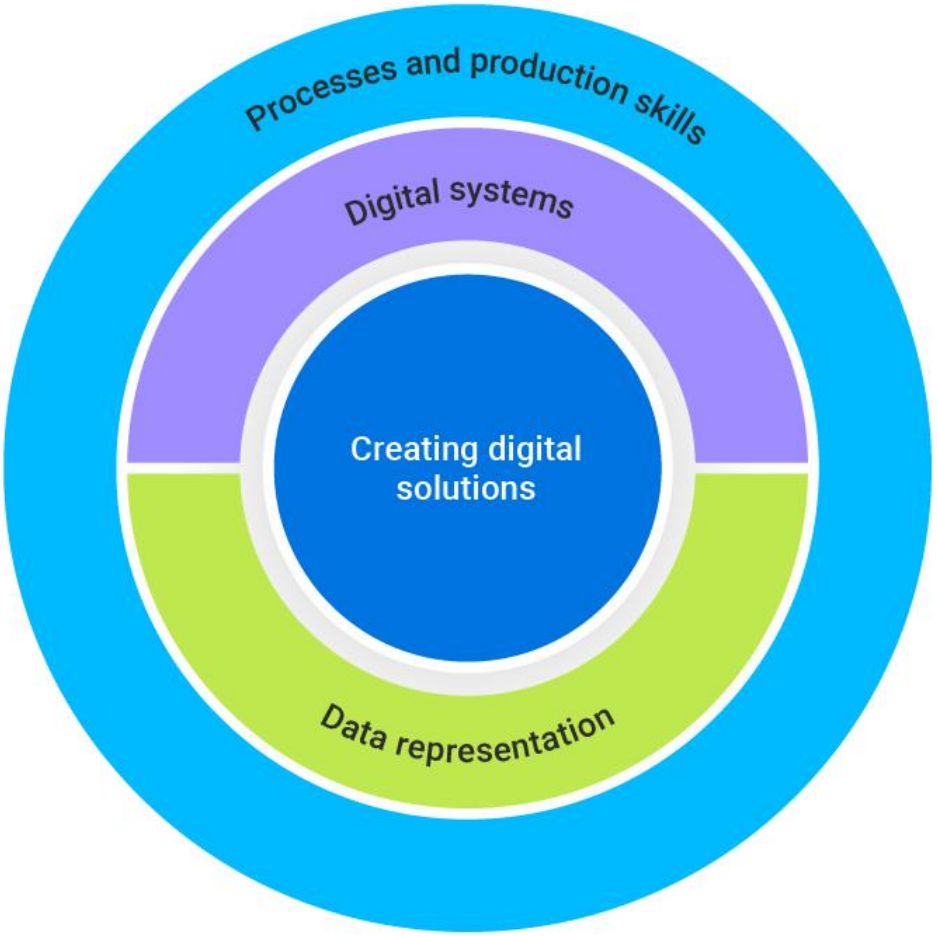

Figure 3: Relationship between the Digital Technologies strands and sub-strands

Read more

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	Systems; Digital systems*
	Data representation	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

Foundation

Level description
Learning in Digital Technologies builds on the Early Years Learning Framework, revisiting, strengthening and extending skills as needed. By the end of Foundation students will have had opportunities to explore digital systems, software, cameras and programmable devices in play experiences and projects. Students learn techniques to use digital systems to create information and represent their ideas. They focus on developing an awareness of digital systems and how we effectively use them to solve everyday problems or to cater to our needs. When exploring these problems and needs, students learn that objects, pictures and symbols can represent data. They learn what personal data should remain private and gain confidence in engaging in online learning and communication. There are rich connections to other learning areas, including Science.
Digital Technologies achievement standard
By the end of Foundation students develop familiarity with digital systems and display confidence when using digital systems. They show how digital systems can be used safely to solve problems. Students represent data using objects, pictures and symbols and identify examples of data that is owned by them.
Technologies learning area achievement standard*
By the end of Foundation students identify familiar products, services and environments and develop familiarity with and show confidence in using digital systems. They use materials and equipment to safely make a solution for a school-selected context and show how digital systems can be used to solve problems. Students use objects, pictures and symbols to represent data. They identify if data is personal and owned by them. * 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	recognise and explore digital systems (hardware and software) and how they can be used to solve simple problems (AC9TDIFK01)	exploring digital hardware such as cameras and microscopes to capture images of Aboriginal and Torres Strait Islander material culture, for example taking close-up photos of woven mats or baskets revealing intricate detail and projecting their images onto a screen for class sharing (AC9TDIFK01_E1)
			using audio-recording or video-recording devices to capture cultural stories of Aboriginal and Torres Strait Islander Peoples, for example interviewing a community member with the purpose of preserving stories of local significance (AC9TDIFK01_E2)
			playing with and using different digital systems for transferring and capturing data, for example carefully holding and using a device to take photographs or video with the front-facing and rear-facing cameras to import into a recount of a personal event or visual story (AC9TDIFK01_E3)
			constructing a model of a real or imaginary digital system for use in role-play scenarios and explaining the features of the device, for example making a model of a laptop computer or a robot out of recycled materials (AC9TDIFK01_E4)
			investigating a digital camera, tablet device or 360 camera to take photos of features of the school playground (AC9TDIFK01_E5)
			investigating how people use digital systems, for example discussing which workplaces and professions use digital systems and how those systems make the work safer or easier (AC9TDIFK01_E6)
			discussing how familiar digital systems solve simple problems, for example discussing the purpose of digital tools, smartphones, televisions or printers (AC9TDIFK01_E7)

	Data representation	represent data as objects, pictures and symbols (AC9TDIFK02)	exploring the iconic symbols of Aboriginal and Torres Strait Islander Peoples and how these symbols represent data (AC9TDIFK02_E1)
			sorting objects and events based on easily identified characteristics and using a range of methods to visually represent patterns in data, for example sorting and discussing reasons to group seedpods, leaves, litter or toys in different ways (AC9TDIFK02_E2)
			recognising different ways of representing patterns using materials, movements or pictures, for example by exploring repeating patterns and sequences in dance (AC9TDIFK02_E3)
Processes and production skills	Privacy and security	identify some data that are personal and owned by them (AC9TDIFP01)	letting others know that they do not want their photograph taken or shared or only sharing their full name or date of birth with people they know (AC9TDIFP01_E1)
			discussing the importance of asking permission from a parent or caregiver before entering personal details online such as address, phone number and date of birth (AC9TDIFP01_E2)
			making a list of examples for personal data and creating a T chart with types of data that are personal and of that data which can be public, for example a picture of a bird in the playground can be public but a picture of a child in school uniform should be private (AC9TDIFP01_E3)

Years 1 and 2

Band level description

By the end of Year 2 students will have had opportunities to create a range of digital solutions, such as using programmable devices to navigate a map. Students begin to learn about common digital systems and how they can be used for specific purposes. They focus on developing foundational skills in computational thinking and an awareness of personal experiences using digital systems.

Students organise, manipulate and present data, including numerical, categorical, text, image, audio and video data, in creative ways to create meaning. When defining problems, students use the concept of abstraction to identify the most important information, such as the significant steps involved in a procedure. They begin to develop their digital skills by conceptualising algorithms as a sequence of steps for carrying out instructions or controlling robotic devices.

They describe how information systems meet information, communication and recreational needs. Students learn to apply privacy and security practices to protect themselves and others as they interact online for learning and communicating.

Digital Technologies achievement standard

By the end of Year 2 students use basic computational thinking to create simple solutions to known problems or opportunities. They identify digital systems and their components, exploring their purpose. Students represent data using symbols, numbers and words. They identify examples of personal data that may be stored online. Students describe and represent algorithms that involve repetition and decisions.

Technologies learning area achievement standard*

By the end of Year 2 students describe the purpose of familiar products, services and environments and use basic computational thinking to create simple digital solutions to known problems or opportunities. For each of the two prescribed technologies contexts they identify the features and uses of technologies and create designed solutions. They evaluate their ideas, based on their personal preferences. Students communicate design ideas using models and simple drawings, describe and represent algorithms that involve repetition and decisions, and follow sequenced steps to safely produce designed solutions. They identify examples of personal data that may be stored online.

* 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	identify and explore digital systems and their components for a purpose (AC9TDI2K01)	exploring digital systems to better understand how they are used to provide remote Aboriginal and Torres Strait Islander communities with essential services, for example looking at the systems and components needed to allow families to watch their favourite television shows (AC9TDI2K01_E1)
			exploring and identifying software components of digital systems when creating ideas and information, for example experimenting with different ways of providing instructions to games software using a mouse, touchpad, touch screen, keyboard or stylus, and using different software to manipulate text, numbers, sound and images (AC9TDI2K01_E2)
			recognising and using hardware and software components of digital systems and experimenting with their functions, for example playing with interactive toys, robotic devices or interactive assistants (hardware and software) and discussing the way somebody would use it and how such a system might work as a simple process (AC9TDI2K01_E3)
			recognising and using software components of digital systems and experimenting with their functions, for example exploring mapping software such as Google Earth to find familiar places (AC9TDI2K01_E4)
			recognising that a digital system follows instructions or commands, for example instructing robotic toys to perform a function such as a dance movement or following a planned path as a group activity (AC9TDI2K01_E5)
			constructing and explaining a model of a real or imaginary digital system or device, for example making and explaining the functions of a prototype machine with sensors to detect washed hands that is made from re-used paper and cardboard (AC9TDI2K01_E6)

	Data representation	represent data as pictures, symbols, numbers and words (AC9TDI2K02)	recognising that pictures in Aboriginal and Torres Strait Islander seasonal calendars are used to represent and communicate data, such as how the appearance of a flower can signify an unconnected event or a resource availability, for example how the Gulumoerrgin people understand that the fruiting of freshwater mangrove signifies it is time to harvest magpie geese (AC9TDI2K02_E1)
			sorting objects and events based on easily identified characteristics and visually representing the data, for example sorting class data such as types of pets owned or birthdates and presenting the patterns using visual means such as charts, images or symbols with digital tools (AC9TDI2K02_E2)
			representing patterns in different ways using materials, sounds, movements or drawing, for example locating examples of repeating patterns in art and making their own with stamps, paints or digital tools (AC9TDI2K02_E3)
Processes and production skills	Investigating and defining	investigate simple problems for known users that can be solved with digital systems (AC9TDI2P01)	investigating internet-based translation tools and how similar technologies could promote the use of Aboriginal and Torres Strait Islander languages or assist communications, for example in aged care facilities for Aboriginal and Torres Strait Islander peoples (AC9TDI2P01_E1)
			exploring how digital systems help us, for example investigating how drones are used to inform surf lifesavers of beach and surf conditions or how fire rescue services might use them during natural disasters (AC9TDI2P01_E2)
			identifying how digital systems are used to solve problems at school, for example how teachers monitor student attendance, late arrival or borrowing and tracking library books (AC9TDI2P01_E3)
			comparing an analog and a digital solution, for example discussing the benefits or disadvantages of school notes sent home by email or on paper (AC9TDI2P01_E4)
			investigating how a digital system might solve problems for specific users, for example an artificial intelligence that responds to voice commands to turn lights on or off in a home (AC9TDI2P01_E5)

	Generating and designing	follow and describe algorithms involving a sequence of steps, branching (decisions) and iteration (repetition) (AC9TDI2P02)	identifying and describing sequences of instructions that are commonly experienced, for example creating a flowchart to decide what clothing to wear on any given day using yes or no questions (branching) and some choices leading back to a previously asked question (repetition) until a final description of what to wear is reached (AC9TDI2P02_E1)
			rearranging into correct order a series of mixed-up pictures that describe a procedure, for example how to complete a gross motor course; or rewriting a procedural text into a correct sequence, for example a recipe (AC9TDI2P02_E2)
			experimenting with simple, step-by-step procedures, for example giving weaving or string making instructions to fellow students, following traditional techniques of Aboriginal and Torres Strait Islander Peoples (AC9TDI2P02_E3)
			recognising the similarities of mathematical processes to algorithms in digital systems, for example discussing multiplication as repeated addition (AC9TDI2P02_E4)
			following a sequence of instructions, for example following instructions to build a series of digital slides or screens with sequenced or linked text and pictures with appropriate and available software (AC9TDI2P02_E5)
			experimenting with simple, step-by-step procedures, for example providing instructions to fellow students or robotic devices to move in an intended way, such as following a path around the local community highlighting key cultural places of interest on a map (AC9TDI2P02_E6)
	Evaluating	discuss how existing digital systems satisfy known user needs (AC9TDI2P03)	discussing how interactive versions of Aboriginal and Torres Strait Islander-authored and published stories preserve important cultural expressions (AC9TDI2P03_E1)
			discussing how known digital systems are used to solve problems for a user, for example discussing if a computer or tablet is meeting the learning needs of a student (AC9TDI2P03_E2)
			discussing how a range of information systems support personal needs, for example text-to-speech software for people with vision loss (AC9TDI2P03_E3)

	Collaborating and managing	create and locate content and communicate with others using common tools and their basic functionality (AC9TDI2P04)	respecting Aboriginal and Torres Strait Islander cultures through agreed behaviours regarding cultural protocols, including relevant permissions and attributions avoiding deficit discourse (AC9TDI2P04_E1)
			creating a greeting card using own photographs taken with a digital device or royalty-free images located online or on a network, and using digital systems to make, store or send the finished product (AC9TDI2P04_E2)
		share information with known people following agreed behaviours, supervised by trusted adults (AC9TDI2P05)	recognising and discussing the need for online safety when sharing information, for example recognising that personal information such as a photo can be used for unwanted purposes (AC9TDI2P05_E1)
			participating in safe and secure online or networked spaces to share information, for example creating a factual slide deck about a plant or animal and sharing it with the class teacher (AC9TDI2P05_E2)
	Privacy and security	access their school account with a recorded username and password to access their own information (AC9TDI2P06)	using a private prompt card to type their login details and password into a digital device (AC9TDI2P06_E1)
			practising finding the appropriate keys to use to type their username and password, for example using a laminated keyboard image to find the letters and numbers in their username and password (AC9TDI2P06_E2)
		discuss that some websites and apps store their personal data online (AC9TDI2P07)	sharing experiences of what might be viewed when exploring apps and websites, for example a pop-up ad asking you to enter a competition or an app that requires you to 'sign up' before using it (AC9TDI2P07_E1)
			discussing the importance of asking permission from a parent or caregiver before entering personal details online such as address, phone number and date of birth (AC9TDI2P07_E2)

Years 3 and 4

Band level description

By the end of Year 4 students will have had opportunities to create a range of digital solutions such as interactive adventures that involve user choice, models of simplified real-world systems and simple guessing games. In Years 3 and 4 students focus on further developing understanding and skills in computational thinking, such as categorising and outlining procedures; and developing an increasing awareness of how digital systems are used and could be used at home, in school and the local community. Students explore components of digital systems, and peripherals such as digital microscopes. They develop an understanding of the characteristics of data and its representation. Using the concept of abstraction, students define simple problems using techniques such as summarising facts to deduce conclusions.

They record simple solutions to problems through text and diagrams and develop their designing skills from initially following prepared algorithms to later describing their own algorithms that support branching (choice of options), iteration (repetition) and user input. The student solutions are implemented using appropriate software including visual programming languages that use graphical elements rather than text instructions.

Students explain, in general terms, how their solutions meet specific needs and consider how society may use digital systems to meet needs in environmentally sustainable ways. With teacher guidance, students identify and list the major steps needed to complete a task or project. When sharing ideas and communicating in online environments they develop an understanding of why it is important to consider the feelings of their audiences and apply safe and secure practices agreed by the class that demonstrate respectful behaviour.

Digital Technologies achievement standard

By the end of Year 4 students use computational thinking to create scaffolded digital solutions. They recognise different types of data and identify how they are transmitted by digital systems. They use passphrases and agreed behaviours to safely access and explore digital systems, tools and online or networked environments independently and with others. They define problems and identify opportunities, then design and implement solutions using algorithms and visual programming that involve decision-making, repetition and user input. Students evaluate their solutions against design criteria.

Technologies learning area achievement standard*

By the end of Year 4 students describe how people design products, services and environments to meet the needs of people, including sustainability, and use computational thinking to create scaffolded digital solutions. They recognise different types of data and identify how they are transmitted by digital systems. For each of the two prescribed technologies contexts they describe the features of technologies and create designed solutions. Students evaluate ideas against identified criteria for success. They define problems and identify opportunities, then design and implement solutions using algorithms and

visual programming that involve decision-making, repetition and user input. Students use models and drawings including annotations and symbols to plan, sequence and communicate major steps in design and production. They use technologies and techniques to safely produce solutions. Students use passphrases and agreed behaviours to safely access and explore digital systems, tools and online or networked environments independently and with others.

* 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	explore and describe a range of digital systems and their peripherals for a variety of purposes (AC9TDI4K01)	describing and comparing how terrestrial and satellite systems transmit television, including advantages and limitations of these systems, for example how television is transmitted to remote Aboriginal and Torres Strait Islander communities via satellite such as Milikapiti in the Tiwi Islands, and how heavy rain can interfere with signals when viewing television (AC9TDI4K01_E1)
			experimenting with different types of digital system components and peripherals to perform input, output and storage functions, for example a keyboard, stylus, touch screen, joystick, camera and microphone; a monitor, printer, 3D printer, digital microscope projector, tablet screen and speaker (AC9TDI4K01_E2)
			exploring how we use systems differently depending on the requirements of the task, recognising that many systems can perform multiple tasks, for example a student can use a tablet to take photos, record sound and find information to create a presentation (AC9TDI4K01_E3)
		explore transmitting different types of data between digital systems (AC9TDI4K02)	exploring how many remote Aboriginal and Torres Strait Islander communities rely on 3G network coverage for communications, and how the limitations of these systems do not allow for the exploitation of video conferencing capabilities that metropolitan areas benefit from (AC9TDI4K02_E1)
			exploring how data (video call) can be transmitted from a remote community to a city location (AC9TDI4K02_E2)

			showing that images and music can be transferred from a mobile device to a computer with cables or by utilising bluetooth to share between devices, for example using a cable to connect a camera and computer to upload images or sharing the images directly to the computer via bluetooth (AC9TDI4K02_E3)
			explaining that some file formats are more appropriate depending on purpose and software compatibility, for example a small-sized video may transfer faster than a large one, some software may not be compatible with certain file formats or devices (AC9TDI4K02_E4)
			using specific peripherals to capture different types of data, for example using a digital microscope or a 3D generator software to capture images of living and non-living things, using a micro sensor to measure classroom noise level or soil moisture levels in the school garden (AC9TDI4K02_E5)
	Data representation	recognise different types of data and explore how the same data can be represented differently depending on the purpose (AC9TDI4K03)	identifying petroglyphs and other cultural expressions to understand that images are used to encode and represent ethnobotanical knowledge, for example representation of plant use in the Kimberley rock art holds important data on medicinal and food plant classification and their usable parts (AC9TDI4K03_E1)
			explaining that the same information can be represented differently, for example the term ‘stop’ can also be represented with an octagon-shaped red sign and a hand icon; or explaining that the numeral ‘2’ or tally marks || or the word ‘two’ all represent the same data (AC9TDI4K03_E2)
			recognising that numbers, text, images, sounds, animations and videos are all forms of data when stored in or viewed using a digital system (AC9TDI4K03_E3)
Processes and production skills	Investigating and defining	define problems with given design criteria and by co-creating user stories (AC9TDI4P01)	exploring how Aboriginal and Torres Strait Islander rangers collect and manage information on native animals, for example how they conduct surveys using global positioning system solutions for monitoring local marine turtle populations (AC9TDI4P01_E1)
			defining the design criteria by summarising the problem so that some features of the problem can be outlined, for example what need is associated with the problem, who are the stakeholders and why do they have this problem? (AC9TDI4P01_E2)

			co-creating a user story using a template such as 'A <type of user> has <some goal> so that <some reason>', for example, 'Our soccer team wants to access results on the web so that we can see our progress' (AC9TDI4P01_E3)
	Generating and designing	follow and describe algorithms involving sequencing, comparison operators (branching), and iteration (AC9TDI4P02)	recognising that sequence of instructions or events can include comparison operators, for example if the temperature is greater than 25 degrees put the fan on and if the temperature is below 18 degrees turn the fan off (AC9TDI4P02_E1)
			designing and documenting a sequence of steps for responding to at-risk wildlife, such as considering how Aboriginal and Torres Strait Islander ranger groups monitor and protect sea turtles, for example the Bulgul rangers who work on the Cox Peninsula in the Northern Territory, responding to monitoring data on the vulnerable flatback turtle to protect them from visitor and predator interactions (AC9TDI4P02_E2)
			following algorithms in everyday activities, such as recognising that a set of rules in a game is an algorithm that controls decisions and actions including repeating actions, for example in Simon Says, with an IF structure: IF the instruction is preceded by the words 'Simon says', follow the instruction, ELSE don't; or when playing UNO®, deal each player a card until the number of cards is seven (REPEAT, deal cards until each has seven) (AC9TDI4P02_E3)
		generate, communicate and compare designs (AC9TDI4P03)	exploring information systems that suit particular home or personal needs, for example using speech recognition software that can help speakers whose language background is not English, or a system to monitor energy or water consumption in the home (AC9TDI4P03_E1)
	Producing and implementing	implement simple algorithms as visual programs involving control structures,	implementing a program that demonstrates the strict routines and techniques followed by Aboriginal and Torres Strait Islander ranger groups when providing care or handling specific native animals, for example using IF and THEN statements to create a training manual, such as: IF <insert animal name> is injured THEN the ranger will <insert action> (AC9TDI4P04_E1)

		variables and user input (AC9TDI4P04)	implementing a program that includes control structures, for example the use of branching dependent on a condition being met such as whether a button or key has been pressed, and iteration (repetition) such as how many attempts have been made in a guessing game (AC9TDI4P04_E2)
			programming for choices in a given algorithm, for example capturing a user's name to a variable, implementing a branching mechanism based on whether the user has given a correct answer and displaying or speaking: '<Name>, you are correct/incorrect' (AC9TDI4P04_E3)
	Evaluating	discuss how existing and student solutions satisfy the design criteria and user stories (AC9TDI4P05)	imagining and considering alternative uses and opportunities for digital tools used in the classroom, for example visiting a virtual museum and being able to experience artefacts (AC9TDI4P05_E1)
			evaluating whether a solution has met the design criteria and the requirements outlined in the user story (user story example: 'A <type of user> has <some goal> so that <some reason>', for example, 'Our soccer team wants to access results on the web so that we can see our progress') is the user able to access the progress of the soccer team on the web easily? (AC9TDI4P05_E2)
	Collaborating and managing	create, locate and edit content and communicate with others selecting and using common tools and their core functionality and following agreed conventions to name files (AC9TDI4P06)	building a collaborative word processor to document the progress and operation of a group digital project (AC9TDI4P06_E1)
			complying with agreed conventions, for example file naming (AC9TDI4P06_E2)
		share information and collaborate with others demonstrating agreed behaviours, guided by	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 (AC9TDI4P07_E1)

		trusted adults (AC9TDI4P07)	exploring digital tools that suit particular personal or group needs, for example the use of online mind maps to plan and create ideas, collaborative document systems to communicate, or language translation software that can help those who need translation (AC9TDI4P07_E2)
			investigating how digital tools are used in communities to meet needs, for example jointly creating an anonymous class survey to help plan an end-of-year party, where questions and answers conform to the agreed behavioural expectation (AC9TDI4P07_E3)
	Privacy and security	access their school account using a memorised password and explain why it should be easy to remember, but hard for others to guess (AC9TDI4P08)	investigating the current advice of password choice being long passphrases rather than a complex combination of text and symbols (AC9TDI4P08_E1)
			playing a guessing game with students using clues to see if they can guess simple passwords, for example, 20 questions, and discuss what could be done to make the passwords hard to guess but easy to remember for the user (AC9TDI4P08_E2)
			exploring strategies to assist with memorisation of password such as using the first letter of words in a nursery rhyme or song, a place and a favourite number, for example, 'Little Jack Horner sat in a corner' + ''in Brisbane' + 6' = LJHsiaciB6 (AC9TDI4P08_E3)
		identify what personal data is stored and shared in their online accounts and discuss any associated risks (AC9TDI4P09)	identifying types of personal data that can be stored or collected when creating an online account or posting online, for example posting a picture online may store the location where the image was taken (AC9TDI4P09_E1)
			looking at photographs of students (or fictional characters) and identifying which features might give away a person's location such as school uniform or recognisable landmark and comparing photos to rank them by degree of difficulty to determine location (AC9TDI4P09_E2)
			discussing the use of nicknames and why these are important when playing online games (AC9TDI4P09_E3)

Years 5 and 6

Band level description

By the end of Year 6 students will have had opportunities to create a range of digital solutions, such as games or quizzes and interactive stories and animations. Students focus on further developing understanding and skills in computational thinking such as identifying similarities in different problems and describing minor components of complex systems. They also focus on the sustainability of information systems for current and future uses.

Students develop an understanding of the role individual components of digital systems play in the processing and representation of data. They are introduced to the concept of data states in digital systems and how data is transferred between systems. They learn to further develop abstractions by identifying common elements across similar problems and systems and develop an understanding of the relationship between models and the real-world systems they represent. When creating digital solutions, students define problems clearly by identifying appropriate data and other requirements.

When designing, they consider how users will interact with the solutions, and check and validate their designs to increase the likelihood of creating working solutions. Students increase the sophistication of their algorithms by identifying branching (decisions), repetition and incorporate repeat instructions or structures when implementing their solutions through visual programming, such as reading user input until an answer is guessed correctly in a quiz. They evaluate their solutions and examine the sustainability of their own and existing information systems.

Students identify and list the major steps needed to complete a task or project. When engaging with others, they take personal and physical safety into account, applying social and ethical protocols that acknowledge factors such as social differences and privacy of personal information. They also develop their skills in applying security protocols such as devising file naming conventions that are meaningful and determining safe storage locations to protect data and information.

Digital Technologies achievement standard

By the end of Year 6 students use computational thinking to create digital solutions. They understand and describe how data is represented and transmitted. Students understand how behaviours and ethics help protect data and describe what effect supplied data can have on their digital footprint. They design digital solutions based on user stories by developing algorithms to address problems or opportunities and implement them as visual programs that involve decision-making, repetition and user input. Students evaluate ideas and solutions against design criteria, using their knowledge of digital systems to communicate ideas to an audience.

Technologies learning area achievement standard*

By the end of Year 6 students describe how people design products, services and environments to meet the needs and opportunities of communities, including sustainability. For each of the three prescribed technologies contexts students explain how the features of technologies impact on design decisions and they create designed solutions. They use computational thinking to design and create digital solutions by developing algorithms to address problems or opportunities and implement them as visual programs. They evaluate ideas and solutions against criteria for success. Students use technical terms and graphical representation techniques to communicate ideas to an audience. They record project plans including production processes and select appropriate technologies and techniques to safely produce designed solutions. Students understand and describe how data is transmitted, how behaviours and ethics help protect data and describe what effect supplied data can have on 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	investigate the main internal components of common digital systems and their function (AC9TDI6K01)	investigating the main components in a video conferencing system and their function, for example a telehealth system used by Aboriginal and Torres Strait Islander communities to access ultrasound and other imagery services (AC9TDI6K01_E1)
			examining the use of 2-way radio communications or satellite phones to assist in communications when outside of a mobile phone service area (AC9TDI6K01_E2)
			describing the different functions of the internal components of digital systems, for example internal processing components including the central processing unit that may use artificial intelligence to process data such as facial or speech recognition (AC9TDI6K01_E3)
			investigating how specific digital systems work, for example using images of real-world objects and blending with computer-generated information to construct an augmented reality (AC9TDI6K01_E4)

		examine how digital systems form networks to transmit data (AC9TDI6K02)	investigating the use of satellite phones in remote and very remote Aboriginal and Torres Strait Islander homelands or outstations where mobile phone networks are either not available, accessible or reliable, for example many homeland communities of Arnhem Land, located in the north-eastern corner of the Northern Territory around 500 kilometres from the capital city, Darwin, have limited access to mainstream communication networks (AC9TDI6K02_E1)
			explaining how data may be transmitted between two digital systems in different ways, for example using wired networks to transfer data from one digital system to another, and radio waves to transmit data in wireless or mobile networks (AC9TDI6K02_E2)
			investigating how the internal and external components of digital systems are coordinated to handle data, for example how a keyboard, central processing unit and screen work together to accept, manipulate and present data and information (AC9TDI6K02_E3)
	Data representation	explain how digital systems represent all data using numbers (AC9TDI6K03)	recognising that digital systems rely on two states only: on and off (referring to electrical states) and that this requires every number to be converted to binary (AC9TDI6K03_E1)
		explore how data can be represented by off and on states (zeros and ones in binary) (AC9TDI6K04)	collaboratively making a long thread with beads representing binary for the letters that spell the country name in both English and local language, and could be hung as a 'binary banner' as an Acknowledgement of Country or Welcome to Country that we are on the traditional lands of the <insert name> Peoples (AC9TDI6K04_E1)
			recognising that the numbers 0, 1, 2 and 3 could be represented by the patterns of two binary digits: 00, 01, 10 and 11 (AC9TDI6K04_E2)
			investigating electrical circuits to see that a switch can only exist in one of two states: open or closed; and recognising that in the off state, a switch appears as a gap in the circuit (AC9TDI6K04_E3)

Processes and production skills	Investigating and defining	define problems using given or co-developed design criteria and by creating user stories (AC9TDI6P01)	investigating how Aboriginal land management corporations manage feral animals in Arnhem Land and Cape York Peninsula, for example how buffalo and cattle can be tracked and how this information is used to create economic development opportunities and reduce the impact on native flora and fauna (AC9TDI6P01_E1)
			identifying how the functions of one type of information system could be applied in a new way to meet a community or national need, for example documenting and recording cultural stories using animations (AC9TDI6P01_E2)
			defining the design criteria by summarising a problem so that aspects of the problem can be identified, for example what need is associated with the problem, who are the stakeholders, why do they have this problem (AC9TDI6P01_E3)
			checking existing solutions to identify designs that are transferable to new but similar digital solutions, for example sharing a visual program that takes an English word as input, speaks it, and translates it to another language and speaks the translated word (AC9TDI6P01_E4)
			co-creating a user story using a template such as ‘As a <type of user>, I want <some goal> so that <some reason>’, for example, ‘As a parent, I want to access my child’s progress so that I can help them with their learning’ (AC9TDI6P01_E5)
	Generating and designing	design algorithms involving multiple alternatives (branching) and iteration (AC9TDI6P02)	designing an algorithm including branching and iteration which responds to data, for example how Aboriginal and Torres Strait Islander rangers use structured procedures to respond to live tracking data that indicates feral buffalo are approaching an environmentally or culturally significant site (AC9TDI6P02_E1)
			experimenting with different ways of representing an instruction to make a choice, for example branches in a tree diagram with an ‘IF’ statement (a common statement used to branch) to indicate making a choice between different circumstances using a spreadsheet or a visual program (AC9TDI6P02_E2)
			experimenting with different ways of representing an instruction to make a repetition, for example loops in a flowchart diagram with a ‘REPEAT’ statement (AC9TDI6P02_E3)

		designing the instructions for a robot, for example a robot vacuum cleaner to clean a room considering when it will need alternatives and when it may need to repeat an action (AC9TDI6P02_E4)
	design a user interface for a digital system (AC9TDI6P03)	exploring different features of user interfaces that allow people from different cultures to access information irrespective of language background, for example the use of consistently placed, self-evident icons (AC9TDI6P03_E1)
		designing the user interface of a solution using different design tools, for example using a storyboard to outline the stages of a game or a mock-up to show the placement of icons (AC9TDI6P03_E2)
		investigating characteristics of a user interface that is common for particular types of problems, for example when using a touch screen many people respond more intuitively than when using a keyboard or stylus, and the consistent placement of symbols helps with performing actions that require speed, such as in games (AC9TDI6P03_E3)
		applying the principles and elements of design to a set of requirements to produce a user interface for a system that addresses an identified need, for example a user who is visually impaired might need larger text and customisable colour contrasts (AC9TDI6P03_E4)
	generate, modify, communicate and evaluate designs (AC9TDI6P04)	imagining how the functioning of one type of information system could be applied in a new way to meet a community or national need, for example considering how an electronic tracking system such as a global positioning system could be used to find people who are lost (AC9TDI6P04_E1)
		following, modifying and describing the design of a game involving simple algorithms represented diagrammatically or in English, for example creating a flowchart with software that uses symbols to show decisions, processes, and inputs and outputs (AC9TDI6P04_E2)

	Producing and implementing	implement algorithms as visual programs involving control structures, variables and user input (AC9TDI6P05)	programming digital systems to perform automated tasks, such as closing gates, for example simulating the work of Aboriginal and Torres Strait Islander rangers attempting to lure and capture feral animals (AC9TDI6P05_E1)
			implementing a program that includes control structures such as branching (dependent on multiple alternatives) and iteration (repeating until all questions have been asked or answered), and uses variables (to store the cumulative score), for example building a simple, interactive quiz that allocates points based on a set number of correct user responses where each point gained adds to a total score (AC9TDI6P05_E2)
			experimenting with different ways of instructing to make choices and repeat instructions, for example using IF statements to allow for making choices and iterations (repeat instructions) until a goal is achieved (AC9TDI6P05_E3)
	Evaluating	evaluate existing and student solutions against the design criteria and user stories and their broader community impact (AC9TDI6P06)	using the safety by design principles from the eSafety Commissioner, for example evaluating existing information systems and how these could benefit from newly designed solutions (AC9TDI6P06_E1)
			exploring and critiquing digital solutions actively used by peers, for example eSport across South-East Asia, identifying key influencers, stakeholders, success and economic factors (AC9TDI6P06_E2)
			evaluating digital solutions used by remote communities, for example online banking systems where internet bandwidth is poor or unreliable, or digital literacies or fluency in English are low (AC9TDI6P06_E3)
	Collaborating and managing	create, locate and edit content for, and communicate with, a specific audience, selecting appropriate tools fand using their advanced functionality	investigating the possible ethical and social outcomes of a given project, for example exploring the positive and negative impacts of a school's social media presence on all stakeholders (AC9TDI6P07_E1)
			creating content for a school celebration, for example designing a collaborative spreadsheet that can be used by a class to plan and cost their graduation party, together with a folder of tagged resources which support the planning (AC9TDI6P07_E2)

		and storage conventions (AC9TDI6P07)	recognising the need for and compliance with agreed conventions, for example file naming, storage location and formatting guidelines such as file extension (AC9TDI6P07_E3)
		share information, plan and collaborate with others demonstrating ethical and agreed behaviours, supported by trusted adults (AC9TDI6P08)	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 (AC9TDI6P08_E1)
			using a range of communication tools to share ideas and information, for example participating in collaborative online environments (AC9TDI6P08_E2)
			using digital systems to share web-based information taking into consideration referencing conventions, for example creating a blog, website or online learning space for sharing ideas (AC9TDI6P08_E3)
	Privacy and security	access multiple personal accounts using unique passphrases and explain the risks of password re-use (AC9TDI6P09)	discussing strategies to create a series of passphrases that can be remembered and used for different platforms, for example making words by mixing letters, numbers and characters such as 5ept3mber!, 0cto8er*, @N0v3mber, D3cember? (AC9TDI6P09_E1)
			discussing the outcome of a series of fictional scenarios if re-using passwords, for example if Child A re-used a password on many sites and child B discovered their password for one site, what could happen to Child A's personal information? (AC9TDI6P09_E2)
		explain the creation and permanence of their digital footprint and consider privacy when collecting user data (AC9TDI6P10)	creating communication strategies that promote positive actions and behaviour when engaging with others online, and using these strategies to show respect for self and others, for example seeking permission from others before posting photos online, responding respectfully to other people's opinions even if they are different from personal opinions (AC9TDI6P10_E1)
			using respectful language when online and recognising that many popular applications record all voice and text interactions, and these cannot be easily retracted (AC9TDI6P10_E2)

	explaining how our digital footprint is linked to our offline reputation, for example posting inappropriate content affects real people and might have lasting consequences on your own reputation (AC9TDI6P10_E3)