


The Australian Curriculum

Learning areas	Technologies
Subjects	Design and Technologies, Digital Technologies
Year levels	Year 9

Years 9 and 10 Content Descriptions

Design and Technologies Knowledge and Understanding

Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global [preferred futures](#) and the complex design and production processes involved ([ACTDEK040 - Scootle](#) )



Elaborations

evaluating design and technology professions and their contributions to society locally, nationally, regionally and globally, for example Aboriginal designers collaborating with international craftspeople for local enterprises



recognising the impact of past designed solutions and possible decisions when creating preferred futures, for example the design of public transport systems that use renewable energy 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 skills, knowledge, finance, expertise, for example Australian designers working with rapid prototyping manufacturers in China




explaining how product life cycle thinking can influence decision-making related to design and technologies, for example rethinking products to provide for re-use, selecting a material for a product that has a lower carbon footprint



critiquing mass production systems taking into account ethics and sustainability considerations, for example the mass production of food, clothing and shoes and why manufacturers produce different versions of the same product



Explain how products, services and environments evolve with consideration of [preferred futures](#) and the impact of emerging [technologies](#) on design decisions ([ACTDEK041 - Scootle](#) )



Elaborations

considering how creativity, innovation and enterprise contribute to how products, services and environments evolve, for example how designers use biomimicry, the ways plant and animal adaptations can be copied to solve human challenges, such as the Japanese building Sendai Mediatheque based on seaweed-like tubes



exploring the ways commercial enterprises respond to the challenges and opportunities of technological change, for example e-commerce, and carbon footprint



explaining the consequences of social, ethical 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 (forecasting) and what impacts there may be for society and particular groups, and back casting from preferred futures



recognising real-world problems and understanding basic needs when considering designed solutions, for example Engineers Without Borders High School Outreach Program allows students to design solutions to problems in a country in Asia



Investigate and make judgments on how the characteristics and properties of materials are combined with force, motion and energy to create engineered solutions

(ACTDEK043 - Scootle [↗](#))



Elaborations

explaining the way common machines combine properties of materials and force, motion and energy in, for example, cranes on building sites



examining and explaining the interaction between material properties and function of a common system, such as car brakes



analysing the relationship between materials of properties, forces and safety in engineered systems such as bridges



critiquing the effectiveness of the combinations of materials, forces, energy and motion in an engineered system such as a 3D printer



calculating forces, reactions and loads in structures



Investigate and make judgments on the ethical and [sustainable](#) production and marketing of food and [fibre](#)

([ACTDEK044 - Scootle](#) )

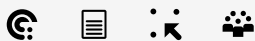


Elaborations

examining emerging production technologies and methods in terms of productivity, profitability and sustainability, for example vertical farming, recirculation technologies in aquaculture



investigating how digital technologies could be used to enhance food production systems, for example global positioning system (GPS) for managing animals, crop sensors or automated animal feeding or milking



comparing the environmental impacts of intensive and extensive production systems and their contribution to food and fibre production



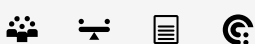
investigating the interdependence of plants and animals in food and fibre production



examining the marketing chain of a range of agricultural products and outlining the effect of product processing and advertising on demand and price



taking account of animal welfare considerations in food and fibre production enterprises



Investigate and make judgments on how the principles of food safety, preservation, preparation, presentation and sensory perceptions influence the creation of food solutions for [healthy eating](#) (ACTDEK045 - Scootle [↗](#))



Elaborations

experimenting with food preservation methods such as freezing and dehydrating to determine changes to food structure and how these impact on designing healthy food solutions, for example dehydrating fruit for the lunch box



conducting sensory assessment testing of a range of foods to determine how these characteristics might be used to enhance food solutions, for example taste testing a variety of milks, comparing freshly squeezed juice to commercial juices



determining how the causes of food spoilage can be addressed when preparing, cooking, presenting and storing food items, for example developing a comprehensive checklist of considerations for safe and hygienic food storage and preparation including danger zone temperatures for a food service



preparing and presenting foods using a range of techniques to ensure optimum nutrient content, flavour, texture and visual appeal, for example designing and producing a healthy snack for the canteen and using food photography and digital technologies to promote the item in a healthy eating campaign



Investigate and make judgments on how the [characteristics](#) and properties of materials, systems, [components](#), tools and [equipment](#) can be combined to create designed solutions (ACTDEK046 - Scootle [↗](#))



Elaborations

critiquing the design of an existing product to identify environmental consequences of material selection



justifying decisions when selecting from a broad range of technologies – materials, systems, components, tools and equipment, for example selecting low-emission paints and locally sourced materials



analysing and explaining the ways in which the properties and characteristics of materials have been considered in the design of a product with specific requirements such as reduced weight to reduce transport costs in rural Australia



investigating emerging materials and their impact on design decisions



Investigate and make judgments, within a range of [technologies](#) specialisations, on how [technologies](#) can be combined to create designed solutions

([ACTDEK047 - Scootle](#) )



Elaborations

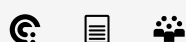
examining factors influencing the design of a product that has an explicit environmental emphasis, for example the low-flush toilet



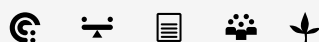
critiquing product manufacturing processes in relation to society, ethics, and sustainability factors, for example a mechanised entertainment system; an interactive multimedia product to teach a concept to a student in a country in Asia



critiquing the social nature of services, for example a signage system to manage students and community members during a school function (signs may include words, pictures and/or braille); organisational system for an aged-care facility



critiquing environments in relation to preferred futures in relation to society, ethics and sustainability practices, for example the refurbishment of a local playground; the re-design of a local wetland



Design and Technologies Processes and Production Skills

Critique needs or opportunities to develop design briefs and investigate and select an increasingly sophisticated range of materials, systems, [components](#), tools and [equipment](#) to develop design ideas

([ACTDEP048 - Scootle](#) )



Elaborations

critiquing the design of new products to identify how well design ideas respond to sustainability issues



critiquing a range of design and technologies ideas, for example assessing those that draw on the intellectual property of others, exploring how well the ideas respond to international and Australian standards



considering the needs of community groups to identify rich design tasks




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



Develop, modify and communicate design ideas by applying [design thinking](#), creativity, innovation and [enterprise](#) skills of increasing sophistication ([ACTDEP049 - Scootle](#) )



Elaborations

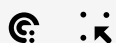
using techniques including combining and modifying ideas and exploring functionality to generate solution concepts



undertaking functional, structural and aesthetic analyses of benefits and constraints of design ideas, for example to different communities and environments including those from the countries of Asia



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 show an understanding of key aesthetic considerations in competing designs



communicating using appropriate technical terms 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



Work flexibly to effectively and safely test, select, justify and use appropriate [technologies](#) and processes to make designed solutions ([ACTDEP050 - Scootle](#) )



Elaborations

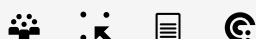
refining technical skills and using production skills with independence to produce quality designed solutions and to reduce risks in production



using materials, components, tools, equipment and techniques safely and considering alternatives to maximise sustainability, for example using timber because it stores carbon and offsets the demand for alternative products



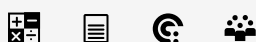
experimenting with innovative combinations and ways of manipulating traditional and contemporary materials, components, tools, equipment and techniques, and recording findings in a collaborative space to debate the merits of each with peers



explaining safe working practices required for a specific classroom design project for individual or community use



modifying production processes to respond to unforeseen challenges or opportunities, for example when producing bulk quantities of recipes, lower than average rainfall and impacts on growth, materials with unexpected faults



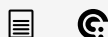
Evaluate design ideas, processes and solutions against comprehensive [criteria for success](#) recognising

the need for sustainability ([ACTDEP051 - Scootle](#))



Elaborations

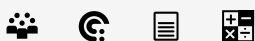
establishing specific criteria for success for evaluating designed solutions



evaluating and justifying the use and best combination of traditional, contemporary and emerging technologies during project development, including consideration of sustainability, for example farming methods in South-East Asia



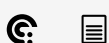
evaluating choices made at various stages of a design process and modifying plans when needed with consideration of criteria for success



evaluating projects for their long-term application, functionality and impact



reflecting on learning, evaluating processes and transferring new knowledge and skills to future design projects



Develop [project](#) plans using digital [technologies](#) to plan and manage projects individually and collaboratively taking into consideration time, cost, risk and production processes ([ACTDEP052 - Scootle](#))

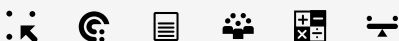


Elaborations

producing, explaining and interpreting drawings; and planning production timelines using digital technologies



creating production flowcharts using digital technologies to ensure efficient, safe and sustainable sequences



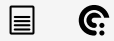
establishing materials and equipment needs using digital technologies such as spreadsheets



collaborating to develop production plans for equitable distribution of work




investigating manufacturing processes to identify strategies to enhance production



Years 9 and 10 Content Descriptions

Digital Technologies Knowledge and Understanding

Investigate the role of hardware and software in managing, controlling and securing the movement of and access to [data](#) in networked digital systems ([ACTDIK034 - Scootle](#) )



Elaborations

explaining how an operating system manages the relationship between hardware, applications and system software



comparing the similarities and differences of two common operating systems



identifying how changes to the configuration of an operating system change the operation of hardware and software components in a networked digital system



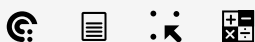
explaining the role of hardware and software components in allowing people to interact with digital systems, for example using a mouse or touch pad or screen, speech, accelerometer




investigating the operation and use of robotic process control systems



explaining encryption of data as a means of protecting data, for example secret keys and 'exclusive or' (XOR) and hashing algorithms to digitally sign data

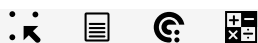


Analyse simple [compression](#) of [data](#) and how content [data](#) are separated from presentation ([ACTDIK035 - Scootle](#) )



Elaborations

explaining how simple compression schemes reduce the size of repetitive data, for example how run length encoding reduces the size of images



explaining the difference between lossy and lossless compression, for example the difference between JPEG and PNG images




explaining codecs for audio-visual compression, for example common codecs for video formats

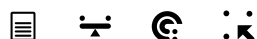


generating a layout or report in a database or applying a style sheet to a web page



Digital Technologies Processes and Production Skills

Develop techniques for acquiring, storing and validating quantitative and qualitative [data](#) from a range of sources, considering privacy and security requirements ([ACTDIP036 - Scootle](#) )



Elaborations

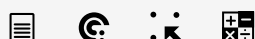
developing strategies and techniques for capturing accurate and usable qualitative and quantitative data of different formats, for example using text entry for open-ended questions to acquire qualitative data; using radio buttons or checkboxes for closed questions to acquire quantitative data



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™ to confirm human responses



extracting specific data from an external source and storing it in a format that is more useful for analysis, for example combining mapping data from multiple electronic data sets to build a composite representation

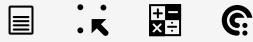


Analyse and visualise [data](#) to create information and address complex problems, and [model](#) processes, entities and their relationships using structured [data](#) ([ACTDIP037 - Scootle](#) )



Elaborations

using visualisation software tools to identify patterns and relationships between sets of data and information, and support abstract reasoning, for example representing data using histograms, network diagrams and maps



summarising data using advanced filtering and grouping techniques, for example pivot tables in spreadsheets and aggregation functions in databases



automating calculations, for example using absolute cell referencing to automatically extend formulas, and automating arithmetic calculations using built-in functions such as trigonometry, compound interest



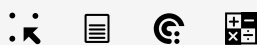
simulating simple, iterative processes, for example modelling compound interest or ecological models using a spreadsheet




documenting the attributes of complex objects and processes using a data dictionary



interpreting schemas that represent relationships between entities and querying data across tables, for example using foreign keys to represent relationships and joining tables in structured query language (SQL) SELECT statements



Define and [decompose](#) real-world problems precisely, taking into account functional and non-functional requirements and including interviewing stakeholders to identify needs ([ACTDIP038 - Scootle](#) )



Elaborations

developing a preliminary specification for an opportunity or a need 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 considering how the requirements of reliability, user-friendliness, portability and robustness could affect the way people use solutions



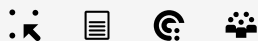
identifying the range of stakeholders who are associated with solutions but are not direct users and using techniques such as interviewing and reinterviewing to clarify needs



using software such as graphic organisers to determine a fundamental cause of a problem or to represent related elements of a problem that need to be jointly addressed in the digital solution



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

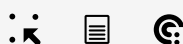


Design the user experience of a digital [system](#) by [evaluating](#) alternative designs against criteria including [functionality](#), [accessibility](#), usability, and [aesthetics \(ACTDIP039 - Scootle \[↗\]\(#\)\)](#)



Elaborations

designing the user interface of a solution using story boards and mock-ups, for example mocking up the product design of an app for people with disability



identifying similar digital systems and existing user interfaces, assessing whether their elements can be reused



evaluating aspects of the total user experience, that is, all aspects of the system as perceived by the users, for example, a user's initial experience of setting up and using a system, or a user's emotional or cultural response to using a digital system




designing documentation, branding, and marketing for a digital solution, for example a product

demonstration screencast or 'getting started' user guide



applying the principles and elements of design to a client's requirements and evaluating the success of a solution through an iterative feedback process, for example using customer feedback to refine a user interface to more effectively provide access to important features



Design algorithms represented diagrammatically and in [structured English](#) and validate algorithms and programs through tracing and test cases ([ACTDIP040 - Scootle](#) )



Elaborations

designing algorithms to solve real-world problems and describing algorithms using flow charts and structured English, for example START, END, IF and UNTIL



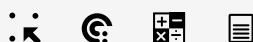
recognising that different algorithms can solve a problem with different trade-offs



tracing algorithms to predict results and program state for a given input, for example desk checking or using an interactive debugging tool




using tracing techniques to test algorithms, for example desk checking an algorithm for a given input by stepping through the algorithm while keeping track of contents of the variables



developing test cases that correspond to the requirements of the specifications, for example validating program behaviour on a range of valid and invalid user input

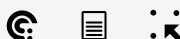


Implement modular programs, applying selected algorithms and [data](#) structures including using an object-oriented programming language ([ACTDIP041 - Scootle](#) )



Elaborations

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



considering different algorithms and selecting the most appropriate based on the type of problem, for example choosing appropriate algorithms for particular problems



selecting different types of data structures such as an array, record and object to model structured data



Evaluate critically how student solutions and existing information systems and policies, take account of future risks and sustainability and provide opportunities for innovation and [enterprise \(ACTDIP042 - Scootle !\[\]\(e8fb589d58dad1692debababa5e928b6_img.jpg\)](#))



Elaborations

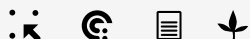
investigating actions, devices and events that are potential risks to information systems, for example losing portable storage devices containing important files, deliberately infecting systems through malware, and power surges



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 now only be 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 schooling 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, national and regional 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*; the *Green Growth Policy* in Korea and the *Korean National Strategy for Sustainable Development*

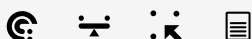


Create interactive solutions for sharing ideas and information online, taking into account safety, social contexts and legal responsibilities ([ACTDIP043 - Scootle](#) )

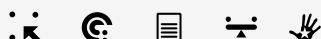


Elaborations

investigating legal responsibilities of organisations regarding the storage, communication and disposal of personal and organisational data, for example the Australian 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; avoiding the use of photos of deceased persons from Aboriginal and Torres Strait Islander communities




creating an interactive web-based project that provides enterprising opportunities and complies with accessibility requirements, for example using fragments of a web language to create dynamic content that supports interactivity



creating online interactive solutions for working with others by combining or modifying online software tools to support project work



Plan and manage projects using an iterative and collaborative approach, identifying risks and considering safety and sustainability ([ACTDIP044 - Scootle](#) )



Elaborations

managing and modifying the development of a solution, for example using software to record and monitor project tasks, responsibilities and timeframes and to organise continuous opportunities to review progress with collaborative partners and to conduct regular unit testing



developing an evolutionary prototype iteratively and incrementally, for example regularly revising features of an application in response to user feedback and development decisions



investigating indicators of economic 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



investigating major causes of threats to data, for example human actions such as losing a storage device, disclosing passwords, theft and fraud

