Draft Australian Curriculum: Technologies

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DRAFT AUSTRALIAN CURRICULUM – TECHNOLOGIES

Rationale

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

The Technologies learning area draws together the distinct but related subjects of Design and Technologies and Digital Technologies. The Australian Curriculum: Technologies will ensure that all students benefit from learning about and working with traditional, contemporary and emerging technologies that shape the world in which we live. The ubiquity of digital technologies provides new ways of thinking, collaborating and communicating for people of all ages and abilities. A comprehensive education in Technologies provides opportunities for students to progress from creative and directed play through to the consolidation of knowledge, understanding and skills. This learning area provides opportunities for students to apply practical skills and processes when using technologies and resources to create innovative solutions that meet current and future needs.

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. They need opportunities to shape and challenge attitudes to the use and impact of technologies. They will do this by evaluating how their own solutions and those of others affect users, equity, sustainability, ethics, and personal and social values. In creating solutions, as well as responding to the designed world, they will contribute to sustainable patterns of living for themselves and others.

Aims

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

- are creative, innovative and enterprising when using traditional, contemporary and emerging technologies, and understand how technologies have developed over time
- effectively and responsibly select and manipulate appropriate technologies, resources, materials, data, systems, tools and equipment when designing and creating products, services, environments and digital solutions
- critique and evaluate technologies processes to identify and create solutions to a range of problems or opportunities
- investigate, design, plan, manage, create, produce and evaluate technologies solutions
- engage confidently with technologies and make informed, ethical and sustainable decisions about technologies for preferred futures including personal health and wellbeing, recreation, everyday life, the world of work and enterprise, and the environment.

Organisation

The Australian Curriculum: Technologies Foundation to Year 10 is written on the assumption that all students from Foundation to Year 8 will study two subjects: Design and Technologies and Digital Technologies.

At Years 9 to 10, the Australian Curriculum: Technologies is written on the assumption that school authorities will decide whether students can choose to continue in one or both subjects and/or if technologies specialisations that do not duplicate these subjects will be offered.

The curriculum for each of Design and Technologies and Digital Technologies describes the distinct knowledge, understanding and skills of the subject and, where appropriate, highlights their similarities and complementary learning. This approach allows students to develop a comprehensive understanding of the nature of traditional, contemporary and emerging technologies. It also provides the flexibility – especially in the primary years of schooling – for developing integrated teaching programs that focus on both Technologies subjects and other learning areas.

Content structure

Strands

Knowledge, understanding and skills in each subject are presented through two related strands:

- Knowledge and understanding
- Processes and production skills.

Within each strand, key concepts and processes as outlined in Table 1 provide the focus for presentation of expected knowledge, understanding and skills across F–10.

Table 1: Design and Technologies and Digital Technologies content structure

Design and Technologies	Digital Technologies
Design and Technologies knowledge and understanding	**Digital Technologies knowledge and understanding**
• the use, development and impact of technologies in people's lives • design concepts across a range of technologies contexts	• how data are represented and structured symbolically • the components of digital systems: software, hardware and networks • the use, development and impact of information systems in people's lives
Design and Technologies processes and production skills	**Digital Technologies processes and production skills**
• critiquing, exploring and investigating needs or opportunities • generating, developing and evaluating design ideas for designed solutions • planning, producing (making) and evaluating designed solutions	• collecting, managing and interpreting data when creating information, and the nature and properties of data, how it is collected and interpreted • using a range of digital systems and their components and peripherals • defining problems and specifying and implementing their solutions • creating and communicating information, especially online, and interacting safely using appropriate technical and social protocols

It is intended that when implementing the curriculum, teachers will select technologies-specific content from the *Knowledge and understanding* strand and ask students to apply the skills in 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. While the content descriptions are different for each subject there are clear relationships between the two strands in each subject. For example, 'the use, development and impact of technologies/information systems in people's lives'.

Key ideas of the Technologies learning area

Systems thinking and the overarching idea: Creating preferred futures

The Technologies curriculum focuses on systems thinking to develop the technologies knowledge, understanding and skills to provide a method for identifying and moving towards ethical, socially responsible and sustainable patterns of living. Systems thinking is a holistic approach where parts of a system are analysed individually to see the whole, the interactions and interrelationships between the parts and how these parts or components influence the system as a whole.

In both Design and Technologies and Digital Technologies this provides opportunities for students to engage in predicting outcomes and impacts of technological decisions for current and future generations and their environments. Students creatively and actively design solutions to meet present needs without compromising the ability of future generations to meet their needs. Both subjects acknowledge the strong connection with the Australian Curriculum: Sustainability cross-curriculum priority.

Project management

The Technologies curriculum ensures that students are explicitly taught how to manage projects. This includes planning; evaluating processes; considering constraints; risk assessment and management; decision-making strategies; quality control; developing resource, finance, work and time plans; and collaborating and communicating with others at different stages of the process. Every technologies project involves the use of resources and it is critical that there is planning for sustainable use of resources when managing projects.

Technologies projects involve ethical, health and safety considerations. They are designed for the different needs (including consideration of personal and social beliefs and values) of consumers and clients, and for commercial realities. Students learn that when they and others engage in design thinking and technologies processes, they are responsible and accountable for their designs and solutions.

Project management is an essential element in building students' capacity to successfully innovate in both Technologies subjects. Project work and project management occur as a part of everyday life and are critical to many fields of technologies employment. Technologies education allows students to develop skills to manage projects from identification of need or opportunity through conception to realisation. Project management is addressed in all years of schooling as individuals and groups of students plan how they will work to bring a design idea to fruition.

Assessing and managing risk in Technologies learning addresses the safe use of technologies and the risks that can impact on project timelines. It covers all necessary aspects of health, safety and injury prevention at any year level and in any technologies context when using potentially dangerous materials, tools and equipment. It includes ergonomics, safety including cyber safety, data security, and ethical and legal considerations when communicating and collaborating online.

Band level descriptions

The curriculum for each Technologies subject is written in bands of year levels:

- Foundation to Year 2
- Years 3 and 4
- Years 5 and 6
- Years 7 and 8
- Years 9 and 10.

Band level descriptions provide an overview of the content at each level. They also emphasise the interrelated nature of the two strands and the expectation that planning will involve integration of content from across the strands.

Content descriptions

The Australian Curriculum: Technologies includes content descriptions at each band level. These describe the knowledge, understanding and skills that teachers are expected to teach and students are expected to learn. Content descriptions do not prescribe approaches to teaching in the Technologies subjects. The content descriptions have been written to ensure that learning is ordered appropriately and that unnecessary repetition is avoided. However, a concept or skill introduced in one band level may be revisited, strengthened and extended in later band levels.

Content descriptions are grouped to illustrate the clarity and sequence of development of concepts through and across the band levels. They support the ability to see the connections across strands and the sequential development of concepts from Foundation to Year 10.

Content elaborations

Content elaborations are provided for Foundation to Year 10 as support material to illustrate and exemplify what is to be taught and to assist teachers in developing a shared understanding of the content descriptions. They are not intended to be comprehensive content points that all students need to be taught nor do they encompass every aspect of a content description.

Glossary

A glossary is provided to support a common understanding of key terms used in the draft curriculum.

Achievement standards

Across Foundation to Year 10, achievement standards indicate the quality of learning that students should typically demonstrate by a particular point in their schooling.

The sequence of achievement standards in each Technologies subject describes progress in the learning area, demonstrating a broad sequence of expected learning. This sequence provides teachers with a framework of growth and development in each Technologies subject.

An achievement standard describes the quality of learning (the depth of conceptual understanding and the sophistication of skills) that would indicate the student is well-placed to commence the learning required at the next level of achievement.

The achievement standards for Technologies reflect the distinctive practices of each subject along with aspects of learning that are common to all Technologies subjects. Subject-specific terminology and organisation reflect the essential characteristics of learning in each subject.

The achievement standards also reflect differences in the nature and scope of the learning in each Technologies subject, as well as the relationship between the interrelated strands: *Knowledge and understanding* and *Processes and production skills*.

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.

Technologies across Foundation to Year 10

The Australian Curriculum: Technologies is based on the principle that all young Australians are entitled to engage fully in a range of technologies and to be given a balanced and substantial foundation in the knowledge and skills base of each subject.

Complementing the band level descriptions of the curriculum, this section describes the nature of learners and the curriculum across the following year-groupings:

- Foundation to Year 2: typically students from 5 to 8 years of age
- Years 3 to 6: typically students from 8 to 12 years of age
- Years 7 to 10: typically students from 12 to 16 years of age.

Foundation to Year 2

Students bring to school diverse backgrounds and a range of experiences in Technologies. The Technologies curriculum builds on these as rich resources for further learning about each of the technologies subjects.

In Foundation to Year 2, the Technologies curriculum builds on the *Early Years Learning Framework* and its key learning outcomes: children have a strong sense of identity; children are connected with, and contribute to, their world; children have a strong sense of wellbeing; children are confident and involved learners; and children are effective communicators.

In the early years play is important in how students learn; it provides a form of engagement and a sense of purpose to their activities. In Technologies, students have opportunities to learn through purposeful and directed play to develop attitudes of care in relation to the places and resources they use. Through these processes they identify relationships between imagined and virtual worlds and the real world, between people and products, and between resources and environments. They explore materials and technologies and use drawing and modelling to communicate their design ideas. Students will learn about and experience connections between technologies and the designed world. They will begin to learn the importance of preparing precise instructions when solving problems using digital systems, creating ideas and information and sharing them online with known people.

Years 3 to 6

Through the primary years, students draw on their growing experience of family, school and the wider community to develop their understanding of the world and their relationships with others. During these years of schooling, students' thought processes become more complex and consistent, and they gradually become more independent. Students also develop their capacity to work in teams. They develop a sense of social, ethical and environmental responsibility and are interested in and concerned about the future. Students may talk about changes in their own thinking and making, giving reasons for their actions and explaining and demonstrating their organisation and sequence of ideas. They begin to recognise, appreciate and value the different ways in which others think and respond to problems and situations, including those with a regional perspective. They respond resourcefully to a range of design and computing problems and situations using creative and innovative ideas to realise solutions. They communicate and record their ideas in diagrams and drawings using manual and digital technologies. They explain the main functions of their solutions and the materials, systems and technologies which could be used.

In these years, learning in Technologies occurs both through integrated curriculum and Technologies subject-specific approaches. Students' motivation to play in the early years develops into an interest in learning technologies thinking, processes and production. Students in these years increasingly recognise the connections between Technologies and other learning areas.

Years 7 to 10

As students move into adolescence, they undergo a range of important physical, cognitive, emotional and social changes. Students often begin to question established community conventions, practices and values. Their interests extend well beyond their own communities and they develop their concerns about wider social, ethical and sustainability issues. Students in this age range increasingly look for and value learning they perceive as relevant, consistent with personal goals, and leading to important outcomes. Increasingly they are able to work with more abstract concepts and are keen to examine evidence and ideas.

In the Technologies learning area, students use technologies knowledge and understanding, technologies processes and production skills and design, systems and/or computational thinking to solve and produce creative solutions to problems, needs or opportunities. They communicate and record their ideas using a range of media and technologies. These specialised problem-solving activities will be sophisticated, acknowledge the complexities of contemporary life and may make connections to related specialised occupations and further study.

Increasingly, students develop a global perspective, with opportunities to understand the complex interdependencies involved in the development of technologies and between the developer and user in their technologies solutions, and how these can contribute to preferred futures. Students will develop an understanding of the interdependence of technologies development, values, beliefs and environment. Through undertaking technologies processes students develop design, computational and systems thinking; and organisational and project management skills.

Student diversity

ACARA is committed to the development of a high-quality curriculum for all Australian students that promotes excellence and equity in education.

All students are entitled to rigorous, relevant and engaging learning programs drawn from the Australian Curriculum: Technologies. Teachers take account of the range of their students' current levels of learning, strengths, goals and interests and make adjustments where necessary. The three-dimensional design of the Australian Curriculum, comprising learning areas, general capabilities and cross-curriculum priorities, provides teachers with flexibility to cater for the diverse needs of students across Australia and to personalise their learning.

More detailed advice has been developed for schools and teachers on using the Australian Curriculum to meet diverse learning needs. It is available under Student Diversity on the Australian Curriculum website.

Students with disability

The *Disability Discrimination Act 1992* and the *Disability Standards for Education 2005* require education and training service providers to support the rights of students with disability to access the curriculum on the same basis as students without disability.

Many students with disability are able to achieve educational standards commensurate with their peers, as long as the necessary adjustments are made to the way in which they are taught and to the means through which they demonstrate their learning.

In some cases curriculum adjustments are necessary to provide equitable opportunities for students to access age-equivalent content in the Australian Curriculum: Technologies. Teachers can draw from content at different levels along the Foundation to Year 10 sequence. Teachers can also use the extended general capabilities learning continua in Literacy, Numeracy and Personal and social capability to adjust the focus of learning according to individual student need.

English as an additional language or dialect

Students for whom English is an additional language or dialect (EAL/D) enter Australian schools at different ages and at different stages of English language learning and have various educational backgrounds in their first languages. While many EAL/D students bring already highly developed literacy (and numeracy) skills in their own language to their learning of Standard Australian English, there are a significant number of students who are not literate in their first language, and have had little or no formal schooling.

While the aims of the Australian Curriculum: Technologies are the same for all students, EAL/D students must achieve these aims while simultaneously learning a new language and learning content and skills through that new language. These students may require additional time and support, along with teaching that explicitly addresses their language needs. Students who have had no formal schooling will need additional time and support in order to acquire skills for effective learning in formal settings.

A national *English as an Additional Language or Dialect: Teacher Resource* has been developed to support teachers in making the Australian Curriculum: Foundation to Year 10 in each learning area accessible to EAL/D students.

Gifted and talented students

Teachers can use the Australian Curriculum: Technologies flexibly to meet the individual learning needs of gifted and talented students.

Teachers can enrich student learning by providing students with opportunities to work with learning area content in more depth or breadth; emphasising specific aspects of the general capabilities learning continua (for example, the higher-order cognitive skills of the Critical and creative thinking capability); and/or focusing on cross-curriculum priorities. Teachers can also accelerate student learning by drawing on content from later band levels in the Australian Curriculum: Technologies and/or from local state and territory teaching and learning materials.

General capabilities

In the Australian Curriculum, the general capabilities encompass the knowledge, skills, behaviours and dispositions that, together with curriculum content in each learning area and the cross-curriculum priorities, will assist students to live and work successfully in the twenty-first century.

There are seven general capabilities:

- Literacy (LIT)
- Numeracy (NUM)
- Information and communication technology (ICT) capability
- Critical and creative thinking (CCT)
- Personal and social capability (PSC)
- Ethical understanding (EU)
- Intercultural understanding (ICU).

In the Australian Curriculum: Technologies, general capabilities are identified wherever they are developed or applied in content descriptions. They are also identified where they offer opportunities to add depth and richness to student learning through content elaborations.

Initials or abbreviations of titles indicate where general capabilities have been identified in Technologies content. Teachers may find further opportunities to incorporate explicit teaching of the capabilities depending on their choice of activities. Students may also be encouraged to develop capabilities through personally relevant initiatives of their own design.

The following descriptions provide an overview of how general capabilities are addressed in the Australian Curriculum: Technologies, noting that the emphasis on each general capability will vary from one Technologies subject to another. Detailed general capabilities materials, including learning continua, can be found on the Australian Curriculum website.

Literacy (LIT)

Students become literate as they develop the knowledge, skills and dispositions to interpret and use language confidently for learning and communicating in and out of school and for participating effectively in society. Literacy involves students in listening to, reading, viewing, speaking, writing and creating oral, print, visual and digital texts, and using and modifying language for different purposes in a range of contexts.

Students develop literacy capability as they learn how to communicate ideas, concepts and detailed proposals to a variety of audiences; recognise how language can be used to manipulate meaning; read and interpret detailed written instructions for specific technologies, often including diagrams and procedural writings such as software user manuals, design briefs, patterns and recipes; prepare accurate, annotated engineering drawings, software instructions and coding; write project outlines, briefs, concept and project management proposals, evaluations, engineering, life cycle and project analysis reports; and prepare detailed specifications for production.

By learning the literacy of Technologies students understand that language varies according to context and they increase their ability to use language flexibly. Technologies vocabulary is often technical and includes specific terms for concepts, processes and production. Students learn to understand that much technological information is presented in the form of drawings, diagrams, flow charts, models, tables and graphs. They also appreciate the importance of listening, talking and discussing in technologies processes, especially in articulating, questioning and evaluating ideas.

Numeracy (NUM)

Students become numerate as they develop the knowledge and skills to use mathematics confidently across other learning areas at school and in their lives more broadly. Numeracy involves students in recognising and understanding the role of mathematics in the world and having the dispositions and capacities to use mathematical knowledge and skills purposefully.

The Technologies curriculum provides opportunities for students to interpret and use mathematical knowledge and skills in a range of real-life situations. Students use number to calculate, measure and estimate; interpret and draw conclusions from statistics; measure and record throughout the process of generating 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 three-dimensional models, create accurate technical drawings, work with digital models and use algorithmic thinking in decision-making processes when designing and creating best-fit solutions.

Information and Communication Technology (ICT) capability

Students develop ICT capability as they learn to use ICT effectively and appropriately to access, create and communicate information and ideas, solve problems and work collaboratively, and in their lives beyond school. The capability involves students in learning to make the most of the digital technologies available to them. They adapt to new ways of doing things as technologies evolve, and limit the risks to themselves and others in a digital environment.

While much of the explicit teaching of ICT occurs in the Digital Technologies subject, key ICT concepts and skills are strengthened, complemented and extended in Design and Technologies as students engage in a range of learning activities with ICT demands.

In Digital Technologies, students create solutions that consider social and environmental factors when operating digital systems with digital information. They develop and apply an understanding of the characteristics of data, digital systems, audiences, procedures and computational thinking. They apply this when they investigate, communicate and create purpose-designed information solutions. Students learn to formulate problems, logically organise and analyse data and represent it in abstract forms. They automate solutions through algorithmic logic. Students determine the best combinations of data, procedures and human and physical resources to generate efficient and effective information solutions.

In Design and Technologies students learn how to operate specific software tools and digital hardware to assist them to realise their design ideas. This occurs when they investigate, research and analyse information and evaluate design ideas. They communicate and collaborate online. Students develop innovative and creative design ideas; generate plans and diagrams to communicate their designs and produce solutions using digital technologies, for example creating simulations, drawings and models and manufacturing solutions (from basic drawing programs to computer-aided design/manufacture and rapid prototyping).

Critical and creative thinking (CCT)

Students develop capability in critical and creative thinking as they learn to generate and evaluate knowledge, clarify concepts and ideas, seek possibilities, consider alternatives and solve problems. Critical and creative thinking are integral to activities that require students to think broadly and deeply using skills, behaviours and dispositions such as reason, logic, resourcefulness, imagination and innovation in all learning areas at school and in their lives beyond school.

Students develop capability in critical and creative thinking as they imagine, generate, develop, produce and critically evaluate ideas. They take into account sustainability and changing economic, environmental and social needs and concerns. They develop reasoning and abstract thinking capabilities through challenging problems that do not have straightforward solutions. Students analyse problems, refine concepts and reflect upon the decision-making process by engaging in computational, design and systems thinking. They identify, explore and clarify technologies information and use that knowledge in a range of situations and challenges.

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

Personal and social capability (PSC)

Students develop personal and social capability as they learn to understand themselves and others, and manage their relationships, lives, work and learning more effectively. The capability involves students in a range of practices including recognising and regulating emotions; developing empathy for others and understanding relationships, establishing and building positive relationships; making responsible decisions; working effectively in teams, handling challenging situations constructively and developing leadership skills.

Students develop personal and social capability as they engage in project management. They direct their own learning, plan and carry out investigations, and become independent learners who can apply design thinking, technologies understanding and skills to decisions they will have to make in the future. Through collaborating with others, students develop their social and employability skills. They learn to work cooperatively in teams, make group decisions, resolve conflict and show leadership. Designing and innovation involve a degree of risk-taking and resilience, as students work with the uncertainty of sharing new ideas they develop resilience.

The Technologies learning area enhances personal and social capability by developing students' social awareness. This includes awareness of diversity, which students gain through researching and identifying user needs. Students consider past and present impacts of decisions on people, communities and environments. They develop social responsibility through understanding, tolerance of and empathy and respect for others and themselves.

Ethical understanding (EU)

Students develop ethical understanding as they identify and investigate the nature of concepts, values, character traits and principles, and understand how reasoning can assist ethical judgment. Ethical understanding involves students in building a strong personal and socially oriented, ethical outlook that helps them to manage context, conflict and uncertainty, and to develop an awareness of the influence that their values and behaviour have on others.

Students develop the capacity to understand and apply ethical and socially responsible principles when collaborating, creating, sharing and using technologies, materials, data, processes, tools and equipment. Using an ethical lens, they investigate past, current and future local, national, regional and global technological priorities. They evaluate their findings against the criteria of legality, environmental sustainability, economic viability, health, social and emotional responsibility and social awareness. They explore complex issues associated with technologies and consider possibilities. They are encouraged to develop informed values and attitudes.

Students learn about their own roles and responsibilities as discerning citizens, including detecting bias and inaccuracies. Understanding the protection of data, intellectual property and individual privacy in the school environment assists students to become ethical digital citizens. Students learn about safe and ethical procedures for investigating and working with data, materials, people and animals. They consider the rights of others and their responsibilities in using sustainable practices that protect the planet and its life forms.

Intercultural understanding (ICU)

Students develop intercultural understanding as they learn to value their own cultures, languages and beliefs, and those of others. They come to understand how personal, group and national identities are shaped, and the variable and changing nature of culture. The capability involves students in learning about and engaging with diverse cultures in ways that recognise commonalities and differences, create connections with others and cultivate mutual respect.

In the Technologies learning area students consider how technologies are used in diverse communities at local, national, regional and global levels. This includes their impact and potential to transform people's lives. Students explore ways in which past and present practices enable people to use technologies to interact with one another across cultural boundaries. Students investigate how cultural identities and traditions influence the function and form of solutions, products, services and environments designed to meet the needs of daily life.

In their interactions with others, students consider the dynamic and complex nature of cultures, including values, beliefs, practices and assumptions. They recognise and respond to the challenges of cultural diversity. Students take responsibility for securing positive outcomes for members of all cultural groups including those faced with prejudice and misunderstanding.

Cross-curriculum priorities

There are three cross-curriculum priorities in the Australian Curriculum:

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

The cross-curriculum priorities are embedded in the curriculum and will have a strong but varying presence depending on their relevance to each of the learning areas.

Aboriginal and Torres Strait Islander histories and cultures

In the Australian Curriculum: Technologies the priority of Aboriginal and Torres Strait Islander histories and cultures provides creative, engaging and diverse learning contexts for students to value and appreciate the contribution by the world's oldest continuous living cultures to past, present and emerging technologies.

Students identify and explore the rich and diverse knowledge and understandings of technologies employed by Aboriginal and Torres Strait Islander peoples in past, present and future applications. They understand that the technologies of the world's first and most continuous culture often developed through intimate knowledge of Country/Place and Culture.

Students identify, explore, understand and analyse the interconnectedness between technologies and Identity, People, Culture and Country/Place. They explore how this intrinsic link guides Aboriginal and Torres Strait Islander people in sustaining environments, histories, cultures and identities. Students apply this knowledge and understanding within Design and Technologies and Digital Technologies to create appropriate and sustainable products, services and environments to meet personal, local, national, regional and global demands.

In this learning area, students explore how Aboriginal and Torres Strait Islander Peoples' capacity for innovation is evident through the incorporation and application of a range of traditional, contemporary and emerging technologies and practices to purposefully build and/or maintain cultural, community and economic capacity. Students apply this knowledge and understanding throughout the processes of observation, critical and creative thought, action, experimentation and evaluation.

Asia and Australia's engagement with Asia

In the Australian Curriculum: Technologies the priority of Asia and Australia's engagement with Asia provides diverse and authentic contexts to develop knowledge and understanding of technologies processes and production and related cultural, social and ethical issues. It enables students to recognise that interaction between human activity and the diverse environments of the Asia region continues to create the need for creative solutions and collaboration with others, including Australians, and has significance for the rest of the world.

The Australian Curriculum: Technologies provides opportunities for students to explore traditional, contemporary and emerging technological achievements in the countries of the Asia region. Students apply this knowledge and understanding to create appropriate and sustainable products that reflect intercultural, creative and critical thinking to meet identified needs. In this learning area, students appreciate the diversity of the Asia region. They examine contributions that the people of the Asia region have made and continue to make to global technological advances. They consider the contributions that Australia has made and is making to the Asia region. Students explore Australia's rich and ongoing engagement with the peoples and countries of Asia to create appropriate products and services to meet personal, community, national, regional and global needs.

Sustainability

In the Australian Curriculum: Technologies the priority of sustainability provides authentic contexts for creating preferred futures. When identifying and critiquing a need or opportunity, generating ideas and concepts, and producing solutions, students give prime consideration to sustainability by anticipating and balancing economic, environmental and social impacts.

The Australian Curriculum: Technologies prepares students to take action to create more sustainable patterns of living. The curriculum focuses on the knowledge, understanding and skills necessary to design for effective sustainability action. It reflects on human need and equity of access to limited resources. The curriculum recognises that actions are both individual and collective endeavours shared across local and global communities. The curriculum provides a basis for students to explore their own and competing viewpoints, values and interests. Students work with complexity, uncertainty and risk; make connections between disparate ideas and concepts; self-critique; and propose creative and sustainable solutions.

In this learning area, students focus on the knowledge, understanding and skills necessary to choose technologies and systems with regard to costs and benefits. They evaluate the extent to which the process and designed solutions embrace sustainability. Students reflect on past and current practices, and assess new and emerging technologies from a sustainability perspective.

Links to the other learning areas

Learning in Technologies involves the use of knowledge, understanding and skills learned in other learning areas, particularly in English, Mathematics, Science, Geography, The Arts and Health and Physical Education.

English

In schools across Australia there is strong support for linking learning in Technologies with learning literacy skills. Learning in Technologies places a high priority on accurate and unambiguous communication. The Australian Curriculum: Technologies is supported by and in turn reinforces the learning of literacy skills. Students need to describe objects and events; interpret descriptions; read and give instructions; generate and explore ideas with others; write design briefs and specifications, marketing texts, evaluation and variation reports; and participate in group discussions.

Mathematics

The Technologies curriculum provides contexts within which Mathematics knowledge, understanding and skills may be applied and developed. In Technologies, students process data using simple tables, lists, picture graphs, simple column graphs and line graphs. In Mathematics, students' data analysis skills will develop to include scatter plots, linear graphs and the gradient of graphs. This will enhance their ability to analyse patterns and trends in data as part of technologies investigations.

Students develop their use of metric units in both the Mathematics and Technologies curriculums. The ability to convert between common metric units of length and mass and their use of decimal notation in Mathematics will enable them to represent and compare data in meaningful ways in Technologies. Technologies provide tools for automating mathematical processes which reinforce Mathematics concepts. In Mathematics, students learn statistical methods that may be applied to the quantitative analysis of data required in Technologies. Students apply knowledge of geometry, shapes and angles in Technologies.

When considering systems at a vast range of scales in Technologies, students use their mathematical knowledge of timescales and intervals. Students' mathematical ability to solve problems involving linear equations can be used in Technologies when investigating quantitative relationships and designing algorithms. The development of computational thinking skills in Digital Technologies will complement the problem-solving and reasoning proficiency strands in Mathematics.

Science

The Technologies curriculum closely complements the Science curriculum. Design and Technologies draws upon concepts from biological, chemical and physical sciences to solve problems and design solutions to meet human needs and opportunities. Links with the Science curriculum allow for applications of scientific concepts through designing real-world solutions that are meaningful to students. An example would be applying scientific concepts when designing in an engineering context. Students apply knowledge of material properties and characteristics and do appropriate scientific tests of materials, processes and prototypes. Design and Technologies contextualises learning in Science through engagement with authentic projects. It allows for critiquing, applying prior knowledge and evaluating outcomes.

The Digital Technologies curriculum provides many techniques and technologies for automating the collection, storage and analysis of authentic scientific data in the Science curriculum. Digital technologies such as data loggers, spreadsheets, databases, simulations and imaging technologies are central to modern science. They are used to collect and organise scientific measurements and to derive information by filtering, analysing and visualising large volumes of numerical, categorical and structured data. Digital Technologies provides students with the skills to represent data in ways that enable computational analysis. Scientists use digital technologies to develop software for simulating and modelling natural systems and phenomena. Digital technologies give students the skills to implement simple simulations and gain a deeper understanding of Science concepts and models by interacting with simulations.

History

History provides another avenue to understand how technologies develop and how their developments are a source of historical facts and artefacts. In the Knowledge and understanding strands students will develop increasingly sophisticated knowledge and understanding, drawn from contemporary and historical sources. It is important that students learn that technologies have developed through the gradual accumulation of knowledge over many centuries; that all sorts of people – including people like themselves – use and contribute to the development of technologies. Historical studies of technologies in a range of societies including the peoples and countries of Asia and Aboriginal and Torres Strait Islander cultures extending to modern times will help students understand the contributions of people from around the world.

Geography

The Geography curriculum provides a range of opportunities for students to consolidate their Technologies knowledge, understanding and skills. From the early years students sort information, find patterns and interact with digital systems as they develop spatial understandings, particularly as they create, interpret and use maps. They use directional language; understand scale and distance; and record data related to weather. They create products and systems that measure and further develop their understanding of the influences of climate and weather conditions. They use digital tools to collect and sort information and data and there is a significant emphasis on digital and spatial technologies.

Students strengthen their Technologies understanding and skills as they study the environmental characteristics of places, processes and human significance. During their investigations they collect and convert data into useful forms using spreadsheets, graphs and distribution maps. Students consolidate their understandings of sustainability as they investigate human significance of the biophysical environment and design and manage projects that enhance their understanding of the fine balance between the environment and human endeavour.

Through Design and Technologies, concepts and learning that are addressed in Geography are contextualised through the design and production of products, services and environments through specific targeted projects that relate to sustainability, the environment and society. They critique, design and produce solutions for managed and constructed environments. Learning is further enhanced through authentic activities that focus on enterprising and innovative solutions to perceived needs.

The Arts

The Technologies curriculum complements The Arts curriculum, particularly in the application of the elements and principles of design in Visual Arts and in the use of digital technologies in Media Arts. Through the Technologies curriculum aspects of aesthetics such as line, shape, form, colour, texture, proportion and balance are incorporated into the design processes in Technologies learning activities. This occurs when students design products and environments. Knowledge of materials, tools and equipment and the ways they can be used to create designed solutions provides links between Technologies and two and three-dimensional design in Visual Arts. Skills developed in Visual Arts such as representing and exploring creative ideas through sketching and drawing complement processes used in Design and Technologies to generate ideas to create solutions.

Students learn about multimedia across the Australian Curriculum. In Digital Technologies the focus is on the technical aspects of multimedia, and privacy and intellectual property concerns. In Media Arts students use digital technologies to tell stories, represent and communicate ideas and explore concepts. Making in Media Arts involves designing, planning, producing, capturing and recording, choosing, combining and editing, and representing and distributing.

Health and Physical Education

The Australian Curriculum: Technologies will take account of what students will learn in Health and Physical Education. Students will explore how systems work together to produce energy and movement and be able to apply this in technologies contexts. They will develop and practise technical skills which will assist students in developing manipulative skills in Technologies and apply learning particularly in relation to nutrition.

Food and nutrition in the Australian Curriculum

In the Australian Curriculum students may be taught about food and nutrition in both Health and Physical Education and in the Technologies learning area through Design and Technologies. The focus in the Health and Physical Education curriculum is on understanding healthy choices in relation to nutrition, understanding the range of influences on these choices, and developing and applying the knowledge, understanding and skills to make healthier choices in relation to food and nutrition. In Technologies students will learn how to apply nutrition knowledge through the preparation of food. Beyond Year 8 students may choose to study a food-related subject offered by states and territories.

Implications for implementation

In the Australian Curriculum: Technologies the two strands, *Knowledge and understanding* and *Processes and production skills,* are interrelated and inform and support each other. When developing teaching and learning programs, teachers combine aspects of the strands in different ways to provide students with learning experiences that meet their needs and interests. There are opportunities for integration of learning between Technologies subjects and with other learning areas.

Engaging learning programs will provide opportunities for students to:

- develop skills and dispositions such as curiosity, imagination, creativity and evaluation
- engage all aspects of perception: sensory, emotional, cognitive, physical and spiritual
- work individually and collaboratively.

Although the individual Technologies subjects of Design and Technologies and Digital Technologies form the basis of the Australian Curriculum: Technologies, students explore how Aboriginal and Torres Strait Islander peoples' capacity for innovation is evident through the critical processes of observation, action, experimentation and evaluation. These processes reflect traditional, contemporary and emerging technologies which produce a range of products, services and environments. This learning involves exploration of traditional, contemporary and emerging technologies from different societies, including from Aboriginal and Torres Strait Islander cultures. Such technologies might:

- include the incorporation of a range of introduced technologies within existing practices to purposefully build or maintain social, community and economic capacity
- involve other learning areas
- exist in physical or virtual spaces
- be created individually or collaboratively.

While content descriptions do not repeat key skills across the band levels, it should be noted that many aspects of Technologies curriculum are recursive, and teachers need to provide ample opportunity for revision, ongoing practice and consolidation of previously introduced knowledge and skills.

Students learn at different rates and in different stages. Depending on each student's rate of learning or the prior experience they bring to the classroom, not all of the content descriptions for a particular band level may be relevant to a student in those year levels.

Some students may have already learned a concept or skill, in which case it will not have to be explicitly taught to them in the band level stipulated. Other students may need to be taught concepts or skills stipulated for earlier band levels. The content descriptions in the Australian Curriculum: Technologies enable teachers to develop a variety of learning experiences that are relevant, rigorous and meaningful and allow for different rates of development, in particular for younger students and for those who require additional support.

Some students will require additional support to develop their skills in specific Technologies subjects.

In the Australian Curriculum: Technologies it is expected that appropriate adjustments will be made for some students to enable them to access and participate in meaningful learning, and demonstrate their knowledge, understanding and skills across the Technologies subjects. To provide the required flexibility teachers need to consider the abilities of each student and adopt options for curriculum implementation that allow all students to participate. This might involve students using modified tools, materials or equipment to create solutions.

Teachers use the Australian Curriculum content and achievement standards first to identify current levels of learning and achievement and then to select the most appropriate content (possibly from across several year levels) to teach individual students and/or groups of students. This takes into account that in each class there may be students with a range of prior achievement (below, at or above the year level expectations) and that teachers plan to build on current learning. Organisation of the curriculum in band levels provides an additional level of flexibility that supports teachers to plan and implement learning programs that are appropriate for all students and make best possible use of available resources.

Teachers also use the achievement standards at the end of a period of teaching to make on balance judgments about the quality of learning demonstrated by the students – that is, whether they have achieved below, at or above the standard. To make these judgments, teachers draw on assessment data that they have collected as evidence during the teaching period. These judgments about the quality of learning are one source of feedback to students and their parents and inform formal reporting processes.

If a teacher judges that a student’s achievement is below the expected standard, this suggests that the teaching programs and practice should be reviewed to better assist individual students in their learning in the future. It also suggests that additional support and targeted teaching will be needed to ensure that students are appropriately prepared for future studies in specific Technologies subjects.

Assessment of the Australian Curriculum: Technologies takes place at different levels and for different purposes, including:

- ongoing formative assessment within classrooms for the purposes of monitoring
- learning and providing feedback to teachers to inform their teaching, and for students to inform their learning
- summative assessment for the purposes of twice-yearly reporting by schools to parents and carers on the progress and achievement of students.

Rationale

Learning in Design and Technologies involves the creative processes through which products, services and environments are designed and developed. Students learn that the design, development and use of technologies are influenced by and can play a role in enriching and transforming societies and our natural, managed, constructed and digital environments.

The Australian Curriculum: Design and Technologies actively engages students in producing quality designed solutions to identified problems or opportunities across a range of technologies contexts. In doing so, students consider social, economic, environmental, ethical, legal, aesthetic and functional factors. Through Design and Technologies students manage projects independently and collaboratively from conception to realisation. They develop a sense of pride, satisfaction and enjoyment from their ability to develop innovative designed solutions. They have the opportunity to contribute to the development of futures that provide sustainable patterns of living.

Design and Technologies develops students' knowledge and confidence to analyse critically and respond creatively to the challenges of a highly technological and complex future. They learn to design, produce and evaluate innovative technological designed solutions. Through the practical application of technologies, students develop manual dexterity and coordination through hands-on activities. The subject engages and motivates young people and provides them with learning experiences to develop skills that are transferable to family and home, constructive leisure activities, community contribution and the world of work.

This rationale complements and extends the rationale for the Technologies learning area.

Aims

In addition to the overarching aims for the Australian Curriculum: Technologies, Design and Technologies more specifically aims to develop the knowledge, understanding and skills to ensure that, individually and collaboratively, students:

- document design ideas and communicate these to a range of audiences
- select and manipulate a range of materials, components, tools and equipment creatively, competently and safely in the development of designed solutions suitable for a range of technologies contexts
- explore, investigate, create and critique innovative, ethical and sustainable designed solutions for preferred futures using a range of technologies
- develop confidence as critical users and designers and producers of technologies and designed solutions
- understand the roles and responsibilities of designers, technologists and those in related occupations.

Organisation

Content structure

The Australian Curriculum: Design and Technologies comprises two related strands:

- Design and Technologies knowledge and understanding – the use, development and impact of technologies and design ideas across a range of technologies contexts
- Design and Technologies processes and production skills – the skills required to design, produce and evaluate designed solutions.

Within each strand, key concepts and processes as outlined in Table 2 provide the focus for content and present a sequence of development of knowledge, understanding and skills across the bands.

Table 2: Design and Technologies content structure

Design and Technologies	
Design and Technologies knowledge and understanding	**Design and Technologies processes and production skills**
• the use, development and impact of technologies in people's lives • design concepts across a range of technologies contexts	• critiquing, exploring and investigating needs or opportunities • generating, developing and evaluating design ideas for designed solutions • planning, producing (making) and evaluating designed solutions

Relationship between the strands

Together, the two strands provide students with knowledge, understanding and skills through which they can safely and ethically design, plan, manage, produce and evaluate products, services and environments taking into account the needs of individuals, society, the economy and the environment. Students take action and make ethical decisions about technologies, considering social, economic, environmental, ethical, legal, aesthetic and functional factors. Teaching and learning programs should balance and integrate both strands. Students learn about technologies and society as well as different technologies contexts (knowledge and understanding). They design, produce and evaluate designed solutions using technologies processes and production involving their hands, tools, equipment and digital technologies, using natural and fabricated materials (processes and production skills).

Design and Technologies knowledge and understanding

The Design and Technologies knowledge and understanding strand focuses on investigating and developing the underpinning knowledge and understanding of technologies, materials, systems, tools and equipment across a number of technologies contexts, some of which are prescribed. It also includes understanding of the relationship between technologies and society.

Technologies and society

The Technologies and society content descriptions focus on how people use and develop technologies taking into account social, economic, environmental, ethical, legal, aesthetic and functional factors and the impact of technologies on individuals, families, local, regional and global communities, the economy and the environment.

Technologies contexts

The Technologies contexts content descriptions provide a framework within which students can gain knowledge and understanding about design concepts across a range of technologies contexts. These content descriptions focus on the properties and characteristics of technologies, materials, components, tools and equipment and how they can be used to create innovative designed solutions.

These technologies contexts provide a progression of learning from Foundation to Year 8 and lead to more specialised Technologies subjects in Years 9 and 10. They also reflect current national priorities including food security and sustainable food and fibre production, workforce demand, and health and wellbeing priorities.

The technologies contexts for Foundation to Year 8 are:

- Materials and technologies specialisations. For example:
    - materials, including composites, metal, plastics, wood, smart materials, textiles
    - an area of specialisation (for example, architecture, electronics, graphics technologies, fashion) (See content descriptions 2.2, 4.2, 6.2, 8.3 and 10.3)
- Food and fibre production (includes Food technologies from F–4)

  (See content descriptions 2.3, 4.3, 6.3 and 8.4)
- Engineering principles and systems

  (See content descriptions 2.4, 4.4, 6.4 and 8.5)
- Food technologies (combines with Food and fibre production from F–4)

  (See content descriptions 2.2, 4.2, 6.5 and 8.6).

Across each band from Foundation to Year 8, students will study each of these contexts and design, produce and evaluate at least three types of designed solutions (product, service or environment). The combination of contexts and types of designed solutions is a school decision. Table 3 outlines the requirements for contexts and designed solutions.

Table 3: Technologies contexts and designed solutions

Technologies contexts (each context studied within a band)	**produced as**	**Designed solutions (product, service or environment)** (each type of solution created within a band)

Design and Technologies processes and production skills

The Design and Technologies processes and production skills are based on the major aspects of design thinking and design and technologies processes.

The Design and Technologies processes and production skills strand focuses on:

- Critiquing, exploring and investigating
- Generating, developing and evaluating ideas
- Planning, producing and evaluating designed solutions.

In each band of the curriculum, one content description focuses on each of these processes. The processes are described below and further detailed in the bands. Students will spend a substantial amount of time engaged in developing processes and production skills.

Critiquing, exploring and investigating

Critiquing, exploring and investigating involve students as creators and consumers critically reflecting on the intention and purpose and operation of technologies and designed solutions. Critiquing encourages students to examine values, analyse, question and review processes and systems and reflect on how decisions they make may have implications for the individual, society and the local and global environment. Students explore and investigate technologies, products, systems, services and environments as they consider the needs of society. They progressively develop effective investigation strategies and consider the contribution of technologies to their lives and make judgments about them.

Generating, developing and evaluating ideas

Generating and developing ideas involves students in embracing change, making choices, weighing up options, considering alternatives and documenting various design ideas and possibilities. Students use critical and creative thinking strategies to generate, evaluate and document ideas to meet needs or opportunities that have been identified by an individual, group or wider community. Generating creative and innovative ideas involves thinking differently; it entails proposing new approaches to existing problems and identifying new design opportunities. Generating and developing ideas involves identifying various competing factors that may influence and dictate the focus of the idea. Students will evaluate, justify and synthesise what they learn and discover. They will use graphic representation skills when they draw, sketch, model and create innovative ideas that focus on high-quality designed solutions.

Planning, producing and evaluating designed solutions

Planning, producing and evaluating designed solutions involve students in making a sequence of general, intentional and operational decisions based on initial exploration and investigation of information. Students increasingly engage in an extensive range of planning and managing approaches, including strategic, program and operational planning. When planning and managing projects, students focus on the project's scope, aims and objectives, its development, the roles and responsibilities of those involved, and the time and cost estimates for completion.

Producing (making) involves developing products, services or environments designed to meet specific purposes and users. Students learn a variety of skills and techniques. They apply knowledge about components, materials and their properties and characteristics to ensure their suitability for use. They learn about the benefits of adopting safe work practices. They develop accurate production skills to achieve quality designed solutions. Students develop the capacity to select and use appropriate materials, components, tools and equipment; and use sustainable work practices. The use of modelling and prototyping to accurately develop simple and complex physical models supports the production of successful designed solutions.

Students evaluate and make judgments about the quality and effectiveness of their designed solutions and those of others throughout a design process. They consider the implications and consequences of actions and decision-making. They determine effective ways to test and judge the appropriateness of their designed solutions.

Learning in Design and Technologies

In Design and Technologies students are actively engaged in the process of designing, producing and evaluating designed solutions for personal, domestic, commercial and global settings for sustainable and preferred futures. For younger children, this usually involves personal and family settings where there is an immediate, direct and tangible outcome, and where playfulness and practical exploration are a focus. Students work independently and collaboratively on projects as they critique, explore and investigate needs and opportunities; generate, develop and evaluate ideas; and plan, produce and evaluate designed solutions using predetermined criteria.

Students make ethical decisions about the use and application of design and technologies, considering health and sustainability implications. Students progress from considering environmental sustainability factors in the early years to then also considering social sustainability factors in primary years and including economic sustainability factors in later years. They learn about the process of design as well as how technologies are developed and used in different technologies contexts.

They produce designed solutions using technologies processes in a practical manner using natural and fabricated materials, components and digital technologies. Students will spend a substantial amount of time engaged in developing processes and production skills. Through the practical application of technologies, students develop manual dexterity, fine motor skills and coordination through hands-on activities.

When students generate, develop and communicate their ideas to a range of audiences and for design tasks in a range of technologies contexts, they develop graphic representation skills. They also develop graphics skills when the focus of the design project is on developing a graphics product, service or environment.

Play in the Technologies learning area

In Design and Technologies and Digital Technologies the imaginative and purposeful application of play is foregrounded in the early years. In play children create imaginary situations in which they change the meaning of objects and actions as they invent new ideas and engage in futures thinking (for them). They also explore real-world concepts, rules and events as they role-play what is familiar and of interest to them. Play is deepened and imagination and creativity are better harnessed for learning when play is relevant and purposeful, and when children and teachers engage in shared, sustained thinking. Play includes the purposeful application of creativity and imagination to learning situations in both Design and Technologies and Digital Technologies.

Learning progression in project management, collaboration, teamwork, enterprise and marketing

In the early years students are actively involved in projects: they plan (with teacher support) simple steps and follow directions to complete their own projects or manage their own role within team projects. As they progress through primary school they take more responsibility for specific roles within a project with increasing levels of collaboration and team work. In the early years of secondary school students begin to manage projects, with support from peers and teachers. In the latter years students use their increasing skills to fully manage projects and teams. They use digital tools to support their project management. They coordinate teams and collaborate with others locally and globally.

Enterprise and marketing in the early years of school focuses on local audiences and promotion through displays and verbally sharing products and services from a personal perspective. In the later years enterprise and marketing becomes more oriented to the perspectives of others, with the use of more sophisticated mechanisms for sharing services and products. Students become more enterprising in developing and promoting designed solutions. Marketing also becomes more sophisticated, in that it draws upon social and sustainability principles, leading to an increasing consideration of ethics and futures thinking.

Implementing the curriculum

Students will undertake design projects that involve the three processes and production skills: critiquing, exploring and investigating; generating, developing and evaluating ideas; and planning, producing and evaluating designed solutions. By the end of each band students will have had the opportunity to design, produce and evaluate designed solutions for each of the identified Technologies contexts. To provide breadth of study, students should complete at least one product design project, one service design project and one environment design project, within each band. The combination of contexts and types of solutions is a school decision.

Typically a unit of work in Design and Technologies would feature the integration of Design and Technologies knowledge and understanding content descriptions (Technologies and society and at least one Technologies context) through the Design and Technologies processes and production content descriptions.

Content descriptions for technologies contexts provide the stimulus for teachers to develop teaching and learning programs. It may be possible to address multiple technologies contexts in a unit.

Design in the Australian Curriculum

In the Australian Curriculum, design thinking and design processes feature significantly in Technologies, in particular in Design and Technologies and The Arts. Critical and creative thinking is closely associated with design thinking and design processes. It is described in the Critical and creative thinking general capability and is developed in all learning areas.

The Design and Technologies processes and production skills strand develops design thinking and design processes. Designing in Design and Technologies involves design thinking and the explicit use of design processes to design solutions for an identified user and purpose (usually to fulfil some practical purpose in the wider world). It involves developing designed solutions that have taken into consideration a range of factors related to the identified need, such as functionality, sustainability and obsolescence, and that can be evaluated using identified criteria for success.

Food and fibre production in the Australian Curriculum

Food and fibre production provides a context and body of knowledge, understanding and skills in the Australian Curriculum: Technologies. Students will also have opportunities across the learning areas from Foundation to Year 10 to learn about the production of the food they eat, fibres they use and the environment in which they live. This learning will address key processes of production, marketing, consumption, sustainable use of resources and waste recycling.

ACARA will document how food and fibre production is addressed across the Australian Curriculum. This will provide a framework for all young Australians to understand and value food and fibre production across learning areas and specifically within the Technologies learning area as a context for core learning in F–8. States and territories may offer additional learning opportunities in Years 9–12.

Food and nutrition in the Australian Curriculum

Student attitudes and behaviour regarding healthy living can be influenced by providing them with opportunities to learn about where their food comes from, how it is produced and how they can prepare it. In the Australian Curriculum students will be taught about food and nutrition in Health and Physical Education (HPE) and in the Technologies learning area through Design and Technologies from Foundation to Year 8. In Technologies students will learn how to apply nutrition knowledge through the design and preparation of food for specific purposes and users.

ACARA will document how food and nutrition are addressed across the Australian Curriculum. This will provide a framework for all young Australians to understand and value food and nutrition across learning areas and specifically within the Technologies learning area as a context for core learning in F–8. States and territories may offer additional learning opportunities in Years 9–12.

Draft Design and Technologies Foundation to Year 10 scope and sequence

Strand		Years F–2	Years 3–4	Years 5–6	Years 7–8	Years 9–10
Design and Technologies knowledge and understanding	*Technologies and society*	2.1 Understand how people, including designers and technologists, design and produce familiar products, services and environments to meet personal and local community needs	4.1 Recognise factors that impact on the design of products, services and environments including the role of designers and technologists to meet local community needs	6.1 Identify how designers and technologists address competing considerations and trade-offs in the design of products, services, environments and systems	8.1 Examine and prioritise competing factors in the development of technologies and designed solutions to meet community needs including ethics, social values and sustainability	10.1 Critically analyse and explain how the design and production of designed solutions for global preferred futures involves complex design processes and decisions, and can require expertise from specialist occupations
					8.2 Understand the ways in which products, services and environments evolve locally and globally through creativity, innovation and enterprise	10.2 Explain factors influencing design and how products, services and environments evolve and the impact of emerging technologies on design decisions and preferred futures
	Technologies contexts	*By the end of Year 2 students will have had the opportunity to design, produce and evaluate designed solutions in at least the three technologies contexts below.*	*By the end of Year 4 students will have had the opportunity to design, produce and evaluate designed solutions in at least the three technologies contexts below.*	*By the end of Year 6 students will have had the opportunity to design, produce and evaluate designed solutions in at least the four technologies contexts below.*	*By the end of Year 8 students will have had the opportunity to design, produce and evaluate designed solutions in at least the four technologies contexts below.*	*By the end of Year 10 students will have had the opportunity to design, produce and evaluate at least four designed solutions focused on a range of materials and technologies specialisations.*
	Materials and technologies specialisations	2.2 Investigate and play with technologies, materials and systems used to identify properties and create designed solutions for personal and local community needs	4.2 Investigate the effectiveness and sustainability of a range of technologies, materials, systems, tools and equipment that support local community needs	6.2 Identify and explain properties and characteristics of a range of technologies, materials, systems tools and equipment and evaluate the impact of their use locally, regionally and globally	8.3 Describe ways to create effective designed solutions that consider ethics, social values and sustainability factors through selecting and combining properties and characteristics of resources	10.3 Investigate and make judgments about how properties and characteristics of resources can be combined to design and produce designed solutions appropriate for purpose, with consideration of ethics, social values and sustainability factors
	Food and fibre production	2.3 Investigate sustainable systems of care for plants and animals that are grown, raised and processed for food, clothing and shelter for an identified purpose	4.3 Recognise the contribution food and fibre production and food technologies make to modern and traditional societies	6.3 Recognise that sustainable resource management is essential in food and fibre production	8.4 Explain how food and fibre is produced in dynamic and interactive systems	
	Engineering principles and systems	2.4 Explore how mechanical, electrical, electronic technologies use pushes and pulls to create movement in systems and products	4.4 Investigate how forces and the properties of materials affect the behaviour and performance of a product or system and how systems can be enhanced through appropriate manipulation and design	6.4 Explain how forces or electrical energy can be used to control movement, sound or light in a product or system and consider how material properties and construction processes influence the design and construction of structures	8.5 Analyse how motion, force and energy, are related and interact with the properties of materials and components in electromechanical systems and the ways these systems can be manipulated and controlled in simple, engineered designed solutions	
	Food technologies			6.5 Investigate how food preparation techniques can be selected and used to design and produce nutritious food	8.6 Incorporate principles of food processing, preparation and presentation in designing solutions for healthy eating	
Design and Technologies processes and production skills	*Critiquing, exploring and investigating*	2.5 Explore and investigate needs or opportunities for designing and the resources required to realise designed solutions	4.5 Critique, explore, investigate needs or opportunities for designing and test and evaluate a variety of technologies, materials, systems, tools and techniques to produce designed solutions	6.6 Critique, explore and investigate needs or opportunities for designing and analyse and select appropriate materials, components, tools and processes to achieve intended designed solutions	8.7 Critique, explore and investigate needs or opportunities and a range of materials, components, tools and techniques to collaboratively develop produce creative and sustainable designed solutions in response to design briefs	10.4 Critique, explore and investigate needs or opportunities to develop design briefs and justify the selection of an increasingly sophisticated range of technologies, materials and systems to produce creative designed solutions
	Generating, developing and evaluating ideas	2.6 Visualise, generate, develop, evaluate and communicate design ideas through a range of media including digital technologies	4.6 Generate, develop, evaluate, communicate and document design ideas and design decisions using both manual and digital technologies	6.7 Generate, develop, evaluate, communicate and document design ideas and processes for a range of audiences, using some relevant technical terminology	8.8 Generate, develop, communicate, test, evaluate and communicate design ideas, plans and processes for identified needs and audiences using manual and digital technologies and collaborative techniques	10.5 Apply design thinking, creativity, innovation, enterprise and project management skills to develop, evaluate, modify and communicate design ideas; sequence production and management plans using digital technologies
	Planning, producing and evaluating designed solutions	2.7 Use design ideas, materials, components, tools and equipment to play, plan, safely produce and evaluate designed solutions based on personal criteria for technologies contexts	4.7 Select materials, components, tools and equipment using safe and sustainable work practices to produce and evaluate designed solutions based on identified criteria for success for technologies contexts	6.8 Develop project plans, manage production processes and procedures when safely using a variety of technologies, materials, systems, tools, equipment and techniques when producing and evaluating designed solutions for technologies contexts	8.9 Competently and safely use a broad range of materials, components, tools and techniques when designing, and project managing production of sustainable designed solutions for technologies contexts and evaluating using identified criteria for success	10.6 Work flexibly to safely test, select, justify and use appropriate technologies to design, produce and evaluate designed solutions using identified criteria for success and suggesting improvements to design processes

Note: Students will spend a substantial amount of time engaged in developing processes and production skills

Draft Design and Technologies Foundation to Year 10 curriculum

Foundation to Year 2

Foundation to Year 2 Band Level Description

Learning in Design and Technologies builds on concepts, skills and processes developed in the Early Years Learning Framework, revisiting and strengthening these as needed, with a focus on play.

By the end of Year 2 students will have had the opportunity to design, produce and evaluate designed solutions in at least the following technologies contexts: Materials and technologies specialisations; Food and fibre production (including Food technologies); and Engineering principles and systems. Students should have opportunities to experience designing, producing and evaluating services and environments as well as products.

In Foundation to Year 2 the curriculum focuses on students investigating and playing with technologies, materials, systems, tools and equipment, including their purpose and how they meet personal and social needs within local settings. They develop an understanding of how society and environmental sustainability factors influence design and technologies decisions. They plan (with teacher support) simple steps and follow directions to complete their own or group design ideas or projects, and manage their own role within team projects.

Using a range of materials and technologies including digital technologies they draw, model and explain design ideas; label drawings; draw objects as two-dimensional images from different views; draw products and simple environments and verbalise design ideas.

Students evaluate designed solutions using questions such as 'How does it work?', 'What purpose does it meet?', 'Who will use it?', 'What do I like about it?' or 'How can it be improved?' They begin to consider the impact of their decisions and of technologies on others and reflect on their participation in a design process. This involves students developing new perspectives, and engaging in different forms of evaluating and critiquing products, services and environments based on personal criteria.

Students are aware of others around them and the need to work safely and collaboratively when making designed solutions.

Foundation to Year 2 Content Descriptions and Elaborations

Design and Technologies knowledge and understanding

2.1 Understand how people, including designers and technologists, design and produce familiar products; services; and environments to meet personal and local community needs

LIT; NUM; ICT; CCT; PSC; EU; ICU; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- exploring how local existing technologies are designed by people for a purpose and meet social needs, for example the range of shelters provided for the public in a local community; graphical displays for school and community events with an enterprising focus; communicating with others using web cams

- asking questions about natural and managed environments when selecting materials and designing and making products, for example harvesting produce from the school garden and using recycled clothing
- making design decisions based on personal and family needs, for example downloading and comparing recipes to suit available cooking facilities such as in the bush compared to in a kitchen
- critiquing products, services and environments for their sustainability, for example a sustainable system for organically or hydroponically growing a vegetable crop from seed or seedling to harvest

2.2 Investigate and play with technologies, materials and systems used to identify properties and create designed solutions for personal and local community needs

LIT; ICT; CCT; PSC; EU; ICU

- investigating local technological designed solutions to meet individual, family and community needs, for example fabrics used for sports clothing, waterproofing play spaces or toys, sustainable use of materials, reducing risk from fires
- developing new meanings for objects and action during play, for example exploring how household packaging and toys can be used to represent other objects during imaginary play and to test designed solutions
- exploring systems used in the classroom or community for dealing with problems and needs, for example storage systems for equipment, traffic system flow for routes to school
- investigating facilities in local environments such as bike tracks and sporting fields and infrastructure that provides accessibility for different groups or least environmental impact
- exploring materials, components, tools and equipment to discover their potential uses when making products or modelling services and environments, for example when designing and making clothes and shelter

2.3 Investigate sustainable systems of care for plants and animals that are grown, raised and processed for food, clothing and shelter for an identified purpose

LIT; NUM; ICT; CCT; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- investigating systems of care for supporting the needs of plants and animals for growth and enterprise, and how humans manage these processes on farms or in glasshouses, for example when designing a system for growing a food plant from seed or seedling and using the food grown as an ingredient in recipes
- identifying products that can be designed and produced from plants and animals, for example food products, paper, fabrics and yarns, and fertilisers
- identifying and categorising a wide range of foods into food groups
- examining how people from different cultures design and create different cuisines based on the plants and animals in their region

- considering the suitability of a range of tools when cultivating gardens, mulching and building garden structures, preparing and cooking specific recipes

2.4 Explore how mechanical, electrical and electronic technologies use pushes and pulls to create movement in systems and products

LIT; NUM; ICT; CCT; PSC; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES

- exploring how the principles of push and pull are used in the design of toys
- identifying and experimenting with components such as wheels, balls, slides, springs, batteries and available local materials to solve problems requiring movement
- exploring a system such as a marionette or Indonesian Wayang Kulit shadow puppet to see that by combining materials with forces movement can be created
- combining materials and using forces in design, for example designing the door on a cage or a simple conveyor belt to move materials short distances
- selecting materials to demonstrate an understanding of material properties appropriate for particular designed solutions, for example materials that enable sliding or that float

Design and Technologies processes and production skills

2.5 Explore and investigate needs or opportunities for designing, and the resources needed to produce designed solutions

LIT; NUM; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; SUSTAINABILITY

- identifying and gathering materials, components, tools and equipment to generate personal design ideas and discussing possible designed solutions based on experience and limited research, for example asking adults for advice
- considering why the development of sustainable designed solutions is desirable
- identifying one common testing method, and recording results, for example taste-testing comparisons of a food product made by the class and recording results in a digital form
- comparing potential materials for their sustainability when making a designed solution

2.6 Visualise, generate, develop, evaluate and communicate design ideas through a range of media including digital technologies

LIT; NUM; ICT; CCT; ICU; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES

- comparing and contrasting features of existing products to provide new ideas, for example when exploring toys with several movable parts with the view to designing and making a simple puppet with one moving part

- communicating design ideas using modelling and manually and digitally produced two-dimensional drawings showing different views (top view and side view) and labels to provide details, for example modelling of packaging for a product, or a new environment such as a cubby house or animal shelter
- recording a judgment about design ideas with teacher guidance, for example expressing own likes and dislikes about a design idea

2.7 Use design ideas, materials, components, tools and equipment to play with, plan, safely produce and evaluate designed solutions based on personal criteria for technologies contexts

LIT; NUM; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA’S ENGAGEMENT WITH ASIA; SUSTAINABILITY

- referring to their identified criteria, design plans and drawings when producing and evaluating designed solutions to check that planned features have been included
- using lists or storyboarding when planning and making, for example when planning a digital animation or an electronic planting calendar
- using everyday materials in new ways, for example when using recycled materials to design, produce and model a constructed environment
- learning and practising a range of technical skills, for example joining techniques when making products and systems
- reflecting on the processes and challenges of designing and producing a solution and sharing these reflections using digital technologies, for example when growing a food product, designing a structure to take a load or producing a nutritious snack

Foundation to Year 2 Achievement Standard

By the end of Year 2, students describe the purpose of familiar products, services and environments; they identify who designs and produces them, and how they meet the needs. of users and affect others. They identify the properties of some materials, systems and technologies for a range of technologies contexts.

Students identify needs or opportunities and suggest resources needed for their designed solutions. Using a range of media and methods including digital technologies, they develop, communicate and evaluate design ideas and choose the best ideas. With guidance they safely use materials, components, tools and equipment and follow steps to produce products, services or environments. They use identified criteria to evaluate these designed solutions predominantly in relation to personal needs.

Years 3 and 4

Years 3 and 4 Band Level Description

Learning in Design and Technologies builds on concepts, skills and processes developed in earlier years, and teachers will revisit and strengthen these as needed.

By the end of Year 4 students will have had the opportunity to design, produce and evaluate designed solutions in at least the following technologies contexts: Materials and technologies specialisations; Food and fibre production (including Food technologies); and Engineering principles and systems. Students should have opportunities to experience designing, producing and evaluating services and environments as well as products.

In Years 3 and 4 the curriculum focuses on students developing a sense of self and ownership of their ideas and thinking in relation to their peers, communities and as a consumer. Students explore creative and innovative ideas and alternatives and establish their own design skills. Students learn to harness their creative ideas and imaginative approaches to achieve designed products, services and environments through planning and awareness of the properties and characteristics of materials and the use of tools and equipment. They learn to reflect on their actions to refine their working and develop their decision-making skills.

Using manual and digital technologies students represent ideas, for example clarifying ideas by drawing freehand annotated diagrams; modelling objects as three-dimensional images from different views by visualising rotating images and using materials. Students recognise techniques for documenting design and production ideas such as basic drawing symbols and use simple flow diagrams.

Students examine personal, social and environmental sustainability implications of existing products and processes to raise awareness of their place in the world. They compare their predicted implications with real-world case studies, and recognise that designs and technologies can affect people and their environments. They become aware of the role of designers and technologists and how they think about the way a product might change in the future.

Students become aware of the appropriate ways to manage their time and focus. With teacher guidance, they identify and list criteria for success and the major steps needed to complete a design task. They demonstrate an understanding of the importance of planning when designing solutions, in particular when collaborating.

Students identify safety issues and learn to follow simple safety rules when producing designed solutions.

Years 3 and 4 Content Descriptions and Elaborations

Design and Technologies knowledge and understanding

4.1 Recognise factors that impact on the design of products, services and environments including the role of designers and technologists to meet local community needs

LIT; NUM; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- exploring factors that impact on design decisions, for example the impact of social values of people on the development of technologies to meet their needs or the impact of natural disasters on design of constructed environments
- investigating materials, components, tools and equipment, including using digital technologies, to discover their characteristics and properties, how they can be used sustainably and their impact in the future
- critiquing designed products, services and environments to establish the factors that influence the design and use of common technologies, for example the characteristics that contribute to an energy-efficient cooking utensil such as a wok; the suitability and sustainability of particular timbers
- exploring materials for their appropriateness, for example materials for a new sun-shade product
- examining the suitability of a service or everyday system and proposing improvements, for example a water saving system for a bathroom at home
- considering the impact of environments on users, for example a school vegetable garden, a protected outdoor play area

4.2 Investigate the effectiveness and sustainability of a range of technologies, materials, systems, tools and equipment that support local community needs

LIT; ICT; CCT; PSC; EU; ICU

- investigating technologies, materials, systems, tools and equipment for suitability when designing and making a product, service or environment, for example a toy for a young child, a composting system for household waste management, raised garden beds for the elderly
- conducting experiments and tests to understand the properties of materials, for example strength, durability, warmth, elasticity
- exploring local constructed environments to compare how buildings were constructed in the past and in the present
- comparing how different components interrelate and complement each other in a finished product, service or environment, for example investigating joining processes for a variety of materials in the production of common products
- critiquing products, services and constructed environments from a range of technologies contexts with consideration of sustainable practices and impact on the local community
- investigating the mass production of products to ensure standardisation, for example students setting up a production line to produce a product for a school fete

4.3 Recognise the contribution food and fibre production and food technologies make to modern and traditional societies

LIT; NUM; ICU; ASIA AND AUSTRALIA’S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES

- reading the labels on food products to identify their country of origin
- identifying the areas in Australia and Asia where major food or fibre plants and animals are grown or bred when designing environments for food and fibre production, for example the wheat and sheep belts, areas where sugar cane or rice are grown, northern Australia's beef industry
- exploring environments which could improve plant or animal production, for example a greenhouse, animal housing, safe bird shelters
- describing ideal conditions for successful plant and animal production including how climate and soils affect production and availability of foods, for example Aboriginal seasons and food availability when designing production systems
- recognising the benefits contemporary food technology provides for health and food safety and ensuring that a wide variety of food is available to provide a balanced diet, for example a healthy lunch for a student in Year 3 using produce from the school vegetable garden
- investigating contemporary methods of food preservation such as freezing and preserving when designing a food product

4.4 Investigate how forces and the properties of materials affect the behaviour and performance of a product or system and how systems can be enhanced through appropriate manipulation and design

LIT; NUM; CCT; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES

- using available local materials and experimentation to solve problems requiring forces including identifying inputs (what goes in to the system), processes (what happens within the system) and outputs (what comes out of the system), for example sports shoes that use friction
- conducting investigations to understand the properties and characteristics of materials and forces that may affect the behaviour and performance of a product or system, for example woomera design
- deconstructing a product or system to identify how motion and forces affect behaviour
- exploring how movement can be initiated by combining materials and using forces, for example releasing a wound rubber band to propel a model boat
- examining models to identify how forces can be used in the design of a toy
- identifying and exploring an engineered product or system to explore properties and construction relationships when designing and producing, for example a structure that floats; a bridge to carry a load; a waterproof container

Design and Technologies processes and production skills

4.5 Critique, explore and investigate needs or opportunities for designing and test and evaluate a variety of technologies, materials, systems, tools and techniques to produce designed solutions

LIT; NUM; ICT; PSC; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; SUSTAINABILITY

- discussing the different uses of materials in a range of products
- testing a range of materials under different conditions for suitability including sustainability considerations and identifying appropriate tools, equipment and techniques
- selecting materials and appropriate joining techniques to create working models
- compiling the criteria for success and planning processes as a class, for example recording a procedure or creating time plans
- examining the structure and production of everyday products, services and environments to enhance their own design ideas
- comparing the amount of waste that would be produced from different design and development options

4.6 Generate, develop, evaluate, communicate and document design ideas and design decisions using manual and digital technologies

LIT; NUM; ICT; CCT; PSC; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; SUSTAINABILITY

- generating a range of design ideas for intended products, services, environments or systems
- visualising and exploring design ideas by creating thumbnail drawings, models and labelled drawings to explain features and modifications
- planning, sharing and documenting ideas and processes using digital tools such as a class blog or collaborative document
- exploring ways of joining, connecting and assembling components that ensure success, and the impact ICT has on these processes
- evaluating and revising design ideas, choosing one that meets class-developed criteria for success and includes consideration of ethics, social values and sustainability
- recognising the sustainability implications of selected designed solutions

4.7 Select materials, components, tools and equipment using safe and sustainable work practices to produce and evaluate designed solutions based on identified criteria for success for technologies contexts

LIT; NUM; ICT; PSC; EU; ICU; SUSTAINABILITY

- using tools accurately when measuring, marking and cutting; and explaining why accuracy is important in designing and making, for example creating a template

- using appropriate technology terms to confidently describe and share with others procedures and techniques for making, for example cutting and joining materials
- selecting and using materials, components, tools, equipment and processes with consideration of the environmental impact at each stage of the production process
- demonstrating safe, responsible and cooperative work practices when making designed solutions, for example building a model windmill with moving sails
- managing time and resource allocation throughout production
- reflecting on designed solutions to critique and assess suitability, sustainability and enterprise opportunities and how well they meet identified criteria for success

Years 3 and 4 Achievement Standard

By the end of Year 4 students explain how products, services and environments have been designed to best meet people's current and future needs in the local community and describe how designers and technologists contribute to meeting needs. They describe the properties and characteristics of technologies, materials and systems for a range of technologies contexts.

Students describe design situations. They use a range of media and methods, including digital technologies to investigate, generate, communicate and evaluate design ideas, including making scaled models and annotating drawings. Students plan and sequence major steps in design and production and make design decisions. They document their design decisions and processes. They adopt sustainable and safe work practices as they use appropriate materials, components, tools and equipment correctly to produce designed solutions for a range of technologies contexts. They judge the success of the product, service or environment against student-identified criteria.

Years 5 and 6

Years 5 and 6 Band Level Description

Learning in Design and Technologies builds on concepts, skills and processes developed in earlier years, and teachers will revisit and strengthen these as needed.

By the end of Year 6 students will have had the opportunity to design, produce and evaluate designed solutions in at least four technologies contexts: Materials and technologies specialisations; Food and fibre production; Engineering principles and systems and Food technologies. Students should have opportunities to experience designing, producing and evaluating services and environments as well as products.

In Years 5 and 6 the curriculum focuses on students critically examining technologies, materials, systems, tools and equipment that are used regularly in the home and in local, national, regional or global communities, with consideration of society, ethics and social and environmental sustainability factors. Students consider why and for whom technologies were developed.

Students engage with ideas beyond the familiar, exploring how design and technologies and the people working in a range of technologies contexts contribute to daily life. They seek to explore innovation and establish their own design capabilities. Students are given new opportunities for clarifying their thinking, creativity, analysis, problem-solving and decision-making.

Students work collaboratively with others to identify and sequence steps needed for a design task. They negotiate and develop plans to complete design tasks, and follow plans to complete design tasks safely, making adjustments to plans when necessary. They explore trends and data to imagine what the future will be like and suggest design decisions that contribute positively for people in the future.

Using manual and digital technologies, students represent objects and ideas in a variety of forms such as thumbnail sketches, models, drawings, diagrams and storyboards to illustrate the development of designed solutions. They use a range of techniques such as labelling and annotating sequenced sketches and diagrams to illustrate how products function; and recognise and use a range of drawing symbols in context to give meaning and direction.

Students identify, plan and maintain safety standards and practices when making designed solutions.

Years 5 and 6 Content Descriptions and Elaborations

Design and Technologies knowledge and understanding

6.1 Identify how designers and technologists address competing considerations and trade-offs in the design of products, services, environments and systems

LIT; NUM; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- evaluating the sustainable use of technologies, materials, systems, tools and equipment, for example materials can be recycled or re-used to reduce waste; systems may benefit some, but disadvantage others
- considering the impact designed products, services or environments have in relation to sustainability and on local, regional and global communities
- reflecting on the features of designed solutions that ensure safety and wellbeing of users, for example smoke alarms
- reflecting on products, taking into account aesthetics, function and sustainability, for example a textile product that provides protection and is appealing; a motor that moves a vehicle and uses a sustainable power source
- reflecting on a service to identify components that contribute to its success, for example, communication in the school or communication of a message to a wide audience; a system that manages an aspect of the environment; a campaign such as Clean Up Australia Day and how it varies in different communities
- identifying an environment to review how a range of functions can be met, for example a modification to a home to reduce environmental impact; restoring a natural environment and retaining access for the public

6.2 Identify and explain properties and characteristics of a range of technologies, materials, systems, tools and equipment and evaluate the impact of their use locally, regionally and globally

LIT; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; SUSTAINABILITY

- investigating the properties of materials for the design and construction of a sustainable household item, for example a product for storing harvested water
- evaluating the functional properties of a specific purpose household system, for example a security system
- critically examining the materials and systems used in a public use system and how that system can affect the way people live, for example a community exercise environment or arts facility
- evaluating the use of computer-aided manufacturing in terms of cost and impacts on local and regional designers, producers and enterprises
- comparing the design and production of products, services and environments in Australia and a country in the Asia region
- evaluating products, services and environments from a range of technologies contexts with consideration of ethics and sustainability

6.3 Recognise that sustainable resource management is essential in food and fibre production

LIT; NUM; ICT; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- investigating and experimenting with different methods of preparing soil and their effect on soil quality and sustainability or pest and disease solutions, for example when designing a garden for a community group
- identifying methods of applying, conserving and recycling nutrients in food and fibre production, for example low-input sustainable agriculture (LISA), in a range of environments including Australia and the countries of Asia, for example when designing a sustainable school vegetable garden
- considering the relationship between plant and animal types and environmental suitability, for example when designing suitable environments for plants or animals
- sequencing the steps in converting an 'on-farm' food or fibre product into a product suitable for retail sale, that is, the 'paddock to plate' supply chain, for example when designing the production of preserved produce from a school vegetable garden for sale at a school fete
- exploring and comparing the efficiency of different irrigation methods in plant production systems and the impact that developments in ICT have had on improving their effectiveness, for example when designing a sustainable irrigation system which could be used in a garden

6.4 Explain how forces or electrical energy can be used to control movement, sound or light in a product or system and consider how material properties and construction processes influence the design and construction of structures

LIT; NUM; ICT; CCT; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES

- deconstructing a product or system to discover how movement, sound or light can be controlled, for example taking apart a torch or buzzer and exploring circuit design
- conducting investigations to understand the properties of materials to solve problems requiring the control of movement, sound or light, for example directing light through a maze using mirrors
- exploring how biomimicry can be used by engineers and designers, for example the ways plant and animal adaptations can be copied to solve human challenges
- recognising the need to carefully plan and select components for a system to perform a specific task, for example when designing a pet animal enclosure
- creating models to demonstrate how to control movement, sound or light in structures, for example to create the tallest freestanding interactive billboard from cartridge paper
- evaluating a control system for an identified need or opportunity and user, for example a system for controlling water flow through an environment

6.5 Investigate how food preparation techniques can be selected and used to design and produce nutritious food

LIT; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- experimenting with combining ingredients and techniques to design and produce food products
- examining the relationship between how food is processed, prepared and distributed and the impact on its nutrient value, for example when designing a food service system
- exploring food preparation techniques used in different cultures including those from the Asia region and the impact of these on nutrient retention, taste and palatability
- describing safety considerations for food storage and preparation at home and school
- considering environmental impacts alongside nutritional benefits when designing and preparing appealing and healthy meals for selected groups
- using work practices that demonstrate an understanding of nutrition, wellbeing, environmental considerations and food safety when designing and producing a food product

Design and Technologies processes and production skills

6.6 Critique, explore and investigate needs or opportunities for designing, and analyse and select appropriate materials, components, tools, equipment and processes to achieve intended designed solutions

LIT; NUM; ICT; PSC; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- deconstructing the components, structure and intentions of products, services or environments to identify the importance of complementary parts of working, everyday systems
- exploring and testing a range of materials, components, tools and equipment to determine the appropriate resources needed to make products, services or environments, for example a moving vehicle
- exploring the steps involved in the process to satisfy the design brief, need or opportunity
- independently and collaboratively identifying criteria for success, processes and planning, for example using visual representations such as a flowchart
- examining the environmental and social impacts of selecting particular materials, components, tools and equipment, for example exploring how to minimise material use and how to manage waste
- investigating everyday, designed solutions to make suitable, quality decisions that meet the design brief, challenge or scenario

6.7 Generate, develop, evaluate, communicate and document design ideas and processes for a range of audiences, using some relevant technical terminology

LIT; NUM; ICT; CCT; ICU; ASIA AND AUSTRALIA’S ENGAGEMENT WITH ASIA; SUSTAINABILITY

- reflecting on prior knowledge, skills and research to generate a range of design ideas for products, services or environments.
- examining in detail the essential features of existing processes to inform project planning including safe and sustainable work practices that minimise damage to the environment
- exploring alternative design ideas and considering implications for preferred futures to broaden the appeal and acceptance of the design idea
- analysing and modifying design ideas to enhance and improve the sustainability of the product, service, environment or system
- generating ideas considering the selection of materials and joining techniques that match the purpose of a product
- representing and communicating design ideas using drawing and modelling standards including the use of digital technologies, for example scale, symbols and codes in diagrams, pictorial maps, aerial views using web mapping service applications

6.8 Develop project plans, and manage production processes and procedures when safely using a variety of technologies, materials, systems, tools, equipment and techniques when producing and evaluating designed solutions for technologies contexts

LIT; ICT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; SUSTAINABILITY

- outlining the planning and production steps required to produce a product, service or environment for a specific purpose using digital technologies
- matching material and joining techniques to the design intention, for example accurately cutting and sewing the fabric pieces which form the designed patterns to produce a community banner
- working safely, responsibly and cooperatively to ensure safe work areas, including using safety equipment and safe work practices when making designed solutions, for example when producing a water-resistant, floating craft or a model of a sustainable outdoor shelter
- reflecting on how well their designed solutions ensure safety and wellbeing of users and consumers and meet the needs of communities and different cultures
- considering criteria related to ethics, social values, environmental impact and the future use and application of the solution when evaluating the benefits and costs of production processes

Years 5 and 6 Achievement Standard

By the end of Year 6 students identify how designed products, services and environments may involve competing considerations and trade-offs when sustainability and ethics are considered. They explain how the properties and characteristics of technologies, materials, and systems impact designed solutions and influence design decisions for a range of technologies contexts. They describe how design and technologies contribute to daily life.

Students identify key aspects of a design situation when considering the development of products, services and environments and establish criteria for the evaluation of designed solutions. They communicate, evaluate and modify creative design ideas using a variety of techniques. They select and use appropriate digital technologies to collaborate on, investigate, generate, communicate and document design ideas and processes using technical terminology. Students develop project plans and production processes and procedures. They select and use materials, components, tools, equipment and techniques correctly and safely to produce designed solutions that meet an identified need. They evaluate the product, service or environment against criteria for success.

Years 7 and 8

Years 7 and 8 Band Level Description

Learning in Design and Technologies builds on concepts, skills and processes developed in earlier years, and teachers will revisit and strengthen these as needed.

By the end of Year 8 students will have had the opportunity to design, produce and evaluate designed solutions in at least four technologies contexts: Materials and technologies specialisations, Food and fibre production, Engineering principles and systems, and Food technologies. Students should have opportunities to experience designing, producing and evaluating services and environments as well as products.

In Years 7 and 8 the curriculum focuses on students investigating and selecting from a range of technologies, materials, systems, tools and equipment. They consider the ways properties and characteristics of resources can be combined to create and produce sustainable designed solutions to problems for individuals and the community considering society and ethics, and economic, environmental and social sustainability factors. Students use creativity, innovation and enterprise skills with increasing independence and collaboration.

Students respond to feedback from others about design processes used and evaluate designed solutions for preferred futures. They investigate design and technology professions and the contributions that each makes to society locally and globally through creativity, innovation and enterprise. Students evaluate design ideas and technologies in relation to who does and does not benefit from them.

With greater autonomy, students identify the sequences and steps involved in design tasks. They develop plans to manage design tasks, including safe and responsible use of materials and tools, and apply management plans to successfully complete design tasks.

Using manual and digital technologies such as three-dimensional communication software they generate and clarify ideas through sketching, modelling, perspective and orthogonal drawings using a range of symbols and technical terminology in a range of contexts to produce patterns, annotated concept sketches and freehand drawings, using scale, pictorial and aerial views to draw environments.

Students establish safety procedures that minimise risk and manage a project with safety and efficiency in mind when making designed solutions.

Years 7 and 8 Content Descriptions and Elaborations

Design and Technologies knowledge and understanding

8.1 Examine and prioritise competing factors in the development of technologies and designed solutions to meet community needs including ethics, social values and sustainability

LIT; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA’S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- considering factors that influence the selection of appropriate materials, components, tools and equipment, for example Aboriginal and Torres Strait Islander peoples' sustainable practices, custodianship and connection to Country
- investigating how ethics, social values and sustainability considerations impact on design and technologies, for example animal welfare, genetic engineering, organic farming practices, intellectual property infringement, off-shore manufacturing in Asia
- analysing an environment to determine if it meets personal or community needs, for example consulting with family members when designing an enhancement to an indoor or outdoor home environment
- critiquing competing factors that influence the design of services, for example a natural disaster warning system for a community

8.2 Understand the ways in which products, services and environments evolve locally and globally through creativity, innovation and enterprise

LIT; CCT; ICU; SUSTAINABILITY

- examining the changes in a product over time, for example the telephone
- exploring the factors that have led to the evolution of products and related services and predicting future developments, for example home entertainment in the past, now and in the future
- exploring the use and development of systems for navigating unfamiliar environments, for example a system to assist tourists to engage with a heritage area, traceability of origins of clothing and foods
- investigating traditional and contemporary design and technologies and predicting how they may change in the future
- identifying needs and new opportunities for design, for example promotion and marketing of designed solutions

8.3 Describe ways to create effective designed solutions that consider ethics, social values and sustainability factors through selecting and combining properties and characteristics of resources

LIT; NUM; ICT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES

- investigating and selecting from a broad range of technologies, materials, systems, tools and equipment when designing for a range of technologies contexts
- considering the ways in which the properties and characteristics of resources will impact on designed solutions, for example the choice of building materials and housing design in Australia and the countries of Asia; the density of a fabric influences choice of equipment

- working safely, for example creating a safety information video that details risk management practices for using a piece of equipment in the classroom or within a community
- evaluating products and services for the individual and the community considering ethics and social factors, for example a musical instrument for a school musical group; a short video encouraging individuals to increase their use of public transport in the local area
- evaluating environments that have been designed in consultation with community groups, for example a bush tucker community garden developed in consultation with local Elders

8.4 Explain how food and fibre are produced in dynamic and interactive systems

LIT; NUM; ICT; PSC; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- comparing land and water management methods in traditional Aboriginal systems, countries of Asia and in contemporary Australian food and fibre production, for example comparing traditional fish traps and current fish farming when designing food and fibre production systems
- investigating the manipulation of plant and animal growth through natural and artificial means when producing food and fibre products
- evaluating emerging production methods in terms of productivity, profitability and sustainability and how recent developments in ICT could be used to enhance these systems, for example global positioning system (GPS) when designing food and fibre production systems
- describing physical, chemical and biological characteristics of soil and their effects on plant growth when producing food and fibre products
- investigating different animal grazing strategies, including farmed wildlife such as emu, and their effects on product quality, for example meat tenderness, wool fibre diameter (micron), milk fat and protein content when producing food and fibre products
- recognising the importance of food and fibre production to Australia's food security and economy including exports and imports to and from Asia when critiquing and exploring food and fibre production

8.5 Analyse how motion, force and energy are related and interact with the properties of materials and components in electromechanical systems and the ways these systems can be manipulated and controlled in simple, engineered designed solutions

LIT; NUM; ICT; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES

- identifying opportunities in the local community that require engineered designed solutions

- investigating influences impacting on manufactured products and processes such as historical developments, society, new materials, control systems and biomimicry, for example the development of Velcro
- experimenting with technologies, materials, systems, tools and equipment to select the most appropriate principles and systems on which to base design ideas, for example structural components to be tested for strength
- calculating an engineered system's outputs, for example speed, brightness of light, volume of sound
- creating prototypes and jigs to test functionality, including the use of rapid prototyping tools such as 3D printers
- using code to control systems, for example code to program a microcontroller or a simple, object-based coding application to program a system such as a remote-controlled car or simple robotic arm

8.6 Incorporate principles of food processing, preparation and presentation in designing solutions for healthy eating

LIT; NUM; ICT; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- considering traditional and contemporary methods of food preparation used in a variety of societies, including Aboriginal and Torres Strait Islander society and the countries of the Asia region, when designing solutions for healthy eating
- understanding the need to modify ingredients in recipes to enhance health benefits
- understanding the changes that occur in food during preparation, for example the browning of cut fruit, the absorption of water when cooking rice
- exploring ingredients in a meal to meet particular nutritional or dietary requirements (such as coeliac) and reflect a variety of social influences
- experimenting with plating and presenting food for visual appeal and documenting these experiments in digital form such as photographs or video
- processing and preparing high-quality, safe food items when designing solutions for healthy eating

Design and Technologies processes and production skills

8.7 Critique, explore and investigate needs or opportunities for designing and a range of materials, components, tools and techniques to collaboratively develop and produce creative and sustainable designed solutions in response to design briefs

LIT; NUM; ICT; CCT; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- using traditional and contemporary technologies when developing designs, and discovering the advantages and disadvantages of each approach

- exploring emerging materials and technologies and their potential impact on design decisions, for example smart materials
- examining, testing and evaluating a variety of suitable materials, components, tools and equipment for each design project, for example the differences between natural hardwood and plantation softwood timbers, which determine their suitability for particular uses related to durability, for example interior or exterior use
- evaluating the viability of using different techniques and materials in remote, isolated areas, or less developed countries
- selecting appropriate materials to acknowledge sustainability requirements by using life cycle thinking
- developing criteria to assess the success of designed solutions in terms of aesthetics, functionality and sustainability

8.8 Generate, develop, test, evaluate and communicate design ideas, plans and processes for identified needs and audiences using manual and digital technologies and collaborative techniques

LIT; NUM; ICT; CCT; EU; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES

- using a variety of critical and creative thinking strategies such as brainstorming, sketching, 3-D modelling and experimenting to generate innovative design ideas
- considering which ideas to further explore and investigating the benefits and drawbacks of ideas, for example using digital polling to capture the views of different groups in the community
- identifying factors that may hinder or enhance project development
- developing prototypes and or models to test the functionality of ideas
- producing annotated concept sketches and freehand drawings, using: technical terminology, scale, symbols, pictorial and aerial views to draw environments; production drawings, orthogonal drawings; patterns and templates to explain design ideas
- documenting and communicating the generation and development of design ideas for an intended audience, for example developing a digital portfolio with images and text which clearly communicates each step of a design process

8.9 Competently and safely use a broad range of materials, components, tools and techniques when designing, and project managing production of sustainable designed solutions for technologies contexts and evaluating using identified criteria for success

LIT; NUM; ICT; PSC; ICU; SUSTAINABILITY

- explaining and interpreting drawings, planning and production steps required to produce products, services, environments or systems for specific purposes

- identifying and managing risks in the development of various projects, for example working safely, responsibly, cooperatively and ethically on design projects
- organising time, evaluating decisions and managing resources to ensure successful project completion
- developing technical production skills and safe working practices with independence to produce quality, sustainable designed solutions and developing innovative ways of manipulating materials and technologies by observing, imitating and practising
- using traditional and contemporary materials, components, tools, equipment and techniques and considering alternatives including emerging technologies that could be substituted during the development of the project to reduce waste or time
- evaluating designed solutions and processes and transferring new knowledge and skills to future design projects

Years 7 and 8 Achievement Standard

By the end of Year 8 students explain how designed technologies, products, services and environments evolve by identifying the factors that influence design to meet people's needs and contribute to sustainability. They identify the properties and characteristics of technologies, materials and systems and explain how they impact on designed solutions for a range of technologies contexts. They explain the contribution of design and technology innovations and enterprise to society locally and globally.

When responding to design briefs students develop appropriate criteria for evaluating design ideas and designed solutions. They use appropriate digital technologies to collaborate, investigate, generate, and communicate innovative design ideas using appropriate representation techniques to intended audiences and make considered design decisions. Students develop and document detailed production plans and processes including resources.. They select and use materials, components, tools, equipment and techniques including digital technologies to independently, competently and safely produce designed solutions. They evaluate the suitability of designed products, services or environments against the identified criteria for success.

Years 9 and 10

Years 9 and 10 Band Level Description

Learning in Design and Technologies builds on concepts, skills and processes developed in earlier years, and teachers will revisit and strengthen these as needed.

By the end of Year 10 students will have had the opportunity to design, produce and evaluate at least four designed solutions focused on a range of materials and technologies specialisations. Students should have opportunities to experience designing, producing and evaluating designed solutions for services and environments as well as products.

In Years 9 and 10 the curriculum focuses on students using design and technologies knowledge and understanding, processes and production skills and design thinking to produce designed solutions to identified needs or opportunities. These needs and opportunities are of relevance to individuals and to global communities. Students work independently and collaboratively. Specialised problem-solving activities will be sophisticated, acknowledge the complexities of contemporary life and make connections to related specialised occupations and further study. Increasingly, study will have a global perspective, with opportunities to understand the complex interdependencies involved in the development of technologies and enterprises. Students specifically focus on preferred futures, taking into account ethics, legal issues, social values, economic, environmental and social sustainability factors and using strategies such as life cycle thinking.

Students identify the steps involved in planning the production of designed solutions. They develop detailed project management plans incorporating elements such as sequenced time, cost and action plans to manage a range of design tasks safely. They apply management plans, changing direction when necessary, to successfully complete design tasks. Students use creativity, innovation and enterprise skills with increasing confidence, independence and collaboration.

Using manual and digital technologies students generate and represent original ideas and production plans in two and three-dimensional representations using a range of technical drawings including perspective, scale, orthogonal and production drawings with sectional and exploded views. They produce rendered, illustrated views for marketing and use graphic visualisation software to produce dynamic views of virtual products.

Students identify and establish safety procedures that minimise risk and manage projects with safety and efficiency in mind, maintaining safety standards and management procedures to ensure success. They learn to transfer theoretical knowledge to practical activities across a range of projects.

Years 9 and 10 Content Descriptions and Elaborations

Design and Technologies knowledge and understanding

10.1 Critically analyse and explain how the design and production of designed solutions for global preferred futures involves complex design processes and decisions, and can require expertise from specialist occupations

LIT; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- evaluating design and technology professions and their contributions to society locally, regionally, nationally and globally, for example Aboriginal designers collaborating with international craftspeople for local enterprises
- recognising the impact of past designed solutions and possible future decisions in relation to creating preferred futures, for example public transport systems and the design of rural communities to reduce fire risk
- considering the factors that influence design and professional designers and technologists, including time, access to resources, skills, knowledge, finance, expertise
- explaining how product life cycle thinking can influence decision-making related to design and technologies, for example selecting a material for a product that has a lower carbon footprint or produces less waste than another
- critiquing mass production systems taking into account ethics and sustainability considerations, for example the mass production of clothing and shoes and why manufacturers produce different versions of the same product

10.2 Explain factors influencing design and how products, services and environments evolve and the impact of emerging technologies on design decisions and preferred futures

LIT; CCT; ICU; SUSTAINABILITY

- considering how creativity, innovation and enterprise contribute to how products, services and environments evolve
- exploring the ways commercial enterprises respond to the challenges and opportunities of technological change, for example e-commerce
- explaining the consequences of ethical, social and sustainability decisions for products, services and environments, for example a managed public environment such as a theme park
- predicting the impact of emerging technologies for preferred futures
- constructing scenarios of how the future may unfold and what impacts there may be for society and particular groups
- recognising real-world problems and understanding basic needs when considering designed solutions, for example Engineers Without Borders Challenge and High School Outreach Program both allow students to design solutions to problems in a developing world context

10.3 Investigate and make judgments about how properties and characteristics of resources can be combined to design and produce designed solutions appropriate for purpose, with consideration of ethics, social values and sustainability factors

LIT; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; SUSTAINABILITY

- investigating and making judgments in selecting from a broad range of technologies, materials, systems, tools and equipment, for example selecting low-emission paints and locally sourced materials
- examining factors influencing the design of a product that has an explicit environmental emphasis, for example the low-flush toilet
- critiquing product manufacturing processes in relation to society, ethics, and sustainability factors, for example a mechanised entertainment system; an interactive multimedia product to teach something
- critiquing the social nature of services, for example a signage system to manage students and community members during a school function; organisational system for an aged-care facility; ethical and sustainable food and fibre production system
- critiquing environments in terms of society, ethics and sustainability practices, for example the refurbishment of a local playground; the redesign of a local wetland

Design and Technologies processes and production skills

10.4 Critique, explore and investigate needs or opportunities to develop design briefs and justify the selection of an increasingly sophisticated range of technologies, materials and systems to produce creative designed solutions

NUM; ICT; CCT; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; SUSTAINABILITY

- critiquing a range of design and technologies concepts, for example using intellectual property of others versus originality, the purpose of international and Australian standards
- establishing specific criteria for evaluating the success of designed solutions
- critically evaluating and justifying the use and the best combination of traditional, contemporary and emerging technologies to use during project development, including consideration of sustainability
- examining relationships of properties for complementary materials for products, for example examining compressive and tensile strengths of materials
- identifying appropriate tools, equipment, techniques and safety procedures for each process and evaluating production processes for accuracy, quality, safety and efficiency
- evaluating projects for their long-term application, functionality and impact

10.5 Apply design thinking, creativity, innovation, enterprise and project management skills to develop, evaluate, modify and communicate design ideas; sequence production and management plans using digital technologies

LIT; NUM; ICT; CCT; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA

- using techniques including combining and modifying ideas and exploring functionality to generate solution concepts

- undertaking functional, structural and aesthetic analyses of benefits and constraints of design ideas, for example to different communities and environments
- re-imagining designs to feature emerging technologies
- considering competing variables that may hinder or enhance project development, for example weight, strength and price; laws; social protocols and community consultation processes
- producing drawings, models and prototypes to explore design ideas, for example using technical drawing techniques, digital imaging programs, 3D printers or augmented reality modelling software; producing multiple prototypes that demonstrate an understanding of key aesthetic considerations in competing designs
- communicating using appropriate technical terminology and recording the generation and development of design ideas for an intended audience including justification of decisions, for example developing a digital portfolio with images and text which clearly communicates each step of a design process

10.6 Work flexibly to safely test, select, justify and use appropriate technologies to design, produce and evaluate designed solutions using identified criteria for success and suggesting improvements to design processes

LIT; NUM; ICT; CCT; PSC; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; SUSTAINABILITY

- creating, explaining and interpreting drawings; and planning production timelines using digital technologies
- refining technical skills and using production skills with independence to produce quality designed solutions and to reduce risks in production
- using materials, components, tools, equipment and techniques safely and considering alternatives during the development of the project to maximise sustainability, for example using timber because it stores carbon and offsets the demand for alternative products
- experimenting with innovative combinations and ways of manipulating traditional and contemporary materials, components, tools, equipment and techniques, and recording findings in a collaborative space to debate the merits of each with peers
- evaluating choices made at various stages of a design process and modifying plans when required with consideration of criteria for success
- reflecting on learning, evaluating processes and transferring new knowledge and skills to future design projects

Years 9 and 10 Achievement Standard

By the end of Year 10 students explain the complex interdependencies involved in the global environment in the development of technologies, products, services and environments for preferred futures. They investigate how knowledge of properties and characteristics of technologies, materials and systems can be used to make judgments about their appropriateness for use for designed solutions to problems of individuals and the global preferred futures for a range of technologies contexts.

Students identify authentic needs or opportunities to develop design briefs and criteria for success that include ethical considerations. They communicate creative, innovative, and enterprising design ideas for projects of increasing sophistication using a variety of communication and representation techniques to a range of audiences, justifying design decisions. They compare, select and use manual and digital technologies to collaborate on, investigate, generate and communicate design ideas and document processes. Students develop, document and apply detailed and logically sequenced production and management plans including time, cost, resources and production processes. They test, select and use appropriate materials, components, tools and specialised equipment confidently, collaboratively, independently and safely to produce designed solutions that meet all design brief criteria, making adjustments to plans when necessary. They evaluate products, services or environment against identified criteria for success, justify their responses and transfer knowledge of production and processes to suggest improvements to design processes.

DRAFT CURRICULUM – DIGITAL TECHNOLOGIES

Rationale

In a world that is increasingly digitised and automated, it is critical to the wellbeing and sustainability of society, the economy and environments that the benefits of information systems are exploited ethically. This requires deep knowledge and understanding of digital systems and how to manage risks. Ubiquitous digital systems such as mobile and desktop devices and networks are transforming learning, recreational activities, home life and work. They have led to new ways of thinking, collaborating and communicating when developing social and intellectual capital. They are an essential problem-solving toolset in our knowledge-based society.

The Australian Curriculum: Digital Technologies empowers students to influence skilfully and confidently how contemporary and emerging information systems and practices are applied to meet current and future needs. It empowers students to shape change. 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 be innovative developers of digital solutions and knowledge. It will assist students to become effective users of digital systems and critical consumers of 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 assists students to be regional and global citizens capable of actively and ethically communicating and collaborating.

This rationale complements and extends the rationale for the Technologies learning area.

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 digital solutions to meet and redefine current and future needs of individuals, societies, economies and environments
- frame problems and create solutions using the computational thinking concepts of abstraction; data collection, representation and interpretation; specification, algorithms and implementation; digital systems; and interactions and impact
- use digital systems to efficiently and effectively automate the transformation of data into information and to creatively communicate ideas in a range of formal and informal settings
- apply protocols and legal practices that support safe, ethical and respectful communications and collaboration with known and unknown audiences when developing social and intellectual capital
- monitor, analyse, predict and shape the interactions within and between information systems and the impact on individuals, societies, economies and environments.

Organisation

Content structure

The Australian Curriculum: Digital Technologies comprises two related strands:

- Digital Technologies knowledge and understanding – information systems: data, processes, digital systems, people, and their interactions
- Digital Technologies processes and production skills – defining and solving problems through using digital systems, critical and creative thinking and applying computational thinking.

Within each strand, key concepts as outlined in Table 4 provide the focus for content and present a sequence of development of knowledge, understanding and skills across the bands. The content is described in bands.

Table 4: Digital Technologies content structure

Digital Technologies	
Digital Technologies knowledge and understanding	**Digital Technologies processes and production**
• how data are represented and structured symbolically • the components of digital systems: software, hardware and networks • the use, development and impact of information systems in people's lives	• collecting, managing and interpreting data when creating information, and the nature and properties of data, how they are collected and interpreted • using a range of digital systems and their components and peripherals • defining problems and specifying and implementing their solutions • creating and communicating information, especially online, and interacting safely using appropriate technical and social protocols

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 digital solutions that respond to the needs of individuals, society, the economy and the environment.

The strands are based on key concepts that provide a framework for knowledge and practice in Digital Technologies. The key concept of *abstraction* underpins all content, particularly *Data* and *Specification and Implementation. Interactions and impact* is common to both strands. For more information see Key concepts.

Although the curriculum is presented in two different strands, teaching and learning programs will typically blend these, as content in processes and production skills frequently draws on understanding of concepts in the knowledge and understanding strand. For example, designing and creating software to solve specific problems and to create new opportunities (processes and production skills) involves learning about data, digital systems and factors that influence solutions including human interactions with digital systems (knowledge and understanding). For more information see Learning in Digital Technologies.

Digital Technologies knowledge and understanding

This strand focuses on developing the underpinning knowledge and understanding of information systems: data, processes, digital systems, people, and their interactions. It also includes understanding of the impact of digital technologies in people's lives.

The Digital Technologies knowledge and understanding strand focuses on:

- Representation of data, which involves how data are represented and structured symbolically
- Digital systems (Years 5 to 10 only), which involves the components of digital systems: software, hardware and networks
- Interactions and impact, which involves influences on, and the impact of information systems in people's lives.

Digital Technologies processes and production skills

This strand focuses primarily on defining and solving problems through using digital systems, critical and creative thinking and applying computational thinking – a problem-solving methodology. Students will develop and use increasingly sophisticated computational thinking skills, and processes, techniques and digital systems to create solutions to address specific problems, opportunities or needs. Students will also apply procedural techniques and processing skills when investigating, creating, communicating and sharing ideas and information and collaborating in online environments.

The Digital Technologies processes and production skills strand focuses on:

- using data (Years F to 4), which develops into managing and analysing data (Years 5 to 10). This involves collecting, managing and interpreting data when creating information, and the nature and properties of data, how they are collected and interpreted
- using digital systems (Years F to 4 only), which involves using a range of digital systems and their components and peripherals
- defining and solving problems (Years F to 2), which develops into defining problems and implementing solutions (Years 3 to 6) and then specification, algorithms and implementation (Years 7 to 10). These involve the precise definition of problems and specification and implementation of their solutions.
- creating and communicating (Years F to 2), which develops into creating and communicating online (Years 3 to 4) and creating and interacting online (Years 5 to 10). This involves creating and communicating information, especially online by creating websites, and interacting safely using appropriate technical and social protocols.

Key concepts

A number of key concepts underpin the Digital Technologies curriculum. These establish a way of thinking about information systems and provide a framework for knowledge and practice. The key concepts are:

- **Abstraction**, which underpins all content, particularly the content descriptions relating to the concepts of *data representation* and *specification, algorithms and implementation*
- **Data collection** (properties, sources and collection of data), **data representation** (symbolism and separation) and **data interpretation** (patterns and contexts)
- **Specification** (descriptions and techniques), **algorithms** (following and describing) and **implementation** (translating and programming)
- **Digital systems** (hardware, software and networks and the internet)
- **Interactions** (people and digital systems, data and processes) and **impact** (impacts and empowerment).

These concepts span the key discoveries of computer science and information systems, with ideas about the organisation, representation and automation of information and communication that also correspond to the key elements of computational thinking. These key concepts can be explored in non-technical or digital contexts and are likely to underpin the future digital systems.

These concepts describe the ideas and approaches underpinning the Digital Technologies curriculum and provide a foundation for teachers to plan and assess evidence of progress in student learning. They also provide a language and perspective that students and teachers can use when discussing Digital Technologies.

Abstraction

Abstraction involves hiding details that aren't relevant, to focus on a manageable number of aspects of an idea, problem or solution at one time. 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.

In the same way, the complexity and details of information systems makes them difficult to understand. In digital systems, everything must be broken down into simple instructions. The ability to 'temporarily ignore' the internal details of subcomponents that make up larger specifications, algorithms, systems or interactions, is central to managing the complexity of information systems.

Abstraction is the underpinning concept that organises thinking in Digital Technologies and is evident in the two strands, particularly in the concepts of *data representation* and *specification, algorithms and implementation.*

Data collection, representation and interpretation

Data focuses on the nature and properties of data, how they are collected and represented, and how they are interpreted in context to produce information. It builds on a corresponding sub-strand in the Mathematics curriculum, providing a deeper understanding of the nature of data and their representation, and computational skills for interpreting data. It provides 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, collected or calculated as the raw material for creating information and its binary representation in digital systems. Data collection is addressed in the Processes and production skills strand. *Data representation* describes how data are 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 imposing or extracting meaning from data and is addressed in the Processes and production strand.

Specification, algorithms and implementation

Specification and implementation focuses on the precise and elegant definition and communication of problems and their solutions, beginning with describing tasks in daily life and culminating in accurate definitions of computational problems and their algorithm solutions. This concept draws from logic, algebra and the language of Mathematics, and can be related to the scientific method of documenting experiments in Science.

Specification describes the process of defining and communicating a problem precisely, unambiguously and succinctly. An *algorithm* is a precise description of the steps and decisions needed to solve a problem. Anyone who has followed or given instructions, for example a recipe or navigated using directions, has used an algorithm. These generic skills can be developed without programming. *Implementation* describes the automation of an algorithm, typically by writing a computer program. These concepts are addressed in the Processes and production skills strand.

Digital systems

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

Interactions and impact

These 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 impact are addressed in both strands.

Interactions refers to all human–information systems interactions, especially *user interfaces*, and human–human interactions; and *communication and collaboration* mediated by digital systems. Information systems include the interaction between people and digital systems, and data and processes. *Interactions* also addresses methods for protecting stored and communicated data and information. *Impact* describes: analysing and predicting the extent to which personal, ethical, economic, environmental and social needs are met through existing and emerging digital technologies; and appreciating the transformative power of digital technologies in people's lives. It also involves consideration of the relationship between information systems and society and in particular the legal obligations of individuals and organisations regarding ownership and privacy of data and information.

Information and communication technology in the Australian Curriculum

In the Australian Curriculum, information and communication technology (ICT) is the focus of two subjects: Digital Technologies and Media Arts. Some aspects of ICT are general and students develop this knowledge and skills across all learning areas as described in the ICT general capability. Some aspects of the ICT general capability are explicitly included in the Digital Technologies curriculum, for example security, privacy and intellectual property. The study of Digital Technologies will ensure that ICT capability is developed systematically and conceptually to be applied across other learning areas.

While much of the explicit teaching of ICT occurs in the Digital Technologies subject, key ICT concepts and skills are strengthened, complemented and extended in Design and Technologies as students engage in a range of learning activities with ICT demands.

There is a clear relationship between the Digital Technologies curriculum and the ICT general capability. The capability assists students to become effective *users* of ICT. The Digital Technologies curriculum assists students to become confident *developers* of digital solutions. While some specific ICT knowledge and skills are likely to develop only within Digital Technologies learning programs, key ICT concepts and skills are strengthened, made specific and extended across all learning areas. This occurs as students engage in a range of learning activities with ICT requirements. In each learning area, including Technologies, students apply appropriate social and ethical protocols and practices while managing and operating ICT to investigate, create and communicate ideas, concepts and knowledge.

The Digital Technologies curriculum requires students to operate and manage digital systems, data and processes and to apply computational thinking when creating solutions. These solutions take into account current and predicted economic, environmental and social factors. Students develop and apply an understanding of the characteristics of data, audiences, procedures, digital systems and computational thinking to create and evaluate purpose-designed digital solutions. They learn to formulate problems, logically organise and analyse data and represent it in abstract forms. Students automate solutions through algorithmic logic. They control and monitor processes and devices. Students collaborate and communicate with others when developing and sharing ideas and information. They determine the best combinations of data, procedures and human and physical resources to generate efficient and effective solutions.

Multimedia in the Australian Curriculum

Students learn about multimedia across the Australian Curriculum.

In Digital Technologies multimedia is only one of a range of contexts. The subject focuses on the technical aspects of digital multimedia solutions, and privacy and intellectual property. The technical aspects cover the digital representation of multimedia and text artefacts as a form of structured data and the digital systems required to capture and display those data. It also includes the algorithms required to create or manipulate them, and human interaction with devices and digital media.

The operational mechanics of producing images, animations, videos and audios are a focus in Media Arts, whereas the automated interaction with digital media and the digital representation of multimedia are addressed in Digital Technologies.

Digital Technologies takes a technical and computational approach to digital solutions featuring multimedia such as the design and development of web pages and computer games. For example, it looks at the digital representation of a web page that includes digital media, the representation of a document (its structure) from the formatting (its appearance), and how web pages are transmitted.

Digital Technologies considers security and ethical protocols related to online communication when using blogs, messaging, information sharing and creation sites and social networking.

Computer games generally automatically respond to user input, often simulate the real world, and store and manipulate data representing the current game state. They are almost always implemented by some form of computer programming (including simple visual programming environments).

Learning in Digital Technologies

The knowledge, understanding and skills learned in the Digital Technologies curriculum serve students in two discrete, but interrelated ways. The curriculum supports the pursuit of specialised knowledge and understanding in the field of information systems (Digital Technologies). It also equips students with a set of critical and creative thinking skills and ICT capabilities that will support learning anytime, anywhere, as well as participation in a knowledge-based society.

At the core of the Digital Technologies curriculum is the development of knowledge, understanding and skills that support the integration of human thinking with the capabilities of digital systems. This involves students defining a problem precisely, specifying needs, describing the steps and processes required to create the solution, realising it by applying digital systems and evaluating success against stated needs. Accurate interpretations of the associated data and contexts are critical to meeting current needs and preferred futures. As the sophistication of the underpinning concepts increases through the stages of schooling, adequate time needs to be devoted to the explicit teaching of knowledge and skills. Consideration of human interaction with and through digital systems is critical to ensuring innovative solutions that are accessible and appealing are created.

In Digital Technologies students develop understanding of the relationship and interconnectedness between the components of information systems in authentic situations. They analyse these systems for their impact on society. Students use reason and logic when predicting the likely impact of changes to information systems and they consider how these changes may contribute to preferred futures. They develop and apply conceptual, collaborative and technical skills to systematically create solutions. They automate the transformation of data into information and manipulate data to communicate ideas and information for known and unknown audiences. The selection of software appropriate for each of these broad solution areas is a school decision based on available resources and student needs. Students develop project management skills in allocating tasks, resources and time.

Teaching and learning programs should balance and integrate the two strands *Digital Technologies knowledge and understandings* and *Digital Technologies processes and production skills*. The emphasis given to each will vary depending on the stages of school and the context of learning programs. For example, in the early years students can develop knowledge and skills about abstraction and algorithms as a result of personal, family and community experiences and express these using simple digital systems. In the later years students can create complex and innovative interactive digital solutions.

Communicating online

When communicating online, students develop and apply safe and ethical protocols and practices. They learn knowledge, understanding and skills to maximise the capabilities of hardware, software and networks when creating solutions, communicating, and locating data and information. They transfer knowledge to adapt to emerging developments. Working individually and collaboratively, students develop skills in managing the security and organisation of their data and information and in regulating their social behaviour.

Play in the Technologies learning area

In Design and Technologies and Digital Technologies the imaginative and purposeful application of play is foregrounded in the early years. In play, children create imaginary situations in which they change the meaning of objects and actions as they invent new ideas and engage in futures thinking (for them). They also explore real-world concepts, rules and events as they role-play what is familiar and of interest to them. Play is deepened and imagination and creativity are better harnessed for learning when play is relevant and purposeful, and when children and teachers engage in shared, sustained thinking. Play includes the purposeful application of creativity and imagination to learning situations in both Design and Technologies and Digital Technologies.

Solutions in Digital Technologies

Digital Technologies solutions have been separated into two broad areas:

- Automation: automating the transformation of data into information
- Communications: communicating information and ideas.

Automation covers any process of transforming and manipulating data that does not require manual intervention. For instance, spreadsheets allow for automated processing of data – once the formulas are defined, data can be replaced or updated, and the results are recalculated automatically; running a program allows for automated execution of algorithms.

Communications covers processes and artefacts that communicate information and ideas, or evoke emotions. For instance, processes include systems such as instant messaging, social media and video conferencing; and artefacts include documents and digital media presentations.

Automation and communications interact with each other: information created through automation needs to be communicated and communication processes may be automated, for example mail merge or animation tools.

Solutions for automation and communications intersect, to various extents, with the key concepts. Automation is strongly associated with data, representation, interpretation, specification, algorithms and implementation; communications is strongly associated with interpretation, specification, implementation, interactions and impact. Abstraction underpins both automation and communications.

Integrating content from the strands

Teaching and learning programs will typically blend content from each strand. 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 raw material 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); learning to create, communicate and collaborate in a digital society (processes and production skills) involves understanding legal obligations, constraints, and social and technical protocols (knowledge and understanding); learning to identify opportunities and anticipate consequences of future information systems (processes and production skills) involves understanding the settings in which information systems are used and the factors that influence the interactions between the system components and the settings (knowledge and understanding).

Draft Digital Technologies Foundation to Year 10 scope and sequence

Strand		Years F–2	Years 3–4	Years 5–6	Years 7–8	Years 9–10
Digital Technologies knowledge and understanding	*Representation of data*	2.1 Recognise and play with patterns in data and represent data as pictures, symbols and diagrams	4.1 Recognise a variety of different types of data and explore different representations for the same data	6.1 Explain how digital systems represent whole numbers as a basis for representing all types of data	8.1 Explain how raw text, image and audio data are represented in binary	10.1 Explain how text, audio, image and video data are stored in binary with compression
	Digital systems			6.2 Describe the internal and external components of common digital systems, their functions and interactions, and identify different connections for digital networks	8.2 Explain how data are transmitted and secured in wired, wireless and mobile networks, and understand how the specifications of hardware components impact on applications	10.2 Explain the role of software and hardware components for managing and controlling access, data and communication in networked digital systems
	Interactions and impact	2.2 Describe how people use different information systems safely to meet personal and family communication and recreation needs	4.2 Investigate how well information systems meet home, classroom and community needs and envisage new applications for existing information systems	6.3 Examine the opportunities and consequences including sustainability of using information systems to meet community and national needs and suggest new applications of these systems	8.3 Evaluate the extent to which information systems meet personal, local, regional and global information and communication needs, and anticipate future risks and benefits for economic, environmental and social sustainability	10.3 Critique information systems and policies, and anticipate future risks and opportunities for transforming lives and societies
Digital Technologies processes and production skills	*Managing and analysing data*	2.3 Collect, use and play with personal, family and classroom data (including numerical, categorical, text, image, audio and video data) and understand why it was collected and use digital systems to present the data	4.3 Collect, access and present different types of family, classroom and community data using simple spreadsheets, databases and other software to create information and solve problems	6.4 Acquire, store and validate different types of data, and interpret and visualise data in context to create information	8.4 Collect and acquire data from a range of sources and evaluate its authenticity, accuracy and timeliness	10.4 Develop systematic techniques for acquiring, storing and validating quantitative and qualitative data from a range of sources considering privacy and security requirements
					8.5 Analyse and visualise data (including numerical, categorical, audiovisual and text data) using appropriate software	10.5 Use appropriate software to analyse and visualise data (including numerical, categorical, text, audiovisual and relational data) to create information and address complex problems
					8.6 Model processes and objects using structured data	10.6 Model processes, objects and their relationships using structured data
	Using digital systems	2.4 Identify, explore, and use digital systems (hardware and software components) for personal and classroom needs	4.4 Use a range of digital systems and peripherals for diverse purposes, and transmit different types of data			
	Specification, algorithms and implementation	2.5 Follow, describe, represent and play with a sequence of steps and decisions needed to solve simple problems	4.5 Define simple problems, and follow and describe the algorithms (sequence of steps and decisions) needed to solve them	6.5 Define problems in terms of data and functional requirements, and describe common characteristics and elements of similar problems	8.7 Define real-world problems and decompose them taking into account usability and technical, economic, environmental and social constraints	10.7 Precisely define and decompose real-world problems, taking into account functional and non-functional requirements and including interviewing stakeholders to elicit needs and assumptions
			4.6 Design and implement simple visual programs with user input and branching	6.6 Follow, modify and describe simple algorithms involving sequence of steps, decisions, and repetitions that are represented diagrammatically and in plain English	8.8 Trace algorithms to predict output for a given input and to identify errors, and describe algorithms diagrammatically and in plain English	10.8 Trace complex algorithms to predict output for a given input, develop test cases to validate algorithms against their specifications, and describe algorithms diagrammatically and in plain English
				6.7 Design and implement digital solutions using visual programs with user input, branching and iteration	8.9 Develop and modify programs with user interfaces involving branching, repetition or iteration and subprograms in a general-purpose programming language	10.9 Collaboratively develop modular digital solutions, applying appropriate algorithms and data structures using visual, object-oriented and/or scripting tools and environments
					8.10 Manage the sequence of tasks, the types of processes and the resources needed to develop software that meets user requirements	10.10 Use agile development techniques to iteratively and collaboratively develop (design, implement and test) software that meets user requirements
	Creating and interacting online	2.6 Work with others to organise and create ideas and information in the form of text, images and audio using information systems, and share these with known people in safe online environments	4.7 Manage the creation, sharing and exchange of information with known audiences and apply agreed social protocols to protect people when communicating online	6.8 Use a range of communication tools and agreed social protocols when collaborating on projects and creating, communicating and sharing ideas and information online	8.11 Select and apply generally accepted social and technical protocols when creating and sharing information online, and collaborating with local, regional and global audiences, taking into account social contexts	10.11 Manage online projects taking into account social contexts and legal responsibilities, and evaluate their success in creating enterprising and social opportunities

Draft Digital Technologies Foundation to Year 10 curriculum

Foundation to Year 2

Foundation to Year 2 Band Level Description

The Digital Technologies curriculum comprises two interrelated strands: Knowledge and understanding and Processes and production skills. Teaching and learning programs should balance and integrate both strands. Together the strands focus on developing students' knowledge, understanding and skills in computational thinking and on students building on their personal experiences of using digital systems and data in their immediate environments.

In F–2, students begin thinking computationally by using the power of digital systems in their play with, for example robotic toys or when performing everyday, repetitive tasks with greater efficiency. They develop their ability to solve problems through abstraction and begin to manage time, tasks and data when using digital systems to create information individually and in groups. With support from others they begin to conceptualise steps and sequences of steps for moving their robots or they think abstractly about elements, and elements within systems, to solve problems or achieve personal or group goals.

In projects, they explore different types of data, learn about their purposes and begin to experiment with different forms of representation. They use software to manipulate a range of data and share the ideas and information they create in safe online environments.

Students and teachers discuss and use safe and ethical practices to protect children and their information as they interact online for learning and communicating. Safe practices underlie all experiences in the study of Digital Technologies.

Foundation to Year 2 Content Descriptions and Elaborations

Digital Technologies knowledge and understanding

2.1 Recognise and play with patterns in data and represent data as pictures, symbols and diagrams

LIT; NUM; ICT; CCT; PSC; ICU

- sorting objects and events based on easily identified characteristics and using digital systems to represent patterns in data, for example sorting birthdates according to their seasons and presenting the patterns using seasonal symbols
- making generalisations about data sets, for example recording results of an experiment in an on-screen table and talking about the results, for example comparing different ways of travelling to school using classroom data and then finding patterns
- experimenting with different ways of representing patterns, for example using materials, sounds, movements or drawing
- learning about how data are represented by changing a colour digital photograph to black and white and noting the change in file size

2.2 Describe how people use different information systems safely to meet personal and family communication and recreation needs

LIT; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES

- sharing and describing ways that common information systems can be used to meet communication needs, for example computers can be used as phones, and email allows communication between families living in different regions
- recognising and discussing the need for cybersafety when using online information systems, for example recognising that shared personal information can be used for undesirable purposes by some people and that using passwords is a means of protecting identity
- noticing ergonomics when children are playing with, exploring and experimenting with information systems, for example when using touch screen devices in different settings, such as outdoors or when playing a game on the floor
- discussing types of existing information systems that support individual needs, for example voice tablets for people who are visually impaired
- sharing ideas about the ways familiar 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

Digital Technologies processes and production skills

2.3 Collect, use and play with personal, family and classroom data (including numerical, categorical, text, image, audio and video data) and understand why it was collected and use digital systems to present the data

LIT; NUM; ICT; CCT; PSC; ICU

- locating and purposefully using visual or text data, for example searching through a digital photo library to select an image
- 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
- playing with and successfully using a simple database to retrieve information, for example finding out birthdates to celebrate birthdays
- 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 collect data for a purpose, for example using a mobile device to record a musical performance
- using digital systems to organise data to improve meaning, for example using word processing software to create a list of tasks and visualisation software to create a mind map (diagram) showing relationships between objects

- collecting data and sorting it into categories, for example collecting data about favourite toys and sorting them into manual or electronic and static or moving parts

2.4 Identify, explore, and use digital systems (hardware and software components) for personal and classroom needs

LIT; NUM; ICT; CCT; ICU

- playing with and using different digital systems for transferring and capturing data, for example using a tablet to take a photo of a grandparent and recording an interview with them about life in the past
- exploring and using digital systems for downloading information, for example knowing how to download photographs from a website and inserting them into a word-processed document for a specific purpose
- 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 or stylus, 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
- constructing a model of a real or imaginary digital systems device

2.5 Follow, describe, represent and play with a sequence of steps and decisions needed to solve simple problems

LIT; NUM; ICT; CCT; PSC; EU; ICU

- experimenting and playing with very simple, step-by-step procedures to explore programmable devices, for example investigating different loads that robotic devices can tow and examining the relationship between load and speed
- working with others to sequence events and instructions, for example scanning personal photographs and collating them into a digital photo album to order significant personal events or milestones
- collaboratively writing and entering a simple set of instructions, for example using simple visual programming to direct an actual or virtual robot to perform moves in particular directions

2.6 Work with others to organise and create ideas and information in the form of text, images and audio using information systems, and share these with known people in safe online environments

LIT; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES

- using different types of data such as text, images and sound to create information for sharing, for example creating a class profile that includes a photo of each student, an audio recording of them singing their favourite song and a written message to a friend
- planning the steps and creating text, drawings and sound files to share online, for example collaboratively deciding on the focus for a fable or fairytale from the Asia region, finding relevant images or sound, selecting colours and fonts and using digital systems to write a story that will be shared on the intranet
- making ethical decisions when using images for public viewing, for example asking the question 'What is fair and just?' to decide whether to publish a photo of an event or activity
- participating in online environments that are safe, for example intranets, bookmarked websites approved by teachers and parents, closed chat rooms, school email and supervised use of computers as phones

Foundation to Year 2 Achievement Standard

By the end of Year 2, students experiment with different ways of representing patterns in data. They describe how familiar information systems are used to meet personal, classroom and family needs.

Students suggest and use a sequence of steps to decide how to solve simple problems. They safely use familiar digital systems when experimenting with alternative ways of displaying familiar data to convey meaning, and when organising and creating ideas and information, and sharing these in restricted online environments.

Years 3 and 4

Years 3 and 4 Band Level Description

The Digital Technologies curriculum comprises two interrelated strands: Knowledge and understanding and Processes and production skills. Teaching and learning programs should balance and integrate both strands. Together the strands focus on developing students' knowledge, understanding and skills in computational thinking and on students becoming more aware of the social and environmental use of information systems in local and global communities.

In Years 3 and 4, students think computationally by using digital systems to automate simple tasks and data processing. They explore abstractions by interpreting models of simple real-world systems and describing elements of problems and systems. They further develop their understanding of the characteristics of data through exploring different ways that common data can be represented. They expand their usage of software to include user input and branching. This includes visual programming languages that use graphical elements rather than text instructions.

Students are aware of appropriate ways to manage their time and focus. With teacher guidance, they identify and list the major steps needed to complete a task. They begin to manage time, tasks and data when problem-solving individually and in teams and appreciate the importance of planning when creating solutions.

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 ethical practices that demonstrate respectful behaviour. Safe practices underlie all experiences in the study of Digital Technologies.

Years 3 and 4 Content Descriptions and Elaborations

Digital Technologies knowledge and understanding

4.1 Recognise a variety of different types of data and explore different representations for the same data

LIT; CCT; ICU, NUM; ICT; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA

- recognising that numbers, text, pictures, graphics, sounds, animations and videos are all forms of data when stored or viewed on a digital device such as a computer, mobile phone or electronic toy
- experimenting with different ways that a number can be represented, for example expressing a given number through words, images and MAB blocks
- using a table to reorganise information that includes sentences, and/or words, and/or numbers and/or pictures
- investigating codes that are representations of data, for example morse code and semaphore

4.2 Investigate how well information systems meet home, classroom and community needs and envisage new applications for existing information systems

LIT; NUM; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- investigating how information systems are used in different settings, for example students collaboratively creating a short survey and collecting data about frequency of home usage of different information systems
- imagining and considering alternative uses and opportunities for information systems, for example verbally asking an information system for information when preparing a meal or visiting a museum or accessing the information using another interface
- exploring different types of information systems that suit particular needs, for example considering how an existing information system could be used to help a person with disability
- imagining how to bring two different types of information systems together to create a new system, for example bringing together a school learning system and a gaming system to create games-based learning
- considering ways of managing social media to meet privacy needs, for example not divulging personal data such as photos or addresses and recognising that all electronic instructions/actions are traceable (electronic footprints)

Digital Technologies processes and production skills

4.3 Collect, access and present different types of family, classroom and community data using simple spreadsheets, databases and other software to create information and solve problems

LIT; NUM; ICT; CCT; ICU; PSC

- using different techniques to present data as information, for example creating a column chart in a spreadsheet by colouring cells to represent different measurements
- selecting appropriate formats or layout styles to present data as information depending on the type of data and the audience, for example lists, tables, graphs, animations and presentations
- applying software functions and techniques to improve the appearance and usability of data, for example using colour, headings and labelling of images to organise and accurately identify data
- using software to sort and calculate data when solving problems, for example, sorting numerical and categorical data in ascending or descending order and automating simple arithmetic calculations using nearby cells and summing cell ranges
- exploring different online sources to access data, for example using online query interfaces to select and retrieve data from an online database such as a library catalogue

4.4 Use a range of digital systems and peripherals for diverse purposes, and transmit different types of data

LIT; NUM; CCT; ICT

- using different peripherals to display information, for example using an interactive whiteboard or a data projector to show information to a group, or a printer to show information to a person
- using specific peripherals to capture different types of data, for example using a digital microscope to capture cellular images of nature and a digital probe to capture numeric data
- experimenting with different types of digital system components and peripherals to perform input, output and storage functions, for example a keyboard, stylus, touch screen or joystick to input instructions; a monitor, printer or tablet to display information; a USB flash drive and external hard drive as storage peripherals
- representing the conversion of analog to digital, for example listening to notes played on an instrument and recording the pattern of the notes as a series of numbers on a chart
- recognising that a photograph can be transferred to a computer using a memory card and reader and that a message typed into the class journal appears on the screens of other students

4.5 Define simple problems, and follow and describe the algorithms (sequence of steps and decisions) needed to solve them

LIT; ICT; CCT; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA

- experimenting with different ways of describing a set of instructions, for example writing two simple sets of instructions for a programmable robotic device
- explaining to others how to follow technical instructions, for example providing instructions on how to capture and download photos from a mobile device
- defining and describing the sequence of steps needed to incorporate multiple types of data in a solution, for example sequencing the steps in selecting and downloading music to create a book trailer
- defining and describing the rules of a simple game so that it can be implemented

4.6 Design and implement simple visual programs with user input and branching

LIT; NUM; ICT; PSC; ICU

- designing and implementing a simple interactive program, for example preparing the content and design of a simple guessing game that provides options in English and an Asian language for each question and creating the game using a visual programming language
- using different design tools to record ways in which programs will be developed, for example creating storyboards or flowcharts to record relationships or instructions about content or processes

- exploring different features of user interfaces that appeal to people, for example simplifying the style and consistently placing icons or symbols in games interfaces to reduce the frustrations of game players
- experimenting with different ways of instructing a program to make a choice, for example using an ‘IF’ statement (a common statement used to branch) to indicate that the program must make a choice between two different circumstances
- creating options for users to make choices in solutions, for example using another user input and branching mechanism such as buttons in a slideshow

4.7 Manage the creation, sharing and exchange of information with known audiences and apply agreed social protocols to protect people when communicating online

LIT; ICT; PSC; EU; ICU

- using a range of online tools to share information, for example adding entries to a class blog for a project, participating in a web conference or online chat with an author, or participating in a forum on a specific topic
- organising and creating different types of information for sharing online, for example planning the sequence and appearance of an animation, using digital systems to create it and sharing it online with students from another school
- managing collaborative projects in online environments, for example planning online meeting times and tasks when collaborating with students from another school on projects
- discussing digital citizenship rules and behaviours for participating in an online community and sending emails
- making ethical decisions when faced with dilemmas about reporting a person’s inappropriate online behaviour, for example using a ‘care-based’ criterion focusing on how individuals would like to be treated by others
- applying safe practices while participating in online environments with known people, for example checking the default privacy settings to ensure maximum protection of personal details when participating in an online chat with an expert

Years 3 and 4 Achievement Standard

By the end of Year 4, students demonstrate different ways of representing a variety of familiar types of data. They make judgments about the usefulness of common information systems and suggest creative applications.

Students define simple problems, follow and describe simple algorithms, and develop simple digital solutions involving branching. They collect and access data from different sources and use a range of digital systems and peripherals when creating information and digital solutions. Students apply agreed social protocols and safely use appropriate information systems when creating, managing and sharing information with known audiences.

Years 5 and 6

Years 5 and 6 Band Level Description

The Digital Technologies curriculum comprises two interrelated strands: Knowledge and understanding and Processes and production skills. Teaching and learning programs should balance and integrate both strands. Together the strands focus on developing students' knowledge, understanding and skills in computational thinking and on students considering the role and impact of information systems across local, national and global communities for a range of purposes and audiences.

In Years 5 and 6, students think computationally by using digital systems to automate tasks and analyse data, which are organised in a manner that helps computation. They learn to 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. They further develop their skills of defining problems by following the instructions and decisions in their algorithms to detect errors, and making modifications to increase the likelihood of creating working digital solutions. They broaden their techniques for recording algorithms to include text-based instructions. They increase the sophistication of their abstract thinking by identifying repetition and develop their skills by incorporating repeat instructions/structures including through visual programming.

Students work collaboratively with others to identify and sequence steps needed for a task. In doing so they learn to negotiate and develop plans to complete tasks. They take safety into account and use plans to complete tasks safely, making adjustments when necessary. They learn to manage and operate digital technologies, for example devising file naming conventions that are meaningful and determining safe storage locations.

Students progress from following given social protocols to working with other students to develop an agreed set of protocols that acknowledge factors such as social differences and privacy of personal information. Safe practices underlie all experiences in the study of Digital Technologies.

Years 5 and 6 Content Descriptions and Elaborations

Digital Technologies knowledge and understanding

6.1 Explain how digital systems represent whole numbers as a basis for representing all types of data

LIT; NUM; CCT; ICT

- identifying that every type of data must be represented in digital systems as numbers, for example, a letter (or other character) is represented using a number and an image is represented using arrays of numbers
- explaining that binary represents numbers using just 1s and 0s and these are represented as on and off electrical states in hardware
- representing everyday numbers in binary, for example counting in binary from zero to 15, using the binary system to write a friend's birthdate in binary or using binary code to create secret messages

6.2 Describe the internal and external components of common digital systems, their functions and interactions, and identify different connections for digital networks

LIT; NUM; ICT

- describing digital systems as having internal and external components that perform different functions, for example, external components for inputting data include keyboard, microphone, stylus; internal processing components include the central processing unit and motherboard; external output components include speakers, projector, screen; and data and information storage components include cloud, hard drives, USB flash drive
- explaining how data may be transmitted between two digital systems in different ways, for example that wires or cables are used in wired networks to transfer data from one digital system to another, and radio waves are used to transmit these data in wireless or mobile networks
- 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
- discussing relationships within networks, for example changing an input component can have an effect on the quality or type of output; the output of one network (information) can become the input to another
- investigating how emerging digital systems work, for example using an augmented reality app (or blended reality) and considering how images of real-world objects can be blended with computer-generated information to produce a virtual reality

6.3 Examine the opportunities and consequences including sustainability of using information systems to meet community and national needs and suggest new applications of these systems

LIT; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- investigating the purposes of different types of information systems, for example information systems such as banking, retail transactions, social benefits and air monitoring can be classified as meeting economic, environmental and social needs
- examining the benefits and consequences of using information systems for specific purposes, for example the risks and benefits of apps to diagnose health issues or locate lost mobile phones
- explaining why people interact so readily with touch systems, for example touch input requires less manual dexterity to issue instructions and is designed to be more user friendly through the use of icons
- 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 could be used to find people who are lost

- exploring the ethics and impact of management practices on the use of communication networks, for example internet censorship from a local, national and global perspective and the impact on freedom of access and expression
- considering practices to save energy and resources when using information systems, for example reading on screen rather than printing, switching off when not in use, ensuring electronic devices are in energy-saving mode

Digital Technologies processes and production skills

6.4 Acquire, store and validate different types of data, and interpret and visualise data in context to create information

LIT; NUM; ICT; CCT

- applying techniques to check the reasonableness of data, for example including a data validation function in a spreadsheet to signal any data entered in a cell that does not fit within a specified range, such as 31 November
- selecting and using peripherals suitable to the data, for example using a data probe to collect data about changing soil temperatures for plants, interpreting the data and sharing the results, presented graphically, on a closed wiki
- recognising the difference between numerical, text and date formats in spreadsheets
- using software to automate calculations to assist with interpreting data, for example using functions to make arithmetic calculations using multiple cells and summing cell ranges
- acquiring data from online sources by narrowing the focus, for example filtering data using graphical query interfaces in simple, pre-populated databases and using additional operators such as 'NOT' and 'AND' to restrict search engine queries
- using data visualisation software to assist in interpreting trends, for example uploading data to a web application and building a visualisation of the dataset

6.5 Define problems in terms of data and functional requirements, and describe common characteristics and elements of similar problems

LIT; NUM; ICT; CCT

- checking existing solutions to identify features that are transferable to new but similar digital solutions, for example identifying if there are any similarities (such as user age and special requirements) between an existing game and a new game to be created – in terms of the types of data and the needs of the users
- investigating characteristics of user interfaces that are common for particular types of problems, for example, touch screens – 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 games

- interpreting a set of data related to a problem to establish the root cause, for example using lines and arrows to connect data with particular functions to see if there are any omissions, duplications or mismatches

6.6 Follow, modify and describe simple algorithms involving sequence of steps, decisions, and repetitions that are represented diagrammatically and in plain English

LIT; NUM; ICT; CCT

- following a diagram of a simple method of sorting, for example sorting a group of unknown weights into order by selecting one weight and deciding if each subsequent weight is heavier or lighter and grouping them accordingly, then continuing the process within each group
- following, modifying and describing the design of a game involving simple algorithms represented diagrammatically or in plain English, for example creating a flowchart with software that uses symbols to show decisions, processes and inputs/outputs

6.7 Design and implement digital solutions using visual programs with user input, branching and iteration

LIT; ICT; CCT

- planning and implementing a solution using a visual programming language, for example designing and creating a simple computer game, suitable for younger children, that requires user input to make selections, taking into account intuitive responses of the audience
- experimenting with different programming options that involve repeat instructions
- experimenting with different ways of instructing to make choices and repeat instructions, for example using 'IF' statements to allow for making choices and repeat instructions (iterations) until a goal is achieved
- designing and creating a solution that repeats a motion, for example creating an animation that repeats a movement
- designing and creating a solution that is interactive for people with disability, for example designing a user interface, taking into account visibility and size of icons, and creating a quiz that provides feedback on response and allows a retry, using a visual programming language

6.8 Use a range of communication tools and agreed social protocols when collaborating on projects and creating, communicating and sharing ideas and information online

LIT; NUM; ICT; PSC; EB

- applying practices that support the organisation of collaborative problem-solving, for example finding online meeting times that suit all members, and agreeing on ways of protecting files and sharing information digitally with members
- developing a set of 'rules' about appropriate conduct, language and content when communicating online, and using these rules as a basis for resolving ethical dilemmas

- using digital systems to create web-based information, for example using a web publishing template to create a blog or website for sharing ideas
- using a range of tools to share ideas and information, for example participating in secure chat rooms, contributing to wikis and writing blogs to reflect on their learning about the Asia region

Years 5 and 6 Achievement Standard

By the end of Year 6, students explain how digital systems may represent numbers and letters using binary numbers. They describe the functions of digital system components and identify how different networks are connected. Students make judgments about whether information systems meet community and national needs and suggest new applications.

Students apply a range of techniques to acquire, validate, interpret and visualise data. They define problems in terms of their data and functional requirements. They follow, describe and modify algorithms, and implement digital solutions with simple user interfaces, involving branching, repetition or iteration. They co-develop social protocols and demonstrate respectful behaviour when collaborating on projects and creating and communicating ideas and information in online environments.

Years 7 and 8

Years 7 and 8 Band Level Description

The Digital Technologies curriculum comprises two interrelated strands: Knowledge and understanding and Processes and production skills. Teaching and learning programs should balance and integrate both strands. Together the strands focus on developing students' knowledge, understanding and skills in computational thinking and on students engaging with a wider range of information systems as they broaden their experiences from personal and local to national, regional and global.

In Years 7 and 8, students think computationally by preferring automated solutions, structuring data in a manner that helps computation, and understanding why digital systems require unambiguous instructions. They develop abstractions by identifying common elements while decomposing apparently different problems and systems, and recognise that abstractions hide irrelevant details for particular purposes. They further develop their understanding of the vital role that data play in their lives, and that their quality and availability directly impact on the success of their problem-solving when working computationally.

Students learn to describe step-by-step computational instructions. They practise stating key decisions in diagrammatical form, typically through flowcharts, and in plain English such as by using pseudocode. They progress from using visual programming in Year 6 to general-purpose programming languages when implementing and modifying programs that involve branching, iteration and subprograms.

Students identify the sequences and steps involved in tasks, with some autonomy. They develop plans to manage tasks, including safe and responsible use of information systems, and apply management plans to successfully manage their time, tasks and data when problem-solving individually and in teams.

Students develop an understanding of how different social contexts impact on how they should approach communicating in online environments. They consider ways of managing the exchange of ideas and files when working in online teams, focusing on the application of technical protocols such as file management and techniques for monitoring progress and feedback.

Students apply practices that comply with legal obligations, particularly with respect to the ownership of information, and demonstrate an understanding of respect when communicating and collaborating in online environments. Safe practices underlie all experiences in the study of Digital Technologies.

Years 7 and 8 Content Descriptions and Elaborations

Digital Technologies knowledge and understanding

8.1 Explain how raw text, image and audio data are represented in binary

NUM; CCT

- investigating how colours are represented in a digital system, for example a Red Green Blue (RGB) system for displays or image manipulation

- investigating the basic representation and characteristics of bitmap and vector graphics images with common graphics editing software
- explaining that each letter is represented as a binary string of digits, for example the letter ‘a’ is represented as ‘01100001’ and the letter ‘A’ is represented as ‘01000001’
- investigating how midi events are created using software and what they achieve

8.2 Explain how data are transmitted and secured in wired, wireless and mobile networks, and understand how the specifications of hardware components impact on applications

LIT; ICT; CCT

- knowing that there are different communications protocols for specific applications, for example Hypertext Transfer Protocol (HTTP) is used for web pages, File Transfer Protocol (FTP) is used for sending and receiving files and Transmission Control Protocol/Internet Protocol (TCP/IP) is used for internet use
- learning that networks have components that control the movement of data, for example hubs, switches, bridges and routers manage data traffic
- examining the role of some components of a network that are used to protect the transfer of data, for example how proxy servers and firewalls act as barriers to protect data flows
- explaining encryption as a means of protecting data when using wireless networks
- explaining how cellular radio towers (transceivers) and mobile phones work together to create mobile networks
- comparing the reliability and speed of transmitting data through wireless, wired and mobile networks

8.3 Evaluate the extent to which information systems meet personal, local, regional and global information and communication needs, and anticipate future risks and benefits for economic, environmental and social sustainability

LIT; NUM; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA’S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- investigating the potential widespread application of an emerging information system and evaluating its effects, for example exploring augmented reality for the purposes of providing extra layers of data about the environmental state of a landscape and using social media networks to advocate sustainability
- evaluating the success of information systems in meeting an economic, environmental or social objective, for example interviewing a local business owner to find out how effectively their information system supports a business objective such as increasing market share
- predicting the risks associated with using an unsecured wireless network

- developing a personal portfolio of competing digital solutions to a problem, for example using multiple cloud-based bookmarking tools, and using this to design a system that addresses the shortcomings of each tool in a futures context
- considering the effects of e-waste on societies and environments, for example the impacts of toxic chemicals when hardware is disposed of, and the practice of dumping unwanted digital systems overseas, particularly in the Asia region
- investigating what features of touch input rather than keyboard or mouse input contribute to their success in meeting a wide range of needs

Digital Technologies processes and production skills

8.4 Collect and acquire data from a range of sources and evaluate authenticity, accuracy and timeliness

LIT; NUM; ICT; CCT; EU; ICU

- designing a search engine query to find specific information on the web and checking its accuracy against information contained in other sources, for example entering instructions such as *intitle:* and *inurl:* prefixes to find information within a general directory, and comparing the results with information found in a wiki
- using digital systems to authenticate data, for example responding to an email or SMS (short message service) message to confirm the due date for an assignment or payment for an excursion
- acquiring data from a range of sources, for example people, websites, books, mobile phones, radiofrequency identification (RFID) and data repositories such as the Australian Bureau of Statistics datasets, and compiling these data into a digital format

8.5 Analyse and visualise data (including numerical, categorical, audiovisual and text data) using appropriate software

LIT; NUM; ICT; CCT

- querying an existing database to isolate specific data for analysis, for example devising multiple selection criteria and using simple Structured Query Language (SQL) statements such as ‘SELECT statement’ to retrieve data from a specified field
- identifying and applying a set of conditions in a spreadsheet that will result in targeted information being provided, for example using conditional formatting to highlight the state of particular cells, and filtering and sorting categorical data using column filters
- using software to present targeted data in formats that assist analysis, for example using visualisation software to represent data selected from spreadsheets and databases in a dynamic form
- manipulating data to present it in a format that supports analysis, for example calculating a simple budget of income and payments and creating a summary table for analysis

8.6 Model processes and objects using structured data

LIT; NUM; ICT; CCT

- describing the attributes of complex objects, for example defining the records, fields, formats and relationships of a simple dataset
- structuring data to support the modelling of an event or practice, for example organising data relating to different mobile phone plans and expenses in columns and rows in a spreadsheet and modelling their affordability based on current income
- creating database tables to represent complex objects
- modelling the attributes of real-world objects for a computer game

8.7 Define real-world problems and decompose them taking into account usability and technical, economic, environmental and social constraints

LIT; ICT; CCT; EU; ICU

- identifying that problems are comprised of sub-elements, for example creating a decision tree to represent the breakdown and relationships of sub-elements to the main problem
- using software to assist in determining the root causes of a problem, for example using a digital cause and effect graphic organiser to identify why one aspect in a perceived problem has an effect on other aspects
- starting from a simplified system, gradually increase complexity until a model of a real-world system is developed, and record the difficulties associated with each stage of implementation
- investigating human factors that influence proposed solution ideas, for example user age affects the language used for instructions, manual dexterity affects the size of buttons and links, hearing or visual impairments influence alternative ways that common information is presented on a website and the consistency of style and instructions promotes engagement with the solution for most audiences
- examining legal requirements that influence solutions, for example the Privacy Act 1988 requirement to safely store and protect personal data from unauthorised loss and modification requires solutions that secure data
- investigating types of environmental constraints of solutions, for example reducing energy consumption and on-screen output of solutions

8.8 Trace algorithms to predict output for a given input and to identify errors, and describe algorithms diagrammatically and in plain English

LIT; NUM; ICT; CCT

- checking the accuracy of an algorithm before it is implemented, for example desk checking it with test data to see if the instructions produce the expected results
- using digital flowcharts to describe a set of computational instructions

- using pseudocode to express algorithmic instructions in plain English, for example using conventional statements such as 'while' and 'endwhile' when describing interaction instructions

8.9 Develop and modify programs with user interfaces involving branching, repetition or iteration and subprograms in a general-purpose programming language

LIT; NUM; ICT; CCT

- developing and modifying digital solutions by implementing instructions contained in algorithms through programs (see band level description for advice about programming)
- developing a digital game that manipulates models of real-world objects
- using a semantic language engine to develop a narrative, or modifying an existing one, with multiple outcomes based on user decision-making

8.10 Manage the sequence of tasks, the types of processes and the resources needed to develop software that meets user requirements

LIT; ICT; CCT; ICU

- organising the instructions and files in readiness for implementation of a solution, for example applying a file naming convention to all data files that are going to be used to create solutions
- documenting the tasks that need to be done, their order and any resources that are required to create solutions
- devising and applying protocols to manage the collaborative creation of solutions, for example planning to use cloud computing to store common files and establishing virtual meetings that acknowledge time zone differences

8.11 Select and apply generally accepted social and technical protocols when creating and sharing information online, and collaborating with local, regional and global audiences, taking into account social contexts

LIT; ICT; CCT; PSC; EU; ICU; ASIA AND AUSTRALIA'S ENGAGEMENT WITH ASIA; ABORIGINAL AND TORRES STRAIT ISLANDER HISTORIES AND CULTURES; SUSTAINABILITY

- organising the timeline, resources, file naming conventions, back-up measures and sequence of tasks required to collaboratively create solutions that meet specified needs
- discussing how different social contexts affect participation in global virtual spaces, for example considering the use of language, acronyms and humour, and providing opportunities for each team member to express their opinions on their own terms
- establishing a set of 'rules' about acceptable and unacceptable behaviour when sharing ideas in a chat room, for example only applying tags to images of other people with their permission
- creating web-based information to meet specific needs, for example creating a website that involves modifying a web publishing template

- creating a web-based project that involves modifying an existing website template or writing HTML and Cascading Style Sheets (CSS) manually, for example using web-authoring software and CSS to create a website that allows customers to interact with an enterprising solution
- discussing policies about the use of information systems in a range of settings, for example using mobile phones for learning and accessing social media websites at school

Years 7 and 8 Achievement Standard

By the end of Year 8, students differentiate between hardware and software components appropriate for designated purposes, and explain some ways in which data are represented, transmitted and secured in common networks. Students evaluate information systems suggesting how to minimise risks, maximise benefits and promote sustainability for local, national and global communities.

Students select quality data from appropriate data sources, and manipulate and structure data to model phenomena and draw logical conclusions to solve problems. They use given techniques to define and analyse problems and decompose these into subprograms considering constraints, and trace and test algorithms and programs with branching, repetition or iteration and subprograms. They implement these using a general-purpose programming language. They create web-based information that meets specific needs, consider social differences and ethical dilemmas when managing collaborative online projects and apply practices to protect identity and the security and integrity of personal data.

Years 9 and 10

Years 9 and 10 Band Level Description

The Digital Technologies curriculum comprises two interrelated strands: Knowledge and understanding and Processes and production skills. Teaching and learning programs should balance and integrate both strands. Together the strands focus on developing students' knowledge, understanding and skills in computational thinking and on students engaging in more specialised programs in preparation for vocational training or learning in the senior secondary years.

In Years 9 and 10, students think computationally by seeking opportunities to automate complex tasks and analyse data, manipulate data to help computation, and understand what happens when instructions do not match their intention. They learn how to decompose problems and systems into multilevel abstractions, identify standard elements such as searching and sorting in algorithms, and explore the trade-off between the simplicity of a model and the faithfulness of its representation. They broaden their understanding of the importance of quality data by exploring techniques that remove bias from the data collection process.

Students consolidate their skills in methods of expressing solutions such as by using pseudocode and diagrams, and broaden their skills to improve the accuracy and logic of their algorithms. They practise appropriate methods including desk checking to predict the relationship between inputs and outputs and develop test cases to validate the capacity of algorithms to meet requirements. Students build on their knowledge of modular, digital solutions to complex problems through using visual, object-oriented and/or scripting tools and environments. They further develop skills in identifying and correcting errors using debugging techniques.

Students progressively become more skilled at identifying the steps involved in planning the creation of solutions and developing detailed time and action plans to manage a range of tasks safely. They learn to use management plans to manage their time, tasks and data when problem-solving individually and in teams, changing direction when necessary.

Students consolidate practices that comply with legal obligations, particularly with respect to the ownership of information, and demonstrate an understanding of respect when communicating and collaborating in online environments. Safe practices underlie all experiences in the study of Digital Technologies.

Years 9 and 10 Content Descriptions and Elaborations

Digital Technologies knowledge and understanding

10.1 Explain how text, audio, image and video data are stored in binary with compression

LIT; NUM; ICT; ICU

- explaining exclusive or (XOR) to develop simple cryptographic ciphers and hashes to 'secure' communications
- explaining the use of the Unicode charts to look up characters from Asian languages

- explaining simple compression schemes, for example run length encoding
- explaining the difference between lossy and lossless compression

10.2 Explain the role of software and hardware components for managing and controlling access, data and communication in networked digital systems

LIT; ICT; CCT; PSC

- explaining how an operating system manages the relationship between hardware, applications and system software
- comparing the similarities and differences of a range of operating systems
- identifying how changes to the configuration of an operating system change the operation of software and hardware components in a networked digital system
- explaining the role of software and hardware components in allowing people to interact with digital systems, for example using a mouse or touch pad or screen, speech, accelerometer
- investigating the operation and use of robotic process control systems

10.3 Critique information systems and policies, and anticipate future risks and opportunities for transforming lives and societies

LIT; ICT; CCT; PSC; EU; ICU; SUSTAINABILITY

- investigating actions, devices and events that are potential risks to information systems, for example losing portable storage devices containing important files, deliberately infecting systems through malware, and power surges
- investigating techniques used by people and organisations to shape how information systems are used, for example refusing to use innovations, using social media to advocate behaviours, purchasing devices, withdrawing previous processes that can only be now performed by an information system
- investigating the impact and opportunities created through the practice of planned obsolescence, for example discussing the benefits and risks to users, the creators and the environment of information systems having a defined life span, taking into account costs, research and resource extraction
- examining the ICT policy for education and evaluating the impact on education
- reviewing the ‘terms of use’ policies on social media networks and predicting ways in which these can support advocacy of change and protection of individuals and societies
- reviewing state and national policies and analysing the potential impact of each. Examples of policies include: *Australian Government Protective Security Policy Framework*, the *Australian Government ICT Sustainability Plan 2010–2015*

Digital Technologies processes and production strand

10.4 Develop systematic techniques for acquiring, storing and validating quantitative and qualitative data from a range of sources, considering privacy and security requirements

LIT; NUM; ICT; CCT; PSC; EU; ICU

- developing strategies and techniques for capturing qualitative and quantitative data of different formats, for example using text entry for open-ended questions to acquire qualitative data; using radio buttons or checkboxes for closed questions to acquire quantitative data
- identifying strengths and weaknesses of collecting data using different methods, for example online surveys, face-to-face interviews, phone interviews, observation, blog entries in response to a posting, phone logs, browser history and online webcam systems
- developing strategies to ensure the privacy and security of survey data, for example using numbers rather than names as identifiers; password protecting files to reduce risks of modifying data and using CAPTCHA™ (Completely Automated Public Turing test to tell Computers and Humans Apart) to confirm human responses
- developing software that extracts specific data from an external source and stores it in a format that is more useful for analysis purposes

10.5 Use appropriate software to analyse and visualise data (including numerical, categorical, text, audiovisual and relational data) to create information and address complex problems

LIT; NUM; ICT; CCT

- using data visualisation tools that manipulate and format data to help identify patterns and relationships between sets of data and information, and that support abstract reasoning, for example using visualisation software to represent structured data in formats such as histograms, network diagrams and maps, to support analysis, and abstraction and pivot tables for relationships and groupings
- using simulation and/or modelling software such as spreadsheets to analyse data in simple, iterative models such as for compound interest or ecological models
- using software to automate calculations, for example absolute cell referencing to automatically extend formulas and automating arithmetic calculations using built-in functions such as trigonometry, compound interest
- applying software filtering techniques that incorporate a range of conditions to analyse connections between sets of data in a relational database system

10.6 Model processes, objects and their relationships using structured data

LIT; NUM; ICT; CCT

- selecting different types of data structures such as an array, record and object to model structured data
- describing the attributes of complex objects using a data dictionary

- interpreting a schema that represents relationships, for example identifying foreign keys to represent relationships
- designing queries that link data across multiple tables

10.7 Precisely define and decompose real-world problems, taking into account functional and non-functional requirements and including interviewing stakeholders to elicit needs and assumptions

LIT; NUM; CCT; ICT; PSC; EU; ICU

- developing a preliminary specification that typically contains a problem statement, a set of solution needs expressed as functional and non-functional requirements, any assumptions or constraints to be considered and the scope or boundaries of the solution
- investigating different types of functional requirements for solutions, for example increasing the speed of processing, calculating new results, improving the quality of reports
- investigating different types of non-functional requirements for solutions, for example reliability, user-friendliness, portability and robustness
- identifying the range of stakeholders who are associated with solutions but are not direct users and using techniques such as interviewing and reinterviewing to clarify needs
- using software such as graphic organisers to represent elements of a problem, indicating the relationship between the sub-elements
- testing a range of text and graphical user interface designs with clients who have different needs on the basis of time taken to complete the task and the number of errors made

10.8 Trace complex algorithms to predict output for a given input, develop test cases to validate algorithms against their specifications, and describe algorithms diagrammatically and in plain English

LIT; NUM; ICT; CCT

- developing test cases that validate program behaviour on a range of valid and invalid user input
- using tracing techniques to test algorithms, for example desk checking an algorithm for a given input by manually stepping through the algorithm while keeping track of contents of the variables
- developing test cases that correspond to the requirements of the specifications
- choosing appropriate algorithms for particular tasks

10.9 Collaboratively develop modular digital solutions, applying appropriate algorithms and data structures using visual, object-oriented and/or scripting tools and environments

LIT; ICT; CCT; PSC

- using a range of techniques to debug object-oriented programs, for example tracing a program’s execution, trying it on a different system and using a debugging tool to identify and correct errors in the solution
- coding separate modules that perform discrete functions but collectively meet the needs of the solution
- defining classes that represent the attributes and behaviour of objects in the real world or in a game

10.10 Use agile development techniques to iteratively and collaboratively develop (design, implement and test) software that meets user requirements

LIT; CCT; ICT; PSC; ICU

- managing the development of a solution by organising continuous opportunities to review progress with collaborative partners
- modifying a solution during its development using feedback from a client and/or regular unit testing
- developing an evolutionary prototype iteratively and incrementally

10.11 Manage online projects taking into account social contexts and legal responsibilities, and evaluate their success in creating enterprising and social opportunities

LIT; NUM; ICT; CCT; PSC; EU; ICU

- investigating indicators of enterprise success, for example the capacity to scale up an innovative solution to meet the demands of a mass market and the savings accrued through sustainable practices
- using software to record and monitor project tasks, responsibilities and timeframes
- investigating legal responsibilities of organisations regarding the storage, communication and disposal of personal and organisational data, for example the National Privacy Principles as they apply to intellectual property
- applying techniques to make ethical decisions when faced with dilemmas about security and ownership of data, for example selecting an action that results in the greatest benefit for the most number of people
- investigating major causes of threats to data, for example human error such as losing a storage device, disclosing passwords, theft and fraud
- creating an interactive web-based project that provides enterprising opportunities and complies with accessibility requirements, for example using fragments of JavaScript to create dynamic content that supports interactivity

Years 9 and 10 Achievement Standard

By the end of Year 10, students develop strategies and techniques to obtain and validate the integrity of data and derive accurate information to meet opportunities and perceived future needs. They describe the role of hardware and software components in the management and control of data in networked information systems. Students evaluate information systems and policies, anticipating future risks, ethical dilemmas and opportunities for sustainably transforming lives and societies.

Students apply techniques to acquire relevant data for manipulation, meeting privacy and security requirements. They select appropriate data structures and model relationships between entities. Students precisely define real-world problems by eliciting requirements, validate modular algorithms against specifications, and collaboratively develop modular digital solutions including using object-oriented programming. They manage and evaluate projects, demonstrate social sensitivity, and are aware of their legal responsibilities. They use software tools appropriately and ethically to implement strategies to improve the efficiency of managing design, production and evaluation processes in creating digital solutions that create enterprising opportunities and transform lives and societies.

Glossary

abstraction

the process of reducing complexity to formulate generalised ideas or concepts, for example, reducing a computing problem to its fundamental concepts

agile development techniques

a software development approach focused on rapid and flexible response to changing requirements. Agile development is based on iterative and incremental development with lightweight and adaptive planning, where requirements and solutions evolve through close collaboration between customer and developers.

algorithm

a description of the steps and decisions required to solve a problem

algorithmic logic

the logic of breaking down computing problems and systems to a step-by-step process to solve a problem or achieve some end. It involves sequencing and abstraction and leads to algorithmic statements.

annotated drawing

labelled descriptive drawings to show particular parts, elements, components, joining techniques, materials and other necessary information for a possible or intended product, system or environment

augmented reality (AR)

replicates, enhances or overlays additional information about the real-world environment using computer-generated data such as global positioning systems (GPS), sound and images

automate

in Digital Technologies, any process of transforming and manipulating data that does not require manual intervention. For example, through the use of formulas in a spreadsheet, new sets of data can be processed and the results recalculated automatically.

biomimicry

inspiration of functions found in nature for use and adaptation in the design of a product or to solve human problems

branching

occurs when an algorithm makes a choice to do one of two or more actions depending on sets of conditions and the data provided

characteristic

distinguishing aspect (including features and behaviours) of an object, material, living thing or event

cloud-based bookmarking tools

a web tool used to label and classify information for later use and stored on a network or remote servers on the internet

CAPTCHA™

a graphic image recognition test to confirm a human rather than a computer response to a request. A backronym for Completely Automated Public Turing test to tell Computers and Humans Apart.

compression

encoding information using fewer bits than the original representation to reduce file size

computational thinking

a problem-solving method that involves various techniques and strategies, such as organising data logically, breaking down problems into components, and the design and use of algorithms, patterns and models

constructed environments

environments developed, built and/or made by people for human and animal activity, including buildings, streets, gardens, bridges and parks. It includes the natural environment after it has been changed by people for a purpose.

data

in Digital Technologies, numbers, characters, images, symbols and sounds that can be manipulated, stored and communicated by digital systems

database

a collection of data organised so the contents can be easily accessed, managed and updated

data repositories

a central place where ***data*** is stored and maintained

decompose

separate a complex problem into parts to allow a problem to be more easily understood

deconstruct

systematic dismantling process to identify and analyse the components that make up a product or service and their relationships

design brief

a concise statement clarifying the project task and defining the need or opportunity to be resolved after some analysis, investigation and research. It usually identifies the users, criteria for success, constraints, available resources, timeframe for the project and may include possible consequences and impacts.

design processes

a subset of technologies processes that typically involve identifying, exploring and critiquing needs or opportunities, generating, researching and developing ideas and planning, producing and evaluating to produce a solution that considers social, cultural and environmental factors

design thinking

use of strategies for understanding design problems and opportunities, visualising and generating creative and innovative ideas, and analysing and evaluating those ideas that best meet the criteria for success and planning

designed environments

spaces and places – including managed, constructed and digital – that have been created for a specific purpose or intention as a result of design thinking and design processes

designed products

new or modified objects that have been created for a specific purpose or intention as a result of design thinking and design processes

designed services

services that usually support or enhance designed environments or products that have been created for a specific purpose or intention as a result of using design thinking and design processes

designed solutions

in Design and Technologies, the products, services or environments that have been created for a specific purpose or intention as a result of design thinking and design processes

desk checking

a manual method used by a human to check the logic of a computer program's algorithm to ensure there are no errors

digital information

the nature and forms of information stored digitally, and the processes that transform digital data into information for various purposes and meanings; the structures, properties, features and conventions of particular forms of digital information and the appropriate methods of storage, transmission and presentation of each form

digital solutions

the result (or output) of transforming data into information using digital systems, skills, techniques and processes to meet a need or opportunity

digital systems

digital hardware and software components (both internal and external) used to transform data into digital solutions. When digital systems are connected they form a network.

digital technologies

any technology controlled using digital logic, including computer hardware and software, digital media and media devices, digital toys and accessories and contemporary and emerging communication technologies

drawing and modelling standards

Australian standards for engineering and technical drawing

economic sustainability

practices that sustain economies while recognising the finite nature of resources and use resources optimally over the longer term without resulting in economic loss

engineering

the practical application of scientific and mathematical understanding and principles as part of the process of developing and maintaining solutions for an identified need or opportunity

enterprise

a project or activity that may be challenging, requires effort and initiative and may have risks

enterprising

showing initiative and willingness to take action and commitment to follow through on initiatives

environmental sustainability

practices that have minimal impact on ecosystem health, allow renewal of natural systems and value environment qualities that support life

environments

one of the outputs of technologies processes and/or a place or space in which technologies processes operate. Environments may be natural, managed, constructed or digital.

exploded view drawing

a technical drawing of an object, with parts shown separately, that shows the relationship or order of assembly of various parts

file transfer protocol (FTP)

a set of rules or standards for transmitting files between digital systems on the internet

food and fibre production

the process of producing food or fibre (including forestry) as natural materials for the design and development of a range of products

functionality

design of products, services or environments to ensure they are fit for purpose and meet the intended need or market opportunity and identified criteria for success

futures thinking

strategic thinking that envisages what can be, given existing knowledge and strategies, to propose scenarios for probable, possible and preferred futures

general-purpose programming language

a programming language designed to solve a wide range of programming problems (rather than a language designed for solving domain-specific problems or designed for pedagogical reasons). It includes procedural, functional and object-oriented programming languages, but does not include declarative programming languages such as Prolog or SQL. It includes scripting and/or dynamically typed languages such as Python and Ruby. Examples include C#, C++, Java, JavaScript, Python, Ruby and Visual Basic.

graphic organisers

digital frameworks that help structure thinking. They make thinking processes visible by showing connections between data. Examples include concept maps, flowcharts and cause-and-effect patterns.

graphics and modelling

techniques to generate and test ideas, communicate and represent alternatives and solutions and document processes. This includes freehand and technical drawings, diagrams, algorithms, systems architecture diagrams, flowcharts and workflow plans, Gantt charts, simulations, physical and virtual prototypes, 3-D models, recipes, report writing and the development of folios.

health

a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity (World Health Organization 1948)

hypertext transfer protocol (HTTP)

a set of rules or standards for transferring files and messages on the World Wide Web. It provides a standard for web browsers and servers to communicate.

IF statement

a conditional decision statement used to control the flow of a program, for example in a spreadsheet

information systems

the combination of digital hardware and software components (digital systems), data, processes and people that interact to create, control and communicate information

intitle prefix

a strategy to limit searches to the title field of a web page. It indicates that a word or phrase is included in the title.

inurl prefix

a strategy to limit searches to particular words in a URL

iteration

repetition of a process or set of instructions in computer programming

life cycle thinking

a strategy to identify possible improvements to products, services and environments to reduce environmental impact and resource consumption. The cycle goes from the acquisition of materials through to disposal or recycling.

low-input sustainable agriculture (LISA)

a way of thinking about farming that focuses on reducing purchased inputs and uses on-farm resources more effectively. Concepts include rotations and soil and water conservation.

managed environments

in Design and Technologies, those environments coordinated by humans, for example, farms, forests, marine parks, water resources, wetlands

materials

includes knowledge of the origins, structure, characteristics, properties and uses of natural (for example, animals, food, fibre, plants, timber) and fabricated resources such as metals, plastics, textiles. Materials are used to create products or environments and their structure can be manipulated.

model

a representation that describes, simplifies, clarifies or provides an explanation of the workings, structure or relationships within an object, system or idea

multimedia

the use of digital technologies to present text, graphics, video, animation and sound in an integrated way

object-oriented programming language

a programming language that supports the object-oriented programming paradigm. In object-oriented programming, objects represent a combination of data (the attributes of an object) and the actions that can be performed on or with that data (the methods of the object). The valid attributes and methods of an object are defined by its class, and these attributes and methods can be inherited from the definition of another class. Examples include C++, Eiffel, Java, Python and Scala. It is possible to use Python to teach both general-purpose and object-oriented programming languages.

occluded elements

aspects of a drawing that would typically not be visible

orthogonal drawing

a drawing in which each edge is represented by a connected line, each segment of which is parallel to a coordinate axis. A scaled drawing view, showing either top or bottom, and two sides.

peripherals

digital components that can be connected to a digital system but are not essential to the system, for example printer, scanner, digital camera

perspective drawing

a drawing that represents the way objects appear to be smaller and closer together, the further away they are. Perspective drawings may be one point, or two or three-point vanishing points. A one-point perspective drawing has a single vanishing point.

play

includes both an imaginary situation and the exploration of objects and actions for a specific purpose, where meaning and sense of objects, actions and social situation can change for individual and collective needs to create something new

preferred futures

envisaged futures that are economically, environmentally and socially desirable and sustainable

produce

actively realise (make) designs and solutions using appropriate resources and means of production

production drawing

a working drawing that details the manufacture and assembly of products

products

one of the outputs of technologies processes, the end result of processes and production. Products are the tangible end results of natural, human, mechanical, manufacturing, electronic or digital processes to meet a need or want.

project

the set of activities undertaken by students to address specified content, involving understanding the nature of a problem, situation or need; creating, designing and producing a solution to the project task and documenting the process. Project work has a benefit, purpose and use, a user or audience who can provide feedback on the success of the solution, limitations to work within and a real-world technologies context influenced by social, ethical and environmental issues. Project management criteria are used to judge a project's success.

project management

the responsibility for planning, organising, controlling resources, monitoring timelines and activities and completing a project to achieve a goal that meets identified criteria for judging success

protocols

generally accepted standards or 'rules' that govern relationships between and within information systems

prototype

a trial or model built to test an idea or process to inform further design development

pseudocode

a description of the steps and decisions required to solve a problem written in natural language

radiofrequency identification (RFID)

a small electronic device, consisting of a small chip and antenna, used for identifying and tracking products, animals and people

rendered drawing

a perspective drawing that shows the relative weight of elements using light and shade

renewable resource

a substance of economic or social value that can be replaced or replenished in no more time than it takes to draw the supply down

service design

the design of the service and the service concept. The service concept aims to meet the needs of the end user, client or customer. The service design includes the physical, organisational, aesthetic and psychological benefits of the service and required systems thinking

services

one of the outputs of technologies processes, the end result of processes and production. Services are the less tangible outcome (compared to products) of technologies processes to meet a need or want. They may involve development or maintenance of a system and include, for example, catering, cloud computing (software as service), communication, ecosystem provisioning and regulation, the internet and transportation. Services can be communicated by charts, diagrams, posters and procedures.

social protocols

generally accepted 'rules' or behaviours when people interact in online environments, for example, using language that is not rude or offensive to particular cultures, and not divulging personal details about people without their permission

social sustainability

practices that maintain quality of life for people, societies and cultures in a changing world for a long period of time, ensuring health and wellbeing without disproportionate costs or side-effects

structured query language (SQL)

specialist programming language used to manage data in relational database management systems

sustainability factors

economic, environmental and social sustainability issues that impact on design decisions

sustainable

supports the needs of the present without compromising the ability of future generations to support their needs

systems

the structure, properties, behaviour and interactivity of people and components (inputs, processes and outputs) within and between natural, managed, constructed and digital environments

systems thinking

repertoires of practice for understanding and working with complexity, uncertainty and risk (including scientific method, systems modelling, game scenarios and role-playing, probability and risk assessment). A holistic approach to problem-solving and analysis where parts of a system are analysed individually to see the whole, the interactions and interrelationships between the parts and how these parts or components influence the whole.

technologies

the resources including materials, data, systems, tools and equipment used to create solutions for identified needs and opportunities, and the knowledge, understanding and skills used by people involved in the selection and use of these resources

technologies contexts

the focus and opportunities for students in Design and Technologies to use Technologies processes and production skills to design, produce and evaluate products, services and environments, for example:

- focusing on specific materials including composites, metal, plastics, wood, 'smart' materials, textiles
- focusing on an area of specialisation (for example, architecture, electronics, engineering, graphics technologies, fashion, food and fibre production).

technologies processes

the processes that allow the realisation of a solution for a target audience (end user, client or consumer). They involve the purposeful use of resources including materials, data, systems, tools and equipment when creating, designing, producing and using products, services and environments. They may involve identifying, exploring, critiquing, formulating and investigating a problem or opportunity; generating, researching and developing ideas; analysing, creating, designing, planning, producing, representing, constructing and evaluating solutions in a sustainable way, giving appropriate thought to impact. These processes typically require one or more of the following types of thinking: computational, critical, creative, design, futures or systems.

Transmission Control Protocol/Internet Protocol (TCP/IP)

a set of rules or standards for organising how messages are transmitted over the internet

visual programming

a programming language or environment where the program is represented and created visually rather than as text. A common visual metaphor represents statements and control structures as blocks that can be composed to form programs, allowing programming without having to deal with syntax errors. Examples of visual programming languages include: Alice, GameMaker, Kodu, Lego Mindstorms, MIT App Inventor, Scratch (Build Your Own Blocks and Snap).

Note: A visual programming language should not be confused with programming languages for creating visualisations or programs with user interfaces, for example, Processing or Visual Basic.

visualisation tools

software to assist in the recording of ideas as visual representations