Years 9 and 10

Rationale

In a world that is increasingly digitised and automated, it is critical to the wellbeing and sustainability of the economy, the environment, and society. That the benefits of information systems are exploited. This requires an understanding of the functioning and management of 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 new skills such as computational and systems thinking. These technologies are an essential problem-solving tool for our knowledge-based society.

The Digital Technologies curriculum helps students to shape change by influencing 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 enables creators of digital information conveyed by digital systems.

Digital Technologies provides students with 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 regional and global citizens capable of actively and ethically communicating and collaborating.

Aims

In addition to the overarching aims for the Australian Curriculum: Technologies, Digital Technologies more specifically 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 which meet the needs and shape future needs.
- use computational thinking and the key concepts of abstraction; data collection, representation and interpretation; specification; algorithmic thinking and implementation to create digital solutions.
- confidently use digital systems to effectively and efficiently 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.

Key Ideas

Overarching idea: 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 livelihood, 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.

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.

In the Australian Curriculum: Technologies, students explore, analyse and evaluate ideas, planning, and analysing and evaluating problems, projects, and programmes. They interpret problems into problems where the possible solutions to design architectural and mechanical systems and the interdependence of components is necessary to create systems solutions to technical, economic and social problems. Implementation of digital solutions often has consequences for the people who use and interact with the system, and may introduce unintended costs or benefits that impact the present or future society.

Design thinking

Design thinking involves the use of strategies for understanding, defining and shaping needs and opportunities to generate ideas; visualising and generating creative and innovative ideas, planning, and analysing and evaluating those ideas and their specific purposes. Design thinking underpins learning in Design and Technologies. Design processes require students to identify and define design problems, generate, plan and realise designed solutions; and evaluate outcomes 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 interaction with that data and the various types of computational processing that are possible. 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, components, comparing performance or modelling trends.

Computational thinking

Computational thinking is a problem-solving method for understanding, defining and shaping needs and opportunities to generate ideas; visualising and generating creative and innovative ideas, planning, and analysing and evaluating those ideas and their specific purposes. Design thinking underpins learning in Design and Technologies. Design processes require students to identify and define design problems, generate, plan and realise designed solutions; and evaluate outcomes 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 a computer is 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, components, comparing performance or modelling trends.

Information and communication technology in the Australian Curriculum

In the Australian Curriculum, there are opportunities in all learning areas to develop information and communication technology (ICT) capability. These are described in the ICT general capability learning continuum. There are opportunities for students to develop their ICT capability. In Digital Technologies the ICT capability is more explicit and foregrounded. Students develop explicit knowledge, understanding and skills relating to operating and managing ICT and applying social and ethical protocols while designing, creating and communicating.

The study of Digital Technologies will ensure that ICT capability is developed specifically. While specific elements are likely to be addressed within digital technologies learning programs, key concepts and skills are strengthened, complemented and extended across all subjects, including in Design and Technologies. This occurs as students engage in a range of learning activities with digital technologies requirements. The clear difference between the Digital Technologies curriculum and the ICT general capability is that the ICT capability helps students best communicate. In implementing projects with a focus on food, care must be taken with regard to food safety and specific local 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 centers. Some states and territories have their own specific guidelines that should be followed. In the Australian Curriculum into local courses, they will include more specific advice on the care procedures, equipment, medications, on interaction with, or interaction with, animals in their local animals ethics committee, contact your state or territory curriculum authority.

Animal ethics

Any teaching activities that involve caring, using, or interacting with animals must comply with the Australian Code of practice for the care and use of animals for scientific purposes in addition to relevant state or territory guidelines.

When state and territory curriculum authorities integrate the Australian Curriculum into local courses, they will include more specific advice on the care procedures, equipment, medications, on interaction with, or interaction with, animals.

For further information about relevant guidelines or to contact your local ethics committee, contact your state or territory curriculum authority.

Years 9 and 10 Band Description

Learning in Digital Technologies focuses on further developing understanding and skills in computational thinking such as precisely and accurately describing problems and the use of modular approaches to solutions. It also focuses on engaging students with specialised learning in preparation for vocational training or learning in the senior secondary years.

By the end of Year 9, students will have had opportunities to understand problems and design, implement and evaluate a range of digital solutions, such as computer and robotic design, and artificial intelligence and robotic design. In Year 9 and 10, students consider how human interaction with networked systems introduces complexities surrounding the capabilities, boundaries and data entities. They take account of privacy and security requirements when designing and implementing solutions that include safety and security features.

In Year 9 and 10 Achievement Standard

By the end of Year 10, students explain the control and management of networked digital systems and the security implications of the interaction between hardware, software and users. They explain simple data compression, and why content data are separated from presentation.

Students plan and manage digital projects using an iterative approach. They define and decompose complex problems in terms of functional and non-functional requirements. Students design and evaluate user experiences and algorithms. They design and implement modular programs, including an object-oriented oriented program, using symbols and data structures involving modular functions that reflect the relationships of real-world data and data entities. They take account of privacy and security requirements when selecting and validating data. Students test and predict results and implement digital solutions. They evaluate information systems and their solutions in terms of risk, sustainability and potential for innovation and enterprise. They share and collaborate online, establishing protocols for the use, transmission and maintenance of data and projects.
Digital Technologies Knowledge and Understanding
This strand focuses on developing the underpinning knowledge and understanding of digital systems and information systems.

Digital Technologies processes and production skills
This strand focuses on developing skills to create digital solutions to problems and opportunities. The Digital Technologies processes and productionstrand focuses on:

- Investigate and analyse data, including the properties of data, data collection and representation, and interpreting and visualising data

Design and production
- Visualising and representing solutions using digital media and other technologies

Evaluation
- Evaluating digital solutions

Planning and production
- Planning and controlling production processes to meet the requirements of internal and external users

The concepts of abstraction, data collection, representation and interpretation, specification, algorithms and implementation correspond to the key elements of computational thinking. Collectively, these concepts are the key ideas about the organisation, representation and automation of digital solutions and information. They are the foundation for all future digital contexts and are likely to underpin future digital systems. They provide a language and perspective that students and teachers can use when discussing digital technologies.

Computational thinking
- Computational thinking involves taking an approach to problems that can be automated. It means being able to think logically, algorithmically, recursively and abstractly. Students will also apply procedural techniques and processes such as creating diagrams, communicating and sharing ideas and information, and managing projects.

Abstraction involves hiding details of an idea, problem or solution that are not relevant, to focus on a manageable number of aspects. Abstraction 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 begins with the description of algorithms. Algorithms are processes, digital systems to create solutions to problems or generate data. 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 a recipe or describe directions to locate items. Implementing and testing the automation of an algorithm, typically by using appropriate software or writing a computer program. These concepts are addressed in the processes and production strand.

Digital systems
- Digital systems focus on the components of digital systems: hardware and software (computer architecture and the operating system), and networks and the Internet (wired, mobile and wireless 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 falls under the interactions and impacts concept below.

The concepts specification, algorithms and implementation focus on the precise definition and communication of problems and their solutions. This begins with the description of algorithms, which is the process of defining a problem, and then specifying the steps and decisions needed to solve it. Algorithms are processes, digital systems to create solutions to problems or generate data. 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 a recipe or describe directions to locate items. Implementing and testing the automation of an algorithm, typically by using appropriate software or writing a computer program. These concepts are addressed in the processes and production strand.

The digital systems concept focuses on the components of digital systems: hardware and software (computer architecture and the operating system), and networks and the Internet (wired, mobile and wireless 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 falls under the interactions and impacts concept below.

Interactions and impacts
- The interactions and impacts concepts focus on all aspects of human interaction with and through information systems, and the enormous potential for positive and negative economic, environmental and social impacts enabled by these systems. Interactions and impacts are addressed in the processes and production strand. Interactions refers to all human interactions with information systems, especially user interfaces and experiences, and human–human interactions including communication and collaboration facilitated by digital systems. This concept examines the role and impact of digital solutions and information. Interactions describes analyzing and predicting the extent to which personal, economic, environmental and social needs are met through existing and emerging digital technologies; and appreciating the transformative potential of digital technologies in people’s lives. It also involves consideration of the relationship between information systems and society and in particular the ethical and legal obligations of individuals and organisations towards ownership and privacy of data and information.

Years 9 and 10 Content Descriptions

Analyse simple compression of data and how content data are separated from presentation.

Types of digital solutions
Across each band, students will create digital solutions that will use data, require interactions with users and with 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.