Australian Curriculum - Technologies: Digital Technologies - Strands with Elaborations

PROGRESSION IS HIGHLIGHTED IN THE FOLLOWING DOCUMENT VIA **BOLDED** TEXT.

General Capabilities

Literacy	Numeracy	ICT capability	Critical and creative thinking	Personal and social capability	Ethical understanding	Intercultural understanding

Cross-curriculum priorities

Aboriginal and Torres Strait Islander histories and cultures	Asia and Australia's engagement with Asia	Sustainability

Sourced from 'Key ideas in the Technologies curriculum'

acara AUSTRALIAN CURRICULUM, ASSESSMENT AND REPORTING AUTHORITY

Overarching ideas

(i) Creating preferred futures

The Technologies curriculum provides students with opportunities to consider how solutions that are created now will be used in the future. Students will identify the possible benefits and risks of creating solutions. They will use critical and creative thinking to weigh up possible short and long term impacts.

As students progress through the Technologies curriculum, they will begin to identify possible and probable futures, and their preferences for the future. They develop solutions to meet needs considering impacts on liveability, economic prosperity and environmental sustainability. Students will learn to recognise that views about the priority of the benefits and risks will vary and that preferred futures are contested.

(ii) Project management

Students will develop skills to manage projects to successful completion through planning, organising and monitoring timelines, activities and the use of resources. This includes considering resources and constraints to develop resource, finance, work and time plans; assessing and managing risks; making decisions; controlling quality; evaluating processes and collaborating and communicating with others at different stages of the process.
Students are taught to plan for sustainable use of resources when managing projects and take into account ethical, health and safety considerations and personal and social beliefs and values.

Thinking in Technologies

(i) Systems thinking

A system is an organised group of related objects or components that form a whole. Systems thinking is a holistic approach to the identification and solving of problems where the focal points are treated as components of a system, and their interactions and interrelationships are analysed individually to see how they influence the functioning of the entire system.

In Design and Technologies the success of designed solutions includes the generation of ideas and decisions made throughout design processes. It requires students to understand systems and work with complexity, uncertainty and risk. Students recognise the connectedness of and interactions between people, places and events in local and wider world contexts and consider the impact their designs and actions have in a connected world.

Participating in and shaping the future of information and digital systems is an integral part of learning in Digital Technologies. Understanding the complexity of systems and the interdependence of components is necessary to create timely solutions to technical, economic and social problems. Implementation of digital solutions often has consequences for the people who use and engage with the system, and may introduce unintended costs or benefits that impact the present or future society.

(ii) Design thinking

Design thinking involves the use of strategies for understanding design needs and opportunities, visualising and generating creative and innovative ideas, planning, and analysing and evaluating those ideas that best meet the criteria for success.
Design thinking underpins learning in Design and Technologies. Design processes require students to identify and investigate a need or opportunity; generate, plan and realise designed solutions; and evaluate products and processes. Consideration of economic, environmental and social impacts that result from designed solutions are core to design thinking, design processes and Design and Technologies.

When developing solutions in Digital Technologies, students explore, analyse and develop ideas based on data, inputs and human interactions. When students design a solution to a problem they consider how users will be presented with data, the degree of interaction with that data and the various types of computational processing. For example, designing a maze; writing precise and accurate sequences of instructions to move a robot through the maze or testing the program and modifying the solution.

(iii) Computational thinking

Computational thinking is a problem-solving method that is applied to create solutions that can be implemented using digital technologies. It involves integrating strategies, such as organising data logically, breaking down problems into parts, interpreting patterns and models and designing and implementing algorithms.

Computational thinking is used when specifying and implementing algorithmic solutions to problems in Digital Technologies. For a computer to be able to process data through a series of logical and ordered steps, students must be able to take an abstract idea and break it down into defined, simple tasks that produce an outcome. This may include analysing trends in data, responding to user input under certain preconditions or predicting the outcome of a simulation.

This type of thinking is used in Design and Technologies during different phases of a design process when computation is needed to quantify data and solve problems. Examples include when calculating costs, testing materials and components, comparing performance, or modelling trends.

STRANDS

'....The Australian Curriculum: Digital Technologies (F–10) comprises two related strands:
(i) Digital Technologies knowledge and understanding – the information system components of data, and digital systems (hardware, software and networks)
(ii) Digital Technologies processes and production skills – using digital systems to create data and information, and to define, design and implement digital solutions, and evaluate these solutions and existing information systems against specified criteria,...'

Relationship between the strands

'....Together, the two strands provide students with knowledge, understanding and skills through which they can safely and ethically exploit 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, as content in processes and production skills frequently draws on understanding of concepts in the knowledge and understanding strand. For more information see Learning in Digital Technologies,...'

'....Teachers can select technologies-specific content from the *Knowledge and understanding* strand and students can apply skills from the *Processes and production skills* strand to that content.
The common strand structure provides an opportunity to highlight similarities across the two subjects that will facilitate integrated approaches to teaching,...'

'....In Digital Technologies students are actively engaged in the process of defining problems and opportunities, designing, implementing and evaluating digital solutions, and creating and sharing information that meets a range of current and future needs. These solutions and information are created through the application of computational and design thinking, and technical skills. The key concepts are progressively developed through the bands as presented in the scope and sequence chart. The sophistication of the key concepts and the technical skills progressively increase and are based on the foundational knowledge, understanding and skills gained in earlier bands.

Teaching and learning programs will typically integrate content from each strand and focus on a digital technologies application in a unit of work. For example, interactive multimedia production, game development, robotic and automated systems, interactive website development, data management systems, application development, artificial intelligence, simulation and modelling, and networking systems. An application would not need to cover all content descriptions and therefore a range of contexts may be included over a band. When planning teaching and learning programs teachers should also consider the relationship between each of the curriculum components (band descriptions, content descriptions, elaborations and achievement standards) and how they contribute to the development of coherent programs,...'

Integrating content from the strands

'....Content from the *Processes and production skills* strand frequently draws on understanding of concepts in the *Knowledge and understanding* strand. For example, learning to acquire, interpret, manipulate, store and communicate data and information to meet a range of purposes (processes and production skills) involves an understanding of the representation of data, the basis for creating solutions (knowledge and understanding); learning to select and use the most appropriate digital systems for specific tasks with consideration of users and interface (processes and production skills) draws on knowledge of the capabilities and capacities of digital systems (knowledge and understanding).

These strands are also integrated when students undertake projects. For example, when defining, designing, implementing and evaluating a game solution, students will need an understanding of how data are represented in digital systems, how data will be input by the user and how they will be transmitted within the digital system. They draw on this knowledge when stating what is required of the solution (defining), designing the game's interface and instructions, implementing the solution using specific software functions and items of hardware, where appropriate, and then evaluating it against the stated needs,...'

Creating digital solutions and problem-solving

'....Students use their knowledge and understanding of data and digital systems to apply processes and production skills as they create digital solutions. Students apply the four-stage process of defining, designing, implementing and evaluating when individually or collaboratively managing projects to create digital solutions. As problems become more complex, and solutions more sophisticated, it becomes increasingly necessary to develop skills in abstraction. Solutions may be developed using combinations of readily available hardware and software applications, and/or specific instructions provided through programming.

Students will also engage in learning activities that do not require the full use of the process. For example, in the early years students will experiment with different ways of using digital systems to capture and present data; they will explore alternative sets of instructions through guided play when writing simple sequences of steps. This means there is greater flexibility about when different content descriptions are introduced into the learning program. It may, for example, be appropriate to sequence the content descriptions relating to data to complement student learning in Science and Mathematics.

In the later years students could start developing a website by using an existing website template and adding some interactive components or connection with data structures without engaging in the design stage (only implementation of the solution). However, as project work is introduced it makes sense to incorporate all the content descriptions related to the four-stage process, increasing the breadth or depth of coverage over the band period through different projects,...'

Factors influencing design decisions

'....When students are problem-solving and creating and communicating information, they will apply skills and protocols to meet their legal, safety, cultural and ethical obligations and responsibilities. For example, protocols such as using acceptable language, acknowledging different cultural practices, and using passwords and privacy settings on social media sites are applied to increase the security of personal data and to respect participants in online environments. In Digital Technologies students develop understanding of the characteristics of, and the relationship between, the components of information systems (people, data, processes and digital systems) in authentic situations. Students apply systems thinking as they progress from identifying how information systems are used in familiar settings, to evaluating how well these systems meet current and future sustainability needs, to suggesting innovative ways that information systems can be used to transform lives and society,...'

Managing projects and collaboration

'....In Digital Technologies, students progress from managing the independent creation of ideas and information to managing collaborative projects in online environments. Managing the independent creation of ideas and information involves activities such as acquiring and checking data, considering and applying appropriate social and technical protocols, and selecting appropriate hardware and software. Managing projects involves identifying and sequencing tasks, determining the required resources (data and digital systems), considering economic, environmental and social factors and allocating the time to each task so that the project is completed on time.

Collaborative projects are more complex as tasks need to be allocated to different team members, priorities set (what task is dependent on the completion of another), strategies for monitoring progress determined and a file management system established so that file types and versions are clearly identified. In the later years students also apply an iterative process for managing projects by constantly reviewing and revisiting steps rather than following a lock-step project plan. Throughout collaborative projects the team will manage the security and organisation of their data and information and regulate their social behaviour,...'

Types of digital solutions

'....Across each band students will create digital solutions that will use data, require interactions with users and within systems, and will have impacts on people, the economy and environments. Solutions may be developed using combinations of readily available hardware and software applications, and/or specific instructions provided through programming. Some examples of solutions are instructions for a robot, an adventure game, products featuring interactive multimedia including digital stories, animations and websites,...'

Managing projects and collaboration

'....In Digital Technologies students are actively engaged in the process of defining problems and opportunities, designing, implementing and evaluating digital solutions, and creating and sharing information that meets a range of current and future needs. These solutions and information are created through the application of computational and design thinking, and technical skills. The key concepts are progressively developed through the bands as presented in the scope and sequence chart. The sophistication of the key concepts and the technical skills progressively increase and are based on the foundational knowledge, understanding and skills gained in earlier bands,...'

Digital Technologies knowledge and understanding

This strand focuses on developing the underpinning knowledge and understanding of information systems: digital systems and representation of data.

(i) Digital systems: The digital systems content descriptions focus 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 are transmitted between components within a system, and how the hardware and software interact to form networks.

(ii) Representation of data: The representation of data content descriptions focus on how data are represented and structured symbolically for use by digital systems. Different types of data are studied in the bands including text, numeric, images (still and moving) and sound from Foundation – Year 8 and then categorical and relational data in Year 9 and 10.

Design and Technologies processes and production skills – the skills needed to create designed solutions.

This strand focuses on developing skills to create digital solutions to problems and opportunities. The Digital Technologies processes and production skills strand focuses on:
(i) collecting, managing and analysing data, which involves the nature and properties of data, how they are collected and interpreted using a range of digital systems and peripheral devices and interpreting data when creating information
(ii) defining problems and designing digital solutions (Foundation – Year 2), which develops into defining problems and designing, implementing and evaluating solutions that have been developed by students, and evaluating how well existing information systems meet different needs (Year 3 – 10)
(iii) communicating ideas and information (Foundation – Year 4), which develops into managing, creating and communicating ideas and information (Year 5 – 6) through to independently and collaboratively managing projects to create interactive solutions (Year 7 – 10). This involves creating and communicating information, especially online by creating websites, and interacting safely using appropriate technical and social protocols.
These require skills in using digital systems; critical and creative thinking including systems, design and computational thinking.
a) Computational Thinking
b) Abstraction
c) Data collection, representation and interpretation
d) Specification, algorithms and implementation
e) Digital systems
f) Interactions and impacts

Bands of Year Levels Indicators	BAND DESCRIPTIONS	Content Descriptor	Elaborations	Content Descriptor	Elaborations	Content Descriptor	Elaborations	Content Descriptor	Elaborations	Content Descriptor	Elaborations
Foundation to Year 2	**Foundation to Year 2** Learning in Digital Technologies builds on concepts, skills and processes developed in the Early Years Learning Framework. It focuses on developing foundational skills in computational thinking and an awareness of personal experiences using digital systems. By the end of Year 2, students will have had opportunities to create a range of digital solutions through guided play and integrated learning, such as using robotic toys to navigate a map or recording science data with software applications. In Foundation – Year 2, students begin to learn about common digital systems and patterns that exist within data they collect. Students organise, manipulate and present this data, including numerical, categorical, text, image, audio and video data, incorrelative ways to create meaning. Students use the concept of abstraction when defining problems, to identify the most important information, such as the significant steps involved in making a sandwich. They begin to develop their design skills by conceptualising algorithms as a sequence of steps for carrying out instructions, such as identifying steps in a process or controlling robotic devices. Students describe how information systems meet information, communication and/or recreational needs. Through discussion with teachers, students learn to apply safe and ethical practices to protect themselves and others as they interact online for learning and communicating. acara	Identify, use and explore digital systems (hardware and software components) for a purpose (ACTDIK001)	* Playing with and using different digital systems for transferring and capturing data, for example using a tablet to take a photograph of a grandparent and recording an interview with them about life in the past * Exploring and using digital systems for downloading and storing information, for example knowing how to download images from a website and inserting them into a document; saving and retrieving data * Exploring and identifying hardware and 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, touch pad, touch screen, keyboard, stylus, or switch scanning device, and using different software to manipulate text, numbers, sound and images * Recognising and using hardware and software components of digital systems and experimenting with their functions, for example playing with interactive toys and robotic devices to determine which ones can work with other devices * Recognising that a digital system follows instructions or commands, for example instructing robotic toys to perform a function such as a movement * Constructing a model of a real or imaginary digital systems device for use in role-play scenarios and explaining the features of the device to an adult	Collect, explore and sort data, and use digital systems to present the data creatively (ACTDIP003)	* Collecting, and sorting data through play, for example collecting data about favourite toys and sorting them into categories such as toys they like or dislike * Locating and purposefully using visual or text data, for example searching through a digital photo library to select an image, taking into account cultural considerations such as awareness of appropriate use of images and audio recordings of deceased persons * Exploring, imagining and comparing the usefulness of different data displays, for example jointly creating simple column graphs and picture graphs to represent different types of items * Exploring and creating graphs to represent classroom data, for example collecting data on the country of birth of each student and presenting the results as a picture graph * Using digital systems to organise data to improve meaning, for example using word processing software to create a list of tasks or visualisation software to create a mind map (diagram) showing relationships between characters in a story * Using common software to present data creatively, for example as a slideshow, movie, sounds, image, chart, word art, poster or drawing	Follow, describe and represent a sequence of steps and decisions (algorithms) needed to solve simple problems (ACTDIP004)	* Experimenting with simple, step-by-step procedures to explore programmable devices, for example providing instructions to physical or virtual objects or robotic devices to move in an intended manner, such as following a path around the classroom * Writing and entering a simple set of instructions for sequencing events and directions, for example scanning personal photographs and collating and ordering significant personal events or milestones and describing the steps involved in the process * Presenting a sequence of instructions or events in a series of slides or screens with text and pictures * Recognising sequences of instructions or events that are commonly experienced such as the sequence of traffic lights or instructions for recording a TV show or how their lunch order is taken and delivered * Following a series of instructions to use a piece of hardware or software, for example taking a photograph, editing and storing it to include in a slideshow presentation	Explore how people safely use common information systems to meet information, communication and recreation needs (ACTDIP005)	* Sharing and describing ways that common information systems can be used to meet communication needs, for example computers can be used as phones and social networking tools allowing communication between families living in different regions * Recognising and discussing the need for cyber-safety when using online information systems, for example recognising that shared personal information can be used in a variety of ways such as to access personal data as a means of protecting identity * Recognising safe ergonomic practices when children are playing with information systems, for example recognising the need to take regular breaks to avoid eye strain and repetitive strain injuries * Discussing how a range of information systems support personal needs and impact on others, for example being able to speech software for people with vision loss * Sharing ideas about the ways information systems are being used by families and friends in everyday life, for example comparing current digital play equipment with play equipment of 20 years ago	Work with others to create and organise ideas and information using information systems safely, and share these with known people (ACTDIP006)	* Using different types of data to create information for sharing online, for example creating a multimedia class profile that includes a photo of each student, a personal audio recording and a written message * Planning and creating text, drawings and sound files to share online, for example jointly creating a photo story to illustrate a fable or fairy-tale from the Asia region or a local Aboriginal and Torres Strait Islander community story * Making ethical decisions when using images for public viewing and using the work of others, for example asking the question 'What is fair and just?' to compare images or access to activities and decide whether or not to publish * Participating in safe online environments, for example sharing ideas and information through intranets, messaging only to people they know, bookmarked websites and moderated online spaces
Foundation to Year 2 Achievement Standard	NOTE: The standards are not divided into Strands or Sub-strands in the Australian Curriculum documents. However, logic would dictate that the standards could be put into sub-strands, as demonstrated to the right. Sourced from 'Achievement standards': 'Achievement standards will be accompanied by portfolios of annotated student work samples that illustrate the expected learning and help teachers to make judgments about whether students have achieved the standard' acara	By the end of Year 2, students identify **how** common digital systems (hardware and software) are used to meet **specific** purposes.		They collect **familiar** data and display them **to convey meaning.**	Students **design** solutions to simple problems using a sequence of steps and decisions.						They create and organise ideas and information using information systems and share information in safe online environments
			They use digital systems to represent simple patterns in data in different ways.								

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Bands of Year Levels Indicators	BAND DESCRIPTIONS	KNOWLEDGE AND UNDERSTANDING							PROCESSES AND PRODUCTION SKILLS				
		Content Descriptor / Elaborations	Content Descriptor / Elaborations	Content Descriptor / Elaborations	Content Descriptor / Elaborations	Content Descriptor / Elaborations	Content Descriptor / Elaborations	Content Descriptor / Elaborations	Content Descriptor / Elaborations	Content Descriptor / Elaborations	Content Descriptor / Elaborations	Content Descriptor / Elaborations	Content Descriptor / Elaborations
Year 3 and 4	(ACTDIK007) (ACTDIK008)	(ACTDIP009)	(ACTDIP010)	(ACTDIP011)	(ACTDIP012)	(ACTDIP013)							

Year 3 and 4 Achievement Standard

NOTE: The standards are not divided into Strands or Sub-strands in the Australian Curriculum documents. However, logic would dictate that the standards could be put into sub-strands, as demonstrated to the right.

Sourced from 'Achievement standards': 'Achievement standards will be accompanied by portfolios of annotated student work samples that illustrate the expected learning and help teachers to make judgments about whether students have achieved the standard.'

By the end of Year 4, students **describe how** a range of digital systems (hardware and software) and their peripheral devices can be used for different purposes.

They collect and **manipulate** different data when creating information and digital solutions.

Students define simple problems, **design and implement digital solutions using** algorithms that involve decision-making and **user input**.

They safely use and **manage** information systems for **identified** needs using agreed protocols and **describe how** information systems are used.

They **explain** how the same data sets can be represented in different ways.

They explain how devices and information systems meet **their purposes**.

Bands of Year Levels Indicators	BAND DESCRIPTIONS	KNOWLEDGE AND UNDERSTANDING					PROCESSES AND PRODUCTION SKILLS						
Year 5 and 6	(ACTDIK014) (ACTDIK015)	(ACTDIP016)	(ACTDIP017)	(ACTDIP018)	(ACTDIP019)	(ACTDIP020)	(ACTDIP021)	(ACTDIP022)					

Year 5 and 6 Achievement Standard

NOTE: The standards are not divided into Strands or Sub-strands in the Australian Curriculum documents. However, logic would dictate that the standards could be put into sub-strands, as demonstrated to the right.

Sourced from 'Achievement standards': 'Achievement standards will be accompanied by portfolios of annotated student work samples that illustrate the expected learning and help teachers to make judgments about whether students have achieved the standard.'

By the end of Year 6, students **explain the fundamentals of** digital system components (hardware, software and networks) and how digital systems **are** connected to form networks.

Students define problems in terms of data and functional requirements and design solutions by **developing algorithms to address the problems**.

They **explain** how digital systems use numbers as a basis for representing a **variety of** data types.

Students manage the creation and communication of ideas and information in collaborative digital projects using validated data and agreed protocols.

They **incorporate** decision-making, repetition and user interface design into their designs and implement their digital solutions, including a visual program.

They explain how information systems and their solutions meet needs and **consider** sustainability.

Bands of Year Levels Indicators	BAND DESCRIPTIONS	KNOWLEDGE AND UNDERSTANDING					PROCESSES AND PRODUCTION SKILLS						
Year 7 and 8	(ACTDIK023) (ACTDIK024)	(ACTDIP025)	(ACTDIP026)	(ACTDIP027)	(ACTDIP028)	(ACTDIP029)	(ACTDIP030)	(ACTDIP031)	(ACTDIP032)	(ACTDIP033)			

Year 7 and 8 Achievement Standard

NOTE: The standards are not divided into Strands or Sub-strands in the Australian Curriculum documents. However, logic would dictate that the standards could be put into sub-strands, as demonstrated to the right.

Sourced from 'Achievement standards': 'Achievement standards will be accompanied by portfolios of annotated student work samples that illustrate the expected learning and help teachers to make judgments about whether students have achieved the standard.'

By the end of Year 8, students **distinguish between** different types of networks and **defined** purposes.

They analyse and evaluate data from a range of sources to model and create solutions.

They define and decompose problems in **terms of** functional requirements and constraints.

Students design user experiences and algorithms incorporating branching and iterations, and test, modify and implement digital solutions.

They evaluate information systems and their solutions in **terms of** meeting needs, innovation and sustainability.

They **explain how** text, image and audio data can be represented, **secured and presented** in digital systems.

They use **appropriate** protocols when communicating and collaborating online.

Students plan and manage digital projects to create interactive information.

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