acara AUSTRALIAN CURRICULUM, ASSESSMENT AND REPORTING AUTHORITY

Draft Shape of the Australian Curriculum: Technologies

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Contents

Preamble

Purpose

1. The draft *Shape of the Australian Curriculum: Technologies* provides broad direction on the purpose, structure and organisation of the Technologies curriculum. It is intended to guide the writing of the Australian Technologies Curriculum from Foundation to Year 12.
2. This paper has been prepared following decisions taken by the ACARA Board and analysis of feedback from the Technologies National Forum and the Technologies National Panel to the *Initial Advice Paper: Technologies* (November 2011).
3. The paper should be read in conjunction with *The Shape of the Australian Curriculum v3.0*. It is informed by ACARA's *Curriculum Design* paper and the *Curriculum Development Process* (http://www.acara.edu.au/curriculum/curriculum.html).

Background

4. The Australian Curriculum: Technologies will contribute to the educational goals set out in the *Melbourne Declaration on Educational Goals for Young Australians* (2008, pp. 8–9) and build on the vision for children's learning and early childhood pedagogy outlined in the *Early Years Learning Framework: Belonging, Being & Becoming, 2009*.
5. The Technologies learning area focuses on the purposeful use of technologies knowledge, understanding, and skills including the creative processes that assist people to select and utilise materials, information, systems, tools and equipment to design and realise solutions. These technologies solutions address personal, community and global needs and opportunities that improve quality of life while taking into account societal values and economic, environmental and social sustainability.
6. The term 'Technologies' has been adopted for the learning area to reflect the range of technologies addressed in schools. This paper proposes that the Australian Curriculum: Technologies comprises two strands for the Foundation Year to Year 8 and two subjects for Years 9 to12 namely, Design and technologies and Digital technologies. This curriculum structure acknowledges and values the distinct knowledge, understanding and skills of each but, particularly in Years F to 8, also recognises those aspects of Technologies learning that are similar in both and that complement learning in each. In brief:
    - Design and technologies will have students learning to develop and apply technologies knowledge, processes and production skills to design, produce and evaluate solutions using traditional, contemporary and emerging technologies for real-world needs, opportunities, end-users, clients or consumers in a range of technologies contexts.
    - Digital technologies will have students learning to develop and apply technical knowledge, processes and computational thinking skills, including algorithmic logic and abstraction, to transform data into information solutions for real-world needs, opportunities, end-users, clients or consumers in a range of technologies contexts.
7. Technologies contexts are the fields of endeavour in which students will apply technologies processes and production. These could include agriculture and primary industries, constructed environments, engineering, entertainment, food technology, home and personal settings, manufacturing, materials and product design (for example electronics, metals, plastics, textiles, timber) and retail.

8. In the curriculum for Years 9 and 10 and for senior secondary years the two separate subjects will provide students with options when selecting programs for study. Students may also choose to study Technologies subjects offered by states and territories that complement and do not duplicate the Australian Curriculum.

9. A glossary of key terms used throughout this paper is provided to support a shared understanding of how they are proposed to be used in the Australian Curriculum: Technologies (p. 32).

Key considerations

10. The development of the Australian Curriculum: Technologies provides an opportunity to shape the future of Technologies learning in schools to ensure that all students benefit from learning about and working with traditional, contemporary and emerging technologies. While this is an exciting opportunity it also presents unique challenges in curriculum development.

11. Unlike some learning areas, there is a need in the Technologies learning area to conceptualise a curriculum structure that can flexibly accommodate rapidly evolving and changing technological knowledge, understanding and skills. While laser cutting and cloud computing may be contemporary technologies today, in a few years' time they may be replaced by more effective technologies. The Technologies curriculum structure needs to adequately provide the flexibility required to allow teaching and learning that meets contemporary and future needs.

12. The structure of the Technologies curriculum described in this draft *Shape of the Australian Curriculum: Technologies* has been informed by the description of learning areas in the *Melbourne Declaration on Educational Goals for Young Australians,* decisions taken by the ACARA Board, advice from the Technologies Advisory Group and analysis of feedback on proposed directions from a range of key stakeholders represented through a Technologies National Forum and a Technologies National Panel. While there has been targeted consultation to inform this draft Shape paper, the national consultation offers the first chance to tap into Australia's technologies' educators, those working in technologies industries and the general public.

13. To ensure that the structure provides for a 21st century Technologies curriculum it is necessary to think beyond custom and practice. The proposed structure comprises two strands (Years F to 8) and subjects (Years 9 to 12) with complementary sub-strands. Envisaging the most effective curriculum structure may include consideration of alternative approaches that provide further flexibility. For example:

    - different ways of articulating the sub-strands
    - two subjects from the Foundation Year with specialised strands
    - one subject from Foundation to Year 8 progressing to two subjects in the following years
    - other structures.

14. That is, while this draft Shape paper proposes a particular approach to the structure of the curriculum, ACARA is open to considering other approaches. The key consideration should be how best to organise curriculum that clearly articulates what we want all young people to learn in this learning area while providing flexibility for teachers in the various settings that exist across the nation to provide quality teaching and learning programs.

15. The feedback from the national consultation will inform the development of the final Shape paper. It should provide a clear direction for the structure of the Technologies curriculum and provide ACARA and writers with a clear brief for the writing of the detailed curriculum.

16. When completing the online questionnaire or preparing a submission, respondents should think carefully about how rapidly technologies are changing and consider that this Technologies curriculum will be developed for students who may be beginning school in 2015 and completing school in 2028. The structure of the Technologies curriculum should facilitate the development of a flexible and dynamic Technologies curriculum for the 21st century.

Introduction

17. People design and use technologies to shape the world in which we live. Technologies increasingly enrich and impact on the lives of people, culture and society globally. It is important that, as a nation, we make connections between technologies, creativity and enterprise as a catalyst for 21st century innovation. We will increasingly depend upon contemporary or emerging technologies, for agriculture, communication, construction, energy and water management, knowledge creation, manufacture, and transportation. Australia needs people with the enterprise, capacity for innovation, willingness to take risks and capability to seize opportunities. They need to make ethical decisions about technologies and to develop creative and innovative solutions to complex problems and for preferred futures. The Australian Curriculum: Technologies has the potential to develop Australia's capacity to respond to our national research priorities, many of which focus on sustainability. It is an active, creative and engaging learning area that fosters students' capacity to be discriminating and informed users, producers and innovators of technologies.

18. Our capacity to manage knowledge and communicate and share information personally and across the globe has changed dramatically in recent years. Information and communication technologies, and social media in particular, have revolutionised the pace of change and the nature of learning, recreational activities and work. It has given access to new ways of thinking and communicating for all ages and abilities. The now ubiquitous nature of digital technologies resulting from digitisation, the miniaturisation and embedding of microelectronics into a range of products, and wireless networking, means that students of all ages and abilities expect to be able to play, learn and study anytime and anywhere, and to design and produce solutions using design and computational thinking and traditional, contemporary and emerging technologies.

19. Technologies challenge us to learn to adapt to new developments and critically examine how they transform and influence our ideas, opportunities and actions. Technologies, in both their development and use, are influenced by and can play a role in transforming society and our natural, constructed and virtual environments. We create, as well as respond to, the designed world in which we live.

20. All technologies impact on people, communities and environments. All Australians need the capacity to engage with society and a knowledge-based economy, to make personal contributions to issues that are relevant to them and to assist in finding sustainable solutions for local and global needs by contributing actively to shaping and improving their world.

The contribution of technologies education to students' lives

21. All young people need to develop knowledge, understanding and skills in the discriminating, ethical, innovative, creative and enterprising use of a range of technologies and the processes through which they can create, design, develop and produce innovative technological solutions. They need opportunities to play, learn, create and produce using a range of technologies from the early years and to be able to pursue a continuum of technologies learning through to the senior secondary years. They should also have the confidence, knowledge, understanding and skills to access, manipulate, create, critique and ethically produce digital information and systems to meet personal, family and community needs, and to be imaginative and innovative in their production of solutions. All students need opportunities to make their personal contribution by being given an active voice on things that are relevant to them.

22. Technologies education provides opportunities for students to make connections between their experiences and to develop knowledge and confidence in meeting the challenges of a highly technological future. Students develop an understanding of the nature, forms and characteristics of materials, information, systems, tools and equipment, and develop ways to manipulate and shape them purposefully to meet their needs and the needs of others across a range of technologies contexts. Technologies education provides opportunities for students to actively engage in designing sustainable and appropriate solutions to meet the needs of the present without compromising the ability of future generations to meet their needs.

23. Students develop understanding of the relationship and interconnectedness between the components of digital systems in authentic situations, taking into account social, legal and ethical considerations. They develop conceptual and technical skills to systematically create information processing solutions for specified audiences, end-users, clients or consumers such as artificial intelligence, communication, databases, digital media, robotics, transactions and websites. They learn to operate and manage ICT systems in order to locate, manage, organise, analyse, represent and present information; to create digital products; to control and monitor processes and devices; to communicate with others; and to support computational and design thinking and production.

24. Technologies education makes direct links to the world of work and the skills needed for collaboration, communication, education, training and employment. All young people need the opportunity to develop the skills to effectively use technologies in their lives and to contribute to a skilled, technologically attuned and highly innovative workforce. To foster interest in careers with a technologies focus, students need to engage in rich technologies experiences. In this way students build technologies competence and awareness over time. In secondary education, students have the opportunity to specialise in technologies contexts. These more specialised studies may provide the stimulus for pursuing a career in technologies.

25. The Technologies learning area provides opportunities for students to identify and consider the contribution of designers and technology specialists to the improvement of the quality of life, including home and family life, the nature of their work, the processes used in specialisations and the importance of teamwork and collaboration.

Technologies education for diverse learners

26. A comprehensive education in Technologies will allow individuals to progress from foundations of creative play, through to consolidated skills and the challenges of developing new knowledge innovations. It will recognise the developmental demands evoked from first engaging in relatively simple technologies, project briefs and problems, to demonstrated knowledge, understanding and skills in established processes, and to the sophisticated level of working through technologically complex projects using materials, information, systems, tools and equipment.

27. Students in Australian classrooms have multiple, diverse and changing needs that are shaped by individual learning histories and abilities, as well as gender, cultural and language backgrounds and socio-economic factors. The Technologies curriculum will be gender-inclusive and accessible to all students. It will provide opportunities to explore gender stereotypes in technologies contexts and the role and contribution of male and female designers and technologists.

28. The curriculum should allow for difference in interests, capabilities and future pathways of students. It will deliver equity of opportunity, engaging every student and enabling them to make active and informed decisions, and equip them with the skills to participate actively in the broader community.

29. The curriculum will provide flexibility for teachers to take into account the different learning situations and rates at which students develop and the diverse range of learning and assessment needs. Consideration of how best to engage every student will be given and of the way that particular groups may have previously been excluded. The utilisation of various technologies, for example, provides opportunities for a range of students, including those with disability, to access and engage with the curriculum.

Nature of the Technologies learning area

30. Technologies education uniquely engages students in technologies processes and production, and design and computational thinking. It also engages students in ways of understanding the world in which they live to identify, explore and critique real-world needs, aspirations and opportunities. It enables students to generate, develop and evaluate ideas, create digital solutions or design, produce and evaluate products, services and environments in a range of technologies contexts in home, community and global settings. Students are able to bring about change by making decisions and choices about technologies through considering social, economic and environmental implications.

31. The Technologies learning area is characterised by students engaging with and creating solutions for real-world situations and end-users by using technologies knowledge, understanding and skills. They engage in creative and critical thinking and manage projects from the identification of needs or opportunities to conception and realisation. They explore scenarios, generate and develop ideas, research, investigate, experiment and test. They realise solutions by working technologically using technologies processes and production that use their hands, tools, equipment, data and digital technologies, and natural and fabricated materials. For younger children, these are realised through personal and family settings where there is an immediate, direct and tangible outcome, and where playfulness and hands-on exploration are a focus.

32. Technologies projects are contextualised by ethical considerations, commercial realities, sustainability, project management, and consumer and client needs, including consideration of personal and cultural beliefs and values. In this learning area, students learn that when they and others work technologically, they are responsible and accountable for their designs and solutions. Projects also provide rich opportunities for applying, synthesising and extending learning from a range of learning areas such as Science, Mathematics, the Humanities and the Arts. Working across learning areas enriches and gives specific content to technological contexts, and supports playfulness and innovation across the curriculum, particularly from Foundation to Year 6.

Technologies knowledge, understanding and skills

33. The Technologies curriculum focuses on the overarching idea of students engaging in creating preferred futures (see p. 12) and:

    - knowledge and understanding of materials, information, systems, tools and equipment; technologies and society including social, cultural and environmental considerations
    - technologies processes and production including: applying a range of thinking skills; responding to needs, opportunities or problems; and managing projects.

34. An overview of Technologies knowledge, understanding and skills is provided on the following pages. The knowledge, understanding and skills for each strand/subject are described in the Structure of the Australian Curriculum: Technologies, pp. 13–16.

Knowledge and understanding

Materials, information, systems, tools and equipment

35. In Design and technologies, technological knowledge and understanding is concerned with the properties and characteristics of materials, information, systems, tools and equipment. Students develop knowledge and understanding of each of these and the interactions between them, understanding that they are a resource and there are constraints on their use to consider. Knowledge and understanding will be dependent on the technologies required to realise or model a solution to meet a need, aspiration or opportunity.

36. In Digital technologies, technological knowledge and understanding is concerned with the properties and characteristics of digital information, people, procedures, digital systems, and electronic equipment. Students develop knowledge and understanding of the ways in which they can be combined and controlled to create structured information and solutions to problems through the processes of investigating, researching, experimenting, testing and validating. Understanding digital technologies focuses on knowing the technical underpinnings of these technologies and how they support the transformation of data in to digital solutions.

Technologies and society including social, cultural and environmental considerations

37. In both Design and technologies and Digital technologies students develop knowledge about and the strategies to critique the relationship between technologies and society, the factors that shape the development of these technologies, and the impact of these technologies on individuals, families, communities and the environment. They learn about how people use and develop technologies to meet their needs.

Technologies processes and production

38. The core of Technologies curriculum in most states and territories concentrates on students applying thinking skills, including design or computational thinking, to respond to needs, opportunities or problems using technologies processes and production and project management. A continuum of learning with a focus on these ways of thinking and producing has enduring value. It is the deep knowledge and understanding of technologies thinking and processes that students in any technologies context will take with them into further play-based settings, personal life, study or the workplace. Although the focus may differ in some ways for each of Design and technologies and Digital technologies, there are similarities. Students:

    - apply a range of thinking skills
    - respond to needs, opportunities or problems
    - manage projects.

Apply a range of thinking skills

39. A core and fundamental dimension to both Design and technologies and Digital technologies is the way students learn to use higher order thinking skills to reflect, evaluate and validate their technological knowledge. Reflecting on learning in Technologies builds their technologies knowledge and deepens their understanding. Technologies knowledge may be validated on the basis of how well a project or task has achieved the brief given to, or developed by, the student. Validation of their choices and coherent uses of materials, information, systems, tools and equipment relies upon the quality of evaluation, justification and choice of technologies used to satisfy criteria for success and design specifications.

40. Students develop increasingly sophisticated design thinking, problem solving, procedural thinking and innovation skills in both Design and technologies and Digital technologies. They develop the ability to use a range of thinking skills to address needs or opportunities when working technologically with materials, information, systems, tools and equipment in home, community and global settings.

41. In Digital technologies, students develop and apply progressively more complex computational thinking to create digital information products, systems or software instructions, beginning in the early years with a more concrete and personal approach. They work creatively and purposefully with digital information and digital systems, and work increasingly collaboratively and independently to develop digital solutions that may be models, simulations, coding, prototypes or finished solutions involving data, hardware and software.

Respond to needs, opportunities or problems

42. Foundational to Design and technologies education is a process of designing and producing with materials, information, systems, tools and equipment in a sustainable and sensitive way. Students evaluate both the process and the solution using criteria of increasing complexity (from personal, through to environmental and ethical). Appropriate thought is given to impact when creating a product, service or environment for real use by a target audience, with the opportunity to respond to and gain feedback from an end-user, client or consumer. The hands-on practical application of technologies skills in Design and technologies develops manual dexterity, fine motor skills and coordination. Students develop a sense of pride, satisfaction and enjoyment in producing quality solutions that may be both functionally appropriate and aesthetically pleasing.

43. In Digital technologies students create digital solutions by formulating and investigating problems; analysing and creating solutions and representing; constructing and evaluating solutions. Creating digital solutions focuses on digital techniques, procedures and computational thinking skills. As in Design and technologies, students develop a sense of pride and satisfaction in the quality digital solutions they create.

44. In both strands/subjects students develop skills in interpreting and using graphic techniques and modelling to communicate and represent ideas and solutions, and to document processes. This includes freehand and technical drawings, diagrams, algorithms, systems architecture diagrams, flowcharts, Gantt charts, simulations, physical and virtual prototypes, 3-D models, report writing and the development of folios. They also develop skills to verbally articulate their ideas and thinking to a range of audiences.

Manage projects

45. Project management is an essential element in building students' capacity to more successfully innovate in Design and technologies and Digital technologies. Project work and project management occur as a part of everyday life and are critical to many fields of employment, particularly in technologies contexts. Technologies education allows students to develop skills to manage projects from identification of need or opportunity through conception to realisation, including planning and reviewing milestones; implementing and monitoring time, action and financial plans; and making judgments using a range of decision-making strategies. Project management can be conceptualised in the early years of schooling as small groups of students explicitly working out how they will work together to bring a design idea to fruition.

46. Students are explicitly taught how to manage projects including considering constraints; risk assessment and management; decision-making strategies; quality control; developing resource, finance, work and time plans; and collaborating and communicating with others in technologies contexts. For younger students, this involves working together to explicitly plan and evaluate technologies at different stages of the process.

47. Assessing and managing risk in Technologies learning applies to the safe use of technologies and to the risks that impact on project timelines, such as availability of components or the impact of weather. In terms of safety, assessing and managing risk 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 cybersafety, and ethical and legal considerations when communicating and collaborating online.

Aims of the Australian Curriculum: Technologies

48. The Australian Curriculum: Technologies will develop active and informed citizens with the capacity to be confident, creative, ethical, enterprising, environmentally and socially responsible innovators. Students will develop the technologies knowledge, understanding and skills to engage purposefully in the process of creating preferred futures by using a range of thinking skills, including futures and systems thinking, to generate and communicate creative ideas. These ideas will be enacted through the practical application of design and computational thinking and traditional, contemporary and emerging technologies to produce effective solutions within personal, family, community and global settings that are meaningful and culturally authentic to those settings.

49. The Australian Curriculum: Technologies will aim to develop students who:

- are creative, innovative and enterprising when using traditional, contemporary and emerging technologies
- effectively and responsibly select and use appropriate technologies, materials, information, systems, tools and equipment when designing and creating socially, economically and environmentally sustainable products, services or environments
- critique, evaluate and apply thinking skills and technologies processes that people use to shape their world, and to transfer that learning to other technology situations
- individually and collaboratively plan, manage, create and produce solutions to purposeful technology projects for personal, local, national and global settings
- engage confidently with and make informed, ethical decisions about technologies for personal wellbeing, recreation, everyday life, the world of work and preferred futures.

Structure of the Australian Curriculum: Technologies

50. Students need continuing opportunities and sustained engagement to build the capacity to think critically, creatively and innovatively when using and creating with technologies and technologies processes. They need conceptual frameworks, knowledge and skills to explore and understand aspects of the natural, constructed and virtual worlds that surround them, and to critique and apply knowledge to develop innovative, enterprising solutions to a range of challenges. This need is best met from Foundation through a continuum of learning using a range of technologies.

51. The Australian Curriculum: Technologies comprises two strands/subjects: Design and technologies and Digital technologies.

    - It is based on the assumption that all young Australians are entitled to study both Design and technologies and Digital technologies from Foundation to the end of Year 8. While the curriculum will be presented as two discrete strands, it will not preclude schools from integrating the strands in teaching and learning programs. Integration is the central pedagogy found in the early years, and a key strength for meaningful learning in the Technologies curriculum. Schools will be best placed to determine if, and how this will occur.
    - In Years 9–12, students will be able to choose from a range of subjects developed by ACARA and states and territories across a number of learning areas as part of their overall curriculum package. The Australian Curriculum will include the development of two Technologies subjects: Design and technologies and Digital technologies at these year levels. Additional Technologies subjects, that complement and do not duplicate the Australian Curriculum subjects, may be offered by states and territories for other technologies specialisations. Decisions about the continued study of Technologies into Years 9–12 will be taken by school authorities, the school, or the student.

Overarching idea: Engaging in creating preferred futures

52. The overarching idea for the Australian Curriculum: Technologies involves students in developing the technologies knowledge, understanding and skills to engage purposefully in helping to create preferred futures. It acknowledges the strong connection between the Sustainability cross-curriculum priority and in particular the sustainability organising ideas related to futures (see paragraphs 94–97).

53. A focus on preferred futures provides the methodology for identifying and moving towards sustainable patterns of living. Students will engage in predicting outcomes and impacts of technological decisions for current and future generations; considering and identifying probable and preferred futures; taking into account economic, environmental and social sustainability. Over time they will reconstruct and review their visions for preferred futures through research, experience, dialogue, discussion and the exchange of ideas. This overarching idea is common to Design and technologies and Digital technologies, as both are concerned with technology, culture and society; economic, environmental and social sustainability; and creativity, innovation and enterprise.

Relationship between the strands/subjects and sub-strands

54. Learning in each strand/subject is organised through two sub-strands that are realised interactively in curriculum implementation:

    - Knowledge and understanding
    - Processes and production.

55. A complementary sub-strand structure provides an opportunity to highlight similarities across the learning area and facilitates integrated approaches to teaching both strands in Years F–8 if desired. However, the sub-strands of each strand also include learning that is distinct to each and provides schools with the opportunity to teach each strand discretely.

56. The sub-strands for each strand/subject should not be viewed in isolation as there are clear relationships between them. The sub-strand structure has been designed with the intention that teachers when developing programs will select technologies-specific content from the Knowledge and understanding sub-strand and ask students to apply the content using the skills in the Processes and production sub-strand. The sub-strands will assist teachers to plan for the development of comprehensive and developmentally appropriate teaching and learning programs.

57. The overarching idea of engaging in creating preferred futures bridges the strands/subjects and sub-strands across technologies contexts and allows students to engage purposefully in this endeavour. It is reflected in each of the strands/subjects to ensure a futures-oriented approach to Technologies learning. It frames the development of concepts in the Knowledge and understanding sub-strand, supports key aspects of the Processes and production sub-strand, and contributes to developing students' capacity to be active, innovative and informed citizens.

Design and technologies

58. The Design and technologies strand/subject comprises two sub-strands:

    - Design and technologies knowledge and understanding
    - Design and technologies processes and production – design, produce and evaluate.

59. Together, the two sub-strands of the Design and technologies curriculum provide students with technologies knowledge, understanding and skills through which they can design and work technologically to produce solutions for real-world needs, opportunities, end-users, clients or consumers.

Design and technologies knowledge and understanding

60. This sub-strand focuses on materials, information, systems, tools and equipment; and technologies and society. The content is dependent on the technologies context.

61. In the Foundation to Year 6 scope and sequence, content descriptions and elaborations will be written for a range of technologies contexts. They will complement content descriptions already developed for other learning areas to enable teachers to create integrated teaching and learning programs. Selection of technologies contexts will also take into account the organising ideas for the cross-curriculum priorities and the learning continuum for the general capabilities.

62. In Years 7–12, schools will be able to select a range of technologies contexts suited to their location, resources and student interest that allow for students to design, produce and evaluate products, services and environments.

63. Students will develop increasingly sophisticated knowledge and understanding, drawn from both contemporary and historical sources, of:

- the range of materials, information, systems, tools and equipment that are central to traditional, contemporary and emerging technologies, including their properties, characteristics and components
- the ways in which materials, information, systems, tools and equipment interrelate and can be combined to create solutions to problems and to identify new opportunities for innovations
- the relationship between technologies and individuals and their communities (local, national and global), and the factors that shape the development of these technologies and the impact of these technologies on individuals, families, communities and the environment.

Design and technologies processes and production – design, produce and evaluate

64. This sub-strand focuses on designing, that is, identifying, exploring and critiquing a need or opportunity; generating, researching and developing ideas; and planning, producing and evaluating solutions that utilise process and production skills, creativity, innovation and enterprise to promote the development of sustainable patterns of living.

65. Students will develop increasingly sophisticated skills in technologies processes and production through designing and producing in response to design needs or opportunities to create and produce products, services and environments. They will:

- identify, explore and critique needs or opportunities, and use critical, creative, design and systems thinking to examine a range of technologies contexts
- have opportunities to create and produce innovative and enterprising products, services and environments that have positive and sustainable outcomes for preferred futures, for the economy, the environment and society
- identify needs and wants, consider user values and beliefs, generate and develop ideas, research and investigate possible solutions, establish criteria for success, and evaluate and justify their designs against these criteria and design specifications
- assess risk, observe safety standards and practices, including cooperation and respect for others when using appropriate techniques, tools and equipment to produce a technology output of appropriate quality, and in so doing develop a range of production skills
- assess all aspects of the development of their solutions from ethical and sustainability perspectives, evaluate the success of their solutions based on the results of testing and user satisfaction, and suggest improvements that could be made to the solution and to their own performance.

Digital technologies

66. The Digital technologies strand/subject comprises two sub-strands:

    - Digital technologies knowledge and understanding
    - Digital technologies processes and production – create digital solutions.

67. In the Digital technologies curriculum, the two sub-strands provide students with knowledge, understanding and skills through which they can safely and ethically exploit the capacity of digital technologies to create, modify and construct digital information and systems for specific purposes and/or audiences, controlled through a variety of means.

Digital technologies knowledge and understanding

68. This sub-strand focuses on digital information, digital systems and technologies, and digital technologies and society.

69. Students will develop increasingly sophisticated knowledge and understanding, drawn from both contemporary and historical sources, of:

    - the range of digital information and systems, including their properties and characteristics
    - the ways in which digital information and systems can be combined and controlled to create solutions to problems and to identify new problems and innovations
    - the relationship and interconnectedness between the components of digital systems and digital information in real-world situations, taking into account social, legal and ethical considerations
    - the relationship between digital technologies, themselves, their communities (local and global), the factors that shape the development of these technologies and the impact of these technologies on individuals, families, communities and the environment.

Digital technologies processes and production – create digital solutions

70. This sub-strand focuses on formulating and investigating problems; analysing and creating digital solutions; representing, constructing and evaluating solutions; and utilising skills of creativity, innovation and enterprise for sustainable patterns of living.

71. Students will develop increasingly sophisticated skills in digital technologies processes and production through applying computational thinking to create digital information products, systems or software instructions to address digital problems. Through investigation they will:

    - discuss and formulate the dimensions of the problem
    - take action to promote the use of digital technologies to support the evolution of preferred futures, including consideration of security, values, beliefs, ethics and safety including cybersafety
    - conduct research, generate ideas for digital solutions, analyse and organise data to inform their design thinking, and use an increasing variety of methods, techniques and forms to communicate this thinking

- develop solutions to problems either by representing the solution with a model or simulation or by constructing a prototype or finished solution
- evaluate solutions and processes against criteria or specifications
- increasingly select and manage digital data, software and systems within constraints, and make decisions concerning appropriate techniques, processes, quality standards and testing
- explore the capabilities of digital technologies for supporting creative, innovative and enterprising pursuits, including for personal expression, cultural and artistic activity, mathematical abstraction and logic, scientific and social invention, and complex algorithmic thought processes.

72. Computational thinking involves students learning to formulate problems, logically organise and analyse data, and represent it in abstract forms such as data tables, digital graphs, spreadsheets, models and animations. They automate solutions through algorithmic and declarative logic, and determine the best combinations of data, procedures, and human and physical resources to generate efficient and effective information solutions.

General capabilities and the Australian Curriculum: Technologies

73. In the Australian Curriculum, the knowledge, skills, behaviours and dispositions that students need to succeed in life and work in the 21st century have been identified as general capabilities. Over the course of their schooling, students develop and use these capabilities within and across learning areas and in their lives outside school. General capabilities and learning areas have a reciprocal relationship. Learning areas provide opportunities for students to develop and use general capabilities. Similarly, wherever general capabilities are made explicit in learning areas, they can enrich and deepen learning. Aspects of each of the seven general capabilities will be embedded in the content descriptions and/or elaborations where appropriate.

Literacy

74. The Technologies curriculum will present students with particular literacy demands and opportunities, to comprehend and compose a range of visual and digital texts. They learn how to communicate ideas, concepts and detailed proposals to a variety of audiences; recognising how language can be used to manipulate meaning; reading and interpreting detailed written instructions, often including diagrams and specific technologies, procedural writings such as software user manuals, design briefs, patterns and recipes, 3-D models; preparing notated engineering drawings, software instructions and coding; writing project outlines, briefs, concept and project management proposals, evaluations, engineering and project analysis reports; and preparing detailed specifications for production. Drawing, modelling and working with digital tools, equipment and software assists the development of visual literacy. Listening, talking and discussing are critical in design thinking – in particular, articulating, questioning and evaluating ideas.

Numeracy

75. The Technologies curriculum will provide opportunities for students to apply mathematical knowledge and skills in a range of technologies contexts. Numeracy skills enable students to use mathematics to analyse and address technologies and design questions. This includes using number to calculate and estimate; interpreting and drawing conclusions from statistics; measuring and recording throughout the process of idea generation; developing, refining, testing concepts; and costing and making products. In using software, materials, tools and equipment, students work with the numerical concepts of geometry, scale, proportion, measurements, strength and volume. These activities contribute to the development of spatial ability, which is essential to many design challenges.

Information and communication technology (ICT) capability

76. Information and communication technology will be represented in two ways in the Australian Curriculum. It will be detailed in the Digital technologies strand/subject of the Technologies curriculum and through the ICT general capability that applies across all learning areas.

77. In the Digital technologies strand/subject of the Technologies curriculum students will learn the knowledge and skills they need to operate and manage ICT systems to locate, organise, analyse, represent and present information; create digital artefacts and prototypes; control and monitor processes and devices; communicate with others; and

support technologies thinking, production and processes. While much of the explicit teaching of ICT occurs in the Digital technologies strand/subject, it is strengthened, made specific and extended in Design and technologies and across the learning areas as students engage in a range of learning activities with significant ICT demands.

78. In the Digital technologies strand/subject students will also apply computational thinking and become confident developers of information solutions. They will develop and apply an understanding of the characteristics of data, audiences, procedures and digital technologies and computational thinking to create, develop and evaluate purpose-designed information solutions. Computational thinking provides a framework for understanding how contemporary digital technologies help solve current and future information problems. Students learn to formulate problems, logically organise and analyse data, and represent it in abstract forms. They automate solutions through algorithmic logic and determine the best combinations of data, procedures, and human and physical resources to generate efficient and effective information solutions. See paragraphs 66–72 for specific details regarding the Digital technologies curriculum.

79. In contrast with this specialised knowledge and skills, the ICT general capability focuses broadly on ICT learning across all learning areas. Students apply appropriate social and ethical protocols and practices in using ICT to investigate, create and communicate, and develop their ability to manage and operate ICT to meet their learning needs and to become effective users of ICT across the curriculum.

80. While there is a clear relationship between the two the key difference is that the ICT general capability assists students to become effective *users* of ICT, whereas the Digital technologies curriculum assists students to become confident *developers* of information solutions by applying computational thinking.

Critical and creative thinking

81. Critical and creative thinking underpin Technologies learning. Students develop critical and creative thinking in the Australian Curriculum: Technologies as they imagine, generate, develop, produce, and critically and creatively evaluate ideas against a backdrop of rapidly changing environmental, economic and social needs and concerns. They refine concepts and reflect upon the decision-making process by engaging in various forms of thinking, such as design, spatial and systems thinking, and sustainable, action-based thinking. Abstract and concrete thinking capabilities will be developed through challenging topics that do not have straightforward answers. The Technologies curriculum will stimulate students to think creatively about the ways in which products, services and environments impact upon our lives, how they might be better designed, and about possible, probable and preferred futures. Experimenting, drawing, modelling, and working with digital tools, equipment and software will assist students to build their visual and spatial thinking and to create solutions, products, services or environments.

Personal and social capability

82. The Technologies curriculum will develop key aspects of students' personal and social learning. Involvement in project management in the Technologies curriculum will provide rich opportunities to develop students' capacity for self-management. It will assist them in directing their own learning and in planning and carrying out investigations, and will enable them to become independent learners who can apply technologies understanding and skills to decisions they will have to make in the future. Designing and innovation involve a degree of risk taking and resilience as students work with the uncertainty of sharing new ideas. Through working cooperatively with others, students develop their social and employability skills, and learn to work in teams, make group decisions, resolve conflict and show leadership.

Ethical behaviour

83. Students use ethical behaviour as they critically consider and apply ethical principles when collaborating, creating, sharing and being socially responsible in the use of technologies, materials, information, processes, tools and equipment. They investigate current and future local, national and global priorities, and evaluate their findings against the criteria of environmental sustainability, economic viability, social and emotional responsibility, and cultural awareness. When they explore complex issues of personal, local and global significance associated with technologies, students consider possibilities, become aware of their own roles and responsibilities as citizens, and are encouraged to develop informed values and attitudes. The Australian Curriculum: Technologies enables students to learn about safe and ethical procedures for investigating and working with people and animals, and to consider their responsibilities through using sustainable practices that protect the planet for all forms of life that share the world.

Intercultural understanding

84. The Technologies learning area will provide students with opportunities to consider how technologies are used in diverse communities at local, national, regional and global levels, including their impact and potential to transform people's lives. It will enable students to explore ways that people use technologies to interact with one another across cultural boundaries and investigate how cultural identities and traditions influence the function and form of products, services and environments designed to meet the needs of daily life.

Cross-curriculum priorities in the Australian Curriculum: Technologies

85. The Australian Curriculum must be relevant to the lives of students and address the contemporary issues they face. With these considerations in mind, the Australian Curriculum gives special attention to three cross-curriculum priorities:

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

86. In the Australian Curriculum: Technologies, these priorities will have a strong but varying presence, depending on whether the focus is on Design and technologies or Digital technologies.

Aboriginal and Torres Strait Islander histories and cultures

87. The Australian Curriculum: Technologies will value Aboriginal and Torres Strait Islander histories, cultures and technological knowledge. It will provide opportunities for students to appreciate that Aboriginal and Torres Strait Islander Peoples have a longstanding tradition of developing and utilising a range of technologies in a sustainable way.

88. Students will have opportunities to understand that Aboriginal and Torres Strait Islander Peoples develop technologies that support sustainable practices for local conditions. Students will also understand that the world's first and most continued technologies often developed through intimate knowledge of Country/Place and Culture, and that, similar to all peoples, observation, action, experimentation and evaluation have been and are critical in this process.

89. Students will explore how Aboriginal and Torres Strait Islander Peoples' capacity for innovation is evident in the incorporation of a range of introduced technologies within existing practices in ways that purposefully build or maintain cultural, community and economic capacity. Examples include solutions for food or medicinal preparation, building and architecture, and the use of digital technologies to enhance communication. Students will also explore how technologies are intrinsically linked to the traditional and contemporary Cultures and Identities of Aboriginal and Torres Strait Islander Peoples.

Asia and Australia's engagement with Asia

90. The Australian Curriculum: Technologies will enable students to explore and appreciate the significant contribution that the people and countries of Asia have made to design thinking and global technological advancement, and the impact that Australia's technological advances have had upon the countries of Asia.

91. Students will explore the role that the people and countries of Asia play in pioneering research linked to development of innovative technologies designed to solve complex global challenges, including advanced manufacturing processes linked to automotive, electronic and robotic technologies, food and fibre and medical advances.

92. Students will also explore the significant technological contribution that Australia has made to the countries of Asia and the extent to which technologies from the Asia region have influenced Australian culture in a range of technologies and technologies contexts.

93. They will also gain an understanding of the important contributions that human-powered technologies and the use of local materials and sophisticated craft-based fabrication techniques have made in assisting communities in diverse environmental conditions to create sustainable modes of existence.

Sustainability

94. The Sustainability cross-curriculum priority has a particular significance for the Technologies learning area. The Australian Curriculum: Technologies will support the notion of sustainable patterns of living to meet the needs of the present without compromising the ability of future generations to meet their needs. Actions to improve sustainability are both individual and collective endeavours shared across local and global communities. Actions that support more sustainable patterns of living require consideration of environmental, social, cultural and economic systems, and their interdependence. This applies to both Design and technologies and Digital technologies. Also see paragraphs 52–53.

95. The Technologies learning area will provide students with the knowledge and skills to implement systematically a process to design and engage with sustainability action(s). Through this process, students will assess competing viewpoints, values and interests; work with complexity, uncertainty and risk; make connections between disparate ideas and concepts; self-critique; and propose creative and sustainable solutions.

96. The process of designing for effective sustainability action involves students in projects that require them to:

- reflect on human need and equity of access to limited Earth resources
- consider sustainability as a primary concern when identifying and critiquing a need or opportunity, generating initial ideas and concepts, and refining those concepts
- embed practices throughout the process that promote sustainability when choosing processes, materials, technologies and systems
- evaluate the extent to which the process and designed solutions embrace sustainability as part of the critique and self-reflection process of each project
- research and assess new and developing technologies from a sustainability perspective.

97. Technologies education enables students to gain knowledge of why it is important to develop and utilise environmentally suitable technologies that support the needs of the present without compromising the needs of future generations. It can prepare young people for work within new ‘green industries’, as well as prepare all students to be sustainable consumers and to take an environmental ethos to traditional fields of employment. Furthermore, it enables them to reflect on personal lifestyle choices and their own environmental footprints.

Organisation of the Australian Curriculum: Technologies

98. The Technologies curriculum for each, Design and technologies and Digital technologies strand (Years F–8) or subject (Years 9–12) is organised in the following bands:
    - Foundation to Year 2
    - Years 3–4
    - Years 5–6
    - Years 7–8
    - Years 9–10
    - Senior secondary (Years 11–12).
99. The organisation of the Technologies curriculum in these bands provides the flexibility to address knowledge, understanding and skills in a way that meets the diverse cognitive and developmental needs and interests of students.
100. Learning in Technologies and the development of technological knowledge, understanding and skills is sequential and cumulative.
101. The Australian Curriculum should not exceed 80 per cent of the available teaching time. Indicative hours that guide the writing of all learning areas are available on the ACARA website in Section 4.2 of the *Curriculum Design* paper (http://www.acara.edu.au/curriculum/development_of_the_australian_curriculum.html). The indicative hours for writing Technologies curriculum should be read with this in mind. For Design and technologies and Digital technologies combined these are:
    - 60 hours across Years F–2
    - 80 hours across Years 3–4
    - 120 hours across Years 5–6
    - 160 hours across Years 7–8
    - 80 hours each across Years 9–10
    - a further 200 to 240 hours of learning across Years 11–12 for each of Design and technologies and Digital technologies.
102. Allocation of time for teaching the Technologies learning area will be a school authority or school-based decision. Schools are best placed to determine how learning in Technologies will be delivered. These decisions will take account of the different approaches that can be taken for each Technologies strand or subject. For example, some Technologies curricula require frequent brief tuition while others require more intense immersion less frequently.

Scope and sequence of the Australian Curriculum: Technologies

103. The knowledge, understanding and skills proposed in the scope and sequence of Technologies learning are cumulative in nature. They work to build on the depth of students' understanding and the sophistication of their skills in the ways they think about and work with technologies. The proposed overview of the curriculum is presented below in stages of schooling for each of the Design and technologies and Digital technologies strands or subjects. The detailed curriculum will reflect the general capabilities and cross-curriculum priorities.

104. Like other learning areas, the Technologies curriculum, particularly in the primary years, allows for the integration and support of other learning area knowledge for mutual development of concepts and skills. This is typical practice in primary classrooms and supports the nature of how young children learn and think. The Technologies curriculum will provide both powerful and rich situations and hands-on approaches in which young students can bring to their projects, learning from other learning areas, as they read, measure, write, draw, research, construct and critically think. Importantly, Technologies learning is active, and involves play and group activities as students design and create solutions to challenges and needs relevant to their lives. Technologies learning applied to real-world situations gives meaning and supports student-centred inquiry and purposeful play and learning, developing a motive for learning in all areas of the curriculum.

The Technologies curriculum across the years of schooling

Foundation to Year 2 (typically 5–8 years of age)

105. The *Early Years Learning Framework* (EYLF) recognises the importance of children connecting with people, place, technologies and natural and processed materials; being effective communicators; and using information and communication technologies to access information, investigate ideas and represent their thinking. In Years F–2, the curriculum builds on the EYLF where the outcomes for children include developing a strong sense of identity and wellbeing; being connected with, and contributing to, their world; becoming confident and involved learners; and becoming effective communicators. The EYLF has a specific focus on play-based learning and recognises children's rights to be active participants in all matters affecting their lives.

106. The Years F–2 curriculum will focus on personal forms and use of technologies in children's immediate environments that are relevant to them, such as at home, in the backyard/farmyard, and in the classroom. Students bring diverse experiences with technologies to school and these should be acknowledged. This can include technologies relevant to communicating with family in distant places.

107. In the early years of schooling, children have a natural curiosity about the natural and designed world, and their desire to make sense of it provides a platform to construct and review their learning through interactions with others, experimentation, intentional teaching, and play in the classroom and beyond. This helps them to make sense of a world that is outside their immediate experience, as they connect new knowledge with what they already know or believe. Students will have the opportunity to develop understanding of society and natural, constructed and virtual environments through exploratory and creative learning in technologies.

Years 3–6 (typically 8–12 years of age)

108. During these years of schooling, students progressively engage with more abstract ideas. They begin to understand and appreciate different points of view and can maintain engagement with tasks for longer periods of time. Thought processes become more conceptual and consistent, with learners drawing upon a broader range of experiences to inform their thinking. Students increasingly look for and value learning that helps explain broader aspects of their world.

109. In Years 3–4 (typically 8–10 years of age), students become more concerned with the social and environmental use of technologies in their local, national and global communities for a range of purposes and users, including for community-based work. Students continue to apply knowledge from other areas of learning. This helps them to build an appreciation of design as a learned concept, and the integral nature of technologies for supporting and sustaining human activity in relation to other living things in their local and global environments. Students need opportunities for investigating and testing design ideas in relation to environmental and social needs, and to be enterprising.

110. In Years 5–6 (typically 10–12 years of age), students broaden the scope of their investigations to consider the safe and ethical use of technologies, including the reach of these technologies across local and global settings for a range of purposes and audiences, end-users, clients or consumers. This helps them to understand the relationship between responsible and appropriate design, function and aesthetics, end-user needs and resourcing constraints, and local and global systems. Students should have the opportunity to evaluate technology ideas and solutions in relation to their ethical impact that span beyond local needs to global settings. Students continue to apply knowledge from other learning areas.

Years 7–10 (typically 12–16 years of age)

111. The transition from primary to secondary school coincides with a range of significant personal, biological and social changes. Students often begin to question established conventions, practices and values. Their interests extend well beyond their own communities and they develop concerns about wider issues. The middle and upper secondary years of schooling can be seen as a period of transition to adulthood. Students have a clearer sense of their strengths, interests and goals. They begin to see themselves as active players in community life and are often concerned about major social and environmental issues and the ethical implications of human activity and knowledge.

112. In the lower secondary years of schooling, the Australian Curriculum: Technologies will provide learning opportunities for students to engage in a range of technologies contexts with more specialised facilities and resources.

113. In Years 7–8 (typically 12–14 years of age), the focus of the curriculum will be on the personal and local community with opportunities for national and global perspectives. The focus will be on developing students' capacities to think and act technologically, and to solve problems that move progressively from individual interests to addressing problems of wider community concern. They will develop their design thinking through a number of different technologies contexts (for example, agriculture, food technology, digital, engineering, manufacturing, textiles). They will develop increasing independence in thinking and skill application, and have more of an awareness of safety issues.

They will begin to appreciate the interdependence of technology development, culture, environment, developer and user. Ideally, there will be opportunities for teachers to use the Technologies learning area as an organiser for cross-curricular integrated projects/themes.

114. The design of the Australian Curriculum for Years 9 and 10 recognises that many students commence senior secondary pathways and programs, including vocational pathways, during these years. In Years 9 and 10, there is flexibility for students to undertake more specialised learning pathways in a range of learning areas as preparation to continue learning into the senior secondary years.

115. In the Technologies learning area, students will use technologies knowledge and understanding, technologies processes and production, and design and/or computational thinking to solve problems that require knowledge and skills specific to the technologies context. These specialised problem-solving activities will be sophisticated and 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. Students will incorporate knowledge of the interdependence of technology development, culture, values, beliefs, environment, developer and user in their technologies solutions.

116. At Years 9 and 10 (typically 14–16 years of age), Technologies curriculum will be developed for two subjects: Design and technologies and Digital technologies. Students may also choose to study additional technologies subjects that complement and do not duplicate the Australian Curriculum and are currently offered by states and territories.

Senior secondary (typically 16–18 years of age)

117. The senior secondary curriculum will provide students with increased opportunities to make choices about pathways through school and beyond. These choices are informed by previous success and interests, and future options for training, learning or employment. The Technologies curriculum for senior secondary will provide for a range of specialised courses that have explicit pathways which allow for more depth of study, multi-disciplinary approaches, sophistication of engagement and can lead to tertiary study, vocational training or employment. Years 9–10 technologies subjects are not a pre-requisite. Students will use technologies knowledge and understanding, technologies processes and production, and design and computational thinking to solve complex problems that require knowledge and skills specific to the technologies context. Increasingly, study will acknowledge the complexities of contemporary life and the future. They will make connections to other learning areas, related specialised occupations and further study, and have a more global perspective, with a more sophisticated understanding of the complex interdependencies involved in technologies development. Students will incorporate a more sophisticated understanding of the interdependence of technology development, culture, environment, developer and user in their design solutions.

118. Taking this into account, the senior secondary Technologies curriculum will include the development of curriculum for two subjects – one focusing on Design and technologies and the second focusing on Digital technologies. Students may also choose to study additional technologies subjects that complement and do not duplicate the Australian Curriculum and are currently offered by states and territories.

Design and technologies across the years of schooling

119. Together, the two sub-strands of the Design and technologies curriculum provide students with technologies knowledge, understanding and skills through which they can design and work technologically to produce solutions for real-world needs, opportunities, end-users, clients or consumers. Design and technologies knowledge and understanding sub-strand focuses on materials, information, systems, tools and equipment; and technologies and society. The content is dependent on the technologies context. The Design and technologies processes and production sub-strand focuses on designing, that is, identifying, exploring and critiquing a need or opportunity; generating, researching and developing ideas; and planning, producing and evaluating solutions that utilise process and production skills, creativity, innovation and enterprise to promote the development of sustainable patterns of living.

Foundation to Year 2

120. In Years F–2, Design and technologies content will provide opportunities for students to:

- investigate technologies, materials, information, systems, tools and equipment, with a focus on purpose and personal and social needs within local settings
- develop an understanding of the concept of technologies processes and design processes, through purposefully and safely using and producing with technologies to meet personal and social needs, with consideration about their impact on others. This includes visualising, identifying and communicating design ideas, drawing, talking, modelling, trial and error, planning and safely utilising tools and equipment including digital. Students will recognise that a design project can be evaluated using criteria such as ‘Does it work?’, ‘Does it meet a purpose?’, ‘Do I like it?’ or ‘Can it be improved?’.

Years 3–6

121. In Years 3–4, Design and technologies content will provide opportunities for students to:

- investigate and evaluate the range of technologies, materials, information, systems, tools and equipment that support local community needs and give insights into responsible environmental solutions
- investigate and critique design problems and solutions based on research that goes beyond personal opinion and experience to include understandings about the place and impact of these technologies in relation to other living things
- visualise, identify, research, communicate and document design ideas before, during or after producing a designed solution
- produce designed solutions by purposefully planning, selecting, safely using and evaluating technologies, materials including natural, recycled, everyday household materials and tools and equipment, for design projects in sustainable ways.

122. In Years 5–6, Design and technologies content will provide opportunities for students to:

- examine critically technologies, materials, information, systems, tools and equipment that are used regularly in the home and community, with consideration of ethics and sustainability
- critique ethical and socially responsible solutions to design problems, focused on local and global systems, materials, tools, equipment and design ideas

- develop an understanding of the factors that influence the design, innovation and use of common technologies in order to consider the reasons why and for whom the technologies were developed
- safely design, plan and produce purposeful, innovative and enterprising quality solutions for personal, home and some community-based situations
- create, modify and test ideas, and identify and apply criteria to evaluate their own and others' solutions in relation to users, sustainability, ethics, and cultural and personal values where the interdependence between local and global settings becomes evident
- evaluate the processes and products of design.

Years 7–10

123. In Years 7–8, Design and technologies content will provide opportunities for students to:

- learn and make judgments about an increasing range of materials, information, systems, tools and equipment, and the way in which their characteristics and properties can be combined to create and produce solutions to problems for individual students and the community, with a focus on ethics, enterprise and sustainability
- develop an understanding of the ways in which products, services, and environments evolve, and identify the factors that influence design, including ethical, social and environmental sustainability considerations
- apply, with increasing independence, creativity, innovation, production and enterprise skills to design, plan, manage and safely produce quality solutions for increasingly complex problems
- test and evaluate design ideas and technologies in relation to who does and does not benefit from these, considering equity of access, and sustainable, responsible and ethical use of materials, information, systems, tools and equipment.

124. In Years 9–10, Design and technologies content will engage students with specialised technologies contexts such as agriculture, architecture, manufacturing, media design, digital design, engineering, food technology, industrial design and textiles. It will provide opportunities for students to:

- investigate and make judgments about an increasing range of materials, information, systems, tools and equipment when working technologically, and of the way their characteristics and properties can be combined and utilised to create solutions to problems of relevance to individual students and the wider community
- confidently apply design thinking, creativity, innovation, enterprise and project management skills as they develop design projects of increasing sophistication
- consider factors influencing design and the way that products, services and environments evolve, and ethical, social and environmental sustainability implications of design projects
- identify, explore, critique, design, produce, manufacture and construct, with increasing independence, quality products, services and environments using a range of skills and processes, recognising risks and adopting safe work practices for increasingly complex problems

- work both independently and collaboratively using a range of skills and processes to select and safely use appropriate technologies optimised to suit specific tasks, purposes and technologies contexts
- learn to evaluate the design processes employed and the solution achieved, using identified design criteria and with consideration of impact.

Senior secondary

125. The Design and technologies curriculum will provide opportunities for students to:

- develop deep knowledge and understanding of materials, information, systems, tools and equipment that apply in the design and production of products, services and environments within specialised technologies contexts such as agriculture, digital design, engineering, food technology, industrial design, manufacturing and textiles
- understand properties and applications of materials, including the biological, chemical and physical properties that make them suitable for a range of applications involving complex combinations of materials, generating information in various representations and making critical ethical decisions about suitability for resolving complex design problems
- investigate products, services and environments that enhance aspects of the social, cultural, economic and environmental world
- apply independently design processes and design thinking, creativity, innovation, production, project management and enterprise skills when developing design projects of increasing sophistication
- produce, manufacture and construct quality products, services and environments using a range of skills and processes, while recognising risks, observing safe practices and evaluating processes and finished products against standards for quality, sustainability and identified success criteria.

Digital technologies across the years of schooling

126. In the Digital technologies curriculum, the two sub-strands provide students with knowledge, understanding and skills through which they can safely and ethically exploit the capacity of digital technologies to create, modify and construct digital information and systems for specific purposes and/or audiences, controlled through a variety of means. The Digital technologies knowledge and understanding sub-strand focuses on digital information, digital systems and technologies, and digital technologies and society. The Digital technologies processes and production sub-strand focuses on formulating and investigating problems; analysing and creating solutions; representing, constructing and evaluating solutions; and utilising skills of creativity, innovation and enterprise for sustainable futures. Note: when students safely use digital technologies they give due consideration to cybersafety.

Foundation to Year 2

127. In Years F–2, Digital technologies content will provide opportunities for students to:

- identify digital information and digital systems that support personal, family and classroom needs, their main purposes, the impact on their lives and how some forms of digital information are transmitted
- learn the common major components of the digital systems they use, their functions, simple terminology to describe them, and methods of control
- explore some common ways in which digital technologies used in school and at home help meet the needs of self and familiar others, and the impact on their lives
- investigate digital problems including common design features, and use these to develop and communicate design ideas using trial and error, drawings, discussion, or digital tools
- apply computational thinking to plan, construct and evaluate ethical digital solutions for particular purposes, safely using a range of appropriate devices, software, functions and commands.

Years 3–6

128. In Years 3–4, Digital technologies content will provide opportunities for students to:

- identify some common forms of digital information that local communities create and use, the intended purposes and how some are transmitted
- investigate the use of common digital systems and typical cause-and-effect relationships between major components, and control using linear sequences of instructions
- learn how the use of digital technologies meets the needs of some and not others
- identify and communicate features of a digital problem, generate and evaluate design ideas for digital solutions, communicating this using trial and error, drawings, discussion and simple digital tools
- plan, select and safely use a range of devices, software, functions and commands in digital environments
- apply computational thinking to construct, modify and test creative digital solutions for particular purposes.

129. In Years 5–6, Digital technologies content will provide opportunities for students to:

- make critical judgments about the use of everyday digital technologies, including safety and ethical considerations
- examine data organisation, uses and control through digital systems from a personal and social perspective
- identify the components of local systems and explain their functions and methods of connection, and control using linear and looping sequences of instructions
- identify some factors that influence the design and use of common digital technologies, considering the reasons why and for whom the technologies were developed
- apply computational thinking to deconstruct digital problems to identify key dimensions, compare common digital solutions and make decisions about fundamental design features
- plan, select and safely use a range of devices, software, functions, commands and techniques in online and local digital environments to create, test, edit, troubleshoot and evaluate digital solutions and, in doing so, capture, access, store and present a range of information.

Years 7–10

130. In Years 7–8, Digital technologies content will provide opportunities for students to:

- learn that digital information and systems are designed to meet criteria for particular purposes and/or audiences
- apply principles of systems thinking to investigate commonly used digital systems and control them by linear, repeating and branching instructions
- learn about the influence of scientific developments and societal needs, beliefs and values on the evolving design and use of digital technologies
- apply computational thinking, creativity, innovation, enterprise and project management skills in the use of digital technologies when defining, deconstructing and researching digital problems
- collect and analyse relevant data with increasing independence and collaboration, and safely use a range of processes, hardware and software to model, construct, test and evaluate digital solutions to specified quality.

131. In Years 9–10, Digital technologies content will provide opportunities for students to:

- consider a range of digital information forms that are designed, transformed and produced to meet technical, functional, social, economic and aesthetic criteria
- learn about the nature, structure, operation, control and evaluation of a range of common digital systems that include subsystems
- consider input, processes and output, and the effect on the performance of digital solutions from changes to functions, procedures, devices and sequences of instructions
- evaluate the ethical, social and sustainability risks of particular digital technologies and environments, and security strategies and protocols to protect information, rights, identity and personal safety

- understand the value of, and be able to apply creativity, innovation, collaboration, project management and enterprise skills in, the development of digital solutions
- critique digital problems, collect and analyse relevant data, generate and communicate ideas, create, construct and test digital solutions
- work both independently and collaboratively using a range of skills and processes to select and safely use appropriate digital information and systems optimised to suit specific tasks, purposes and technologies contexts.

Senior secondary

132. The Digital technologies curriculum will provide opportunities for students to:

- explain the influence and constraints of the nature and design of particular digital systems on the techniques used, and the conventions applied to structure digital information
- learn about specialised digital systems and how the components interact within the system and with an environment
- analyse in terms of social, economic and environmental costs and benefits, the emergence and application of specialised digital technologies and the influence of the beliefs and values of stakeholders on their design
- consider the connections between current studies in digital technologies, further studies and employment
- apply computational thinking, creativity, innovation, enterprise and project management skills when developing increasingly sophisticated digital solutions for self-generated, multi-layered digital problems. The problems will be associated with specialised applied technologies contexts or systems and/or software engineering, and students will consider safety and security
- create, test and justify detailed designs, demonstrate algorithmic thinking, generate data to resolve design problems, and use common methods of communicating thinking, including the use of symbols, graphics and technical languages
- use effective project management techniques, optimise the operation and outputs of a range of digital systems, and prepare a range of reports.

Key terms

The following descriptions of terms explain how they are proposed to be used in the Australian Curriculum: Technologies.

computational thinking

the thinking needed for problems to be expressed in a way that can be processed by a computer, such as recognition of patterns, mathematical processes, generation of modular and recursive structures, and understanding of system hierarchies and relationships.

design thinking

use of strategies for understanding design problems, generating creative and innovative ideas, and analysing those ideas to find the best solution.

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 best-fit solution.

digital information

the nature and forms of information stored digitally, and the processes that transform digital data into information for various purposes and meanings, including the structures, properties, features and conventions of particular forms of digital information and how this is transmitted to audiences, as well as the methods of creating, storing, managing and accessing digital information.

digital systems

the nature, types and elements or components of digital systems and how they are operated or controlled; hardware and software components and how these are assembled or constructed; and the methods of controlling digital systems and their components, including creating sets of instructions such as programming.

digital technologies

any technology controlled using electronic binary instructions with information in a binary form, including computer hardware and software, digital media and media devices, digital toys and accessories, and contemporary and emerging communication technologies.

environments

an output of technologies processes or in which technologies processes operate. Environments may be natural, constructed or virtual. The tangible end result or designed solution may be a small- or large-scale environment, blueprint, drawing, image or model.

information

In Design and technologies, information refers to the nature of technologies information and how it is represented to convey meaning (procedural knowledge, diagrams and drawings); the management of information (tools and processes used to make decisions, derive new connections); and the considerations in the presentation of information for particular audiences as product or service.

materials

the origins, structure, characteristics, properties and uses of natural (including plants and animals) and fabricated materials. Materials are used to create products, services or environments.

products

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

project

the set of activities undertaken to address specified content, involving creating, designing and producing a solution to the project task and documenting the process. Project work has a benefit, purpose and use; a user 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.

services

one of the outputs of technologies processes – the intangible product of technologies processes to meet a need or want. Services may involve development or maintenance of a system and include for example: catering; cloud computing (software as service); communication; ecosystem (provisioning and regulating); internet; transportation. Services could be communicated by charts, diagrams, posters and procedures.

systems

the structure, properties, behaviour and interactivity of people and components within natural, constructed and virtual systems, and the interrelationship between systems.

technologies contexts

the fields of endeavour in which students will apply technologies processes and production. These could include agriculture and primary industries, constructed environments, engineering, entertainment, food technology, home and personal settings, manufacturing, materials and product design (for example electronics, metals, plastics, textiles, timber) and retail.

technologies processes

the processes that allow the realisation of a technology output for a target audience, end-user, client or consumer. They involve the purposeful application of materials, information, 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; 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 all of the following types of thinking: computational, critical, creative, design, futures or systems.

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