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CURRICULUM ELEMENTS

Years 7–8

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| **Band level description** |
| By the end of Year 8 students should have had the opportunity to create at least 3 types of designed solutions, and addressed each of the 4 technologies contexts: * Engineering principles and systems
* Food and fibre production
* Food specialisations
* Materials and technologies specialisations.

Students should have opportunities to design and produce products, services and environments. There are rich connections to other learning areas and subjects, for example Science, Geography and Health and Physical Education.Students investigate and select from a range of technologies − tools, equipment, processes, materials, systems and components. They consider how the characteristics and properties of technologies can be combined to design and produce sustainable designed solutions to problems for individuals and the community, considering ethical, economic, environmental and social sustainability factors. Students use innovation and enterprise skills with increasing independence and collaboration. They respond to feedback from others and evaluate design processes and designed solutions for preferred futures. Students investigate design and technologies professions and the contributions that each makes to society locally, regionally and globally through innovation and enterprise. They critique the advantages and disadvantages of design ideas and technologies.Using a range of technologies including a variety of graphical representation techniques to communicate, students generate and clarify ideas through sketching, modelling and technical drawing techniques (for example, perspective and orthogonal drawings). They use a range of symbols and technical terms in a variety of contexts to produce patterns; annotate concept sketches and drawings; and use scale, pictorial and aerial views to communicate design ideas and designed solutions.With greater autonomy, students identify the sequences and steps involved in design tasks. They develop plans to manage design tasks, including safe and responsible use of materials and tools, and apply their plans to successfully complete these tasks. Students establish safety procedures that minimise risk and manage a project with safety and efficiency when making designed solutions. |
| **Design and Technologies Achievement standard** |
| By the end of Year 8 students explain how people design, innovate and produce products, services and environments for preferred futures. For each of the 4 prescribed technologies contexts they explain how the features of technologies impact on design decisions, and create designed solutions based on analysis of needs or opportunities. Students create and adapt design ideas, processes and solutions, and justify their decisions against developed design criteria that include sustainability. They communicate design ideas and solutions to audiences using technical terms and graphical representation techniques, including using digital tools. They independently and collaboratively document and manage production processes to safely produce designed solutions. |
| **Learning area achievement standard** |
| By the end of Year 8 students explain how people design, innovate and produce products, services and environments for preferred futures. For each of the 4 prescribed technologies contexts students explain how the features of technologies impact on design decisions, and create designed solutions based on analysis of needs or opportunities. They acquire, interpret and model with spreadsheets and represent data with integers and binary. Students design and trace algorithms; and implement them in a general-purpose programming language. Students create and adapt design ideas, processes and solutions, and justify their decisions against developed design criteria that include sustainability. They communicate design ideas and solutions to audiences using technical terms and graphical representation techniques, including using digital tools. They select appropriate hardware for particular tasks, explain how data is transmitted and secured in networks, and identify cyber security threats. They use a range of digital tools to individually and collaboratively document and manage production processes to safely and responsibly produce designed or digital solutions for the intended purpose. Students manage their digital footprint. |

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| **Strand: Knowledge and understanding** | **Years 7–8** |
| **Sub-strand: Technologies and society** |
| **Content descriptions***Students learn to:* | **Content elaborations***This may involve students:* |
| analyse how people in design and technologies occupations consider ethical and sustainability factors to design and produce products, services and environments AC9TDE8K01 | * researching current information on animal welfare when designing an animal shelter or researching intellectual property or the significance of offshore manufacturing in a country in Asia when designing a 3D printed product
* investigating traditional and contemporary design and technologies, including from a country in Asia, and predicting how they might change or be sustained in the future in response to technological, environmental or economic change, for example the production of contemporary textile designs using traditional batik techniques and modern dyes in Indonesia
* comparing the design and production of products, services and environments in Australia and a country in Asia by identifying needs and opportunities for design and enterprise, for example design, promotion and marketing of a Western Australian wheat variety especially bred and grown for the making of udon noodles in Japan
* researching the rights and responsibilities of those working in design and technologies occupations, for example taking into account First Nations Australian protocols and Indigenous cultural and intellectual property rights
* analysing the ethical and social requirements when designing solutions for cultural groups including their involvement and consultation, for example designing a solution with community members from other cultural backgrounds or those who usually communicate in a language other than English
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| analyse the impact of innovation and the development of technologies on designed solutions for global preferred futures AC9TDE8K02 | * analysing competing factors, including social and ethical factors, that influence the design of services for First Nations Australian communities in areas classified as remote, for example a natural disaster warning system for the Koeybuway and Moegibuway Peoples of Saibai Island, who are vulnerable to flooding and rising sea levels
* investigating techniques used by land managers for managing and reducing bushfires in forests, for example techniques used by local First Nations Australians or smart technologies such as Internet of Things (IoT) sensors, artificial intelligence, cameras and drones
* investigating traditional, contemporary and emerging design and technologies, including from a country in Asia, and the need for more sustainable patterns of living, and predicting how they might change in the future in response to social, technological, environmental or economic change, for example the diversity of house design or waste management practices
* investigating influences impacting on manufactured products and processes such as historical developments, societal change, new materials, accessibility guidelines, control systems or biomimicry, for example researching the development of Velcro, which was inspired by burrs, or researching contemporary designers who use new materials to design and produce innovative products
* considering factors that impact on innovation, for example developing novel ideas, responding quickly to change, creating a point of differentiation, adding value for society, reducing costs and improving efficiency
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| **Sub-strand: Technologies context: Engineering principles and systems** |
| analyse how force, motion and energy are used to manipulate and control engineered systems AC9TDE8K03 | * analysing how wind turbines harness the motion of propellers to transform wind energy into electricity, and how this energy is used to sustainably power communities classified as remote, such as on Waiben (Thursday Island) in the Torres Strait Islands and in Gawa on Elcho Island near the northern Arnhem Land coast
* investigating the technologies in a control system for an identified need or opportunity and user, for example the Corriong or Millowl (Phillip Island) penguin weighbridge that enables collection of data about penguin weight and foraging duration
* experimenting to select the most appropriate principles and systems on which to base design ideas, for example testing structural components for strength
* testing functionality of an idea by producing prototypes and jigs, including the use of rapid prototyping tools such as 3D printers
* calculating an engineered system’s outputs, for example speed, brightness of light, volume of sound to determine when the system might fail
* experimenting with control systems to understand motion, for example programming a microcontroller or an object-based programming application to control a system such as a remote-controlled car or robotic arm
* investigating components, tools and equipment in terms of force, motion or energy, for example testing the durability of batteries or determining the effective range of wireless devices
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| **Sub-strand: Technologies context: Food and fibre production** |
| analyse how food and fibre are produced in managed environments and how these can become sustainable AC9TDE8K04 | * analysing traditional First Nations Australians’ food and fibre sources for potential species that offer benefits in sustainability, such as conserving water use and resources needed for processing
* comparing land and water management methods in contemporary Australian food and fibre production with a country in Asia, for example comparing the use of robotics, drones, global positioning system (GPS) technologies, minimum-tillage cropping, water-efficient irrigation and smart farm monitoring and controlling systems for increasing efficiency of farm operations and crop protection, and the impact of cash crops versus staples on social sustainability
* investigating how animal and plant crops are grown and the ethical and sustainable techniques used to increase food production, for example comparing the use of herbicides or medicines when producing food and fibre products and recognising the need to increase food production using cost-efficient, ethical and sustainable production techniques
* outlining physical and chemical characteristics of soil and their effects on plant growth when producing food and fibre products, for example comparing the effect on soil characteristics of different farming practices
* investigating different animal nutrition strategies such as grazing and supplementary feeding, and their effects on quality when producing food and fibre products, for example meat tenderness, wool-fibre diameter (micron), milk fat and protein content
* recognising the importance of food and fibre production to Australia’s food security and economy, including exports and imports to and from countries across Asia, for example exports of Tasmanian Candy Abalone (wild-caught dried abalone)
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| **Sub-strand: Technologies context: Food specialisations** |
| analyse how properties of foods determine preparation and presentation techniques when designing solutions for healthy eating AC9TDE8K05 | * analysing how First Nations Australians prepare foods for healthy eating, for example using cooking methods that improve edibility, such as removing bitterness to make yams more palatable, roasting bunya nuts to improve texture and flavour, and on many occasions, carefully selecting wood for roasting and smoking to complement the flavour of foods
* explaining how food preparation techniques impact on the sensory properties, such as flavour, appearance, texture and aroma of food, for example the browning of cut fruit, the absorption of water when cooking rice, and the selection of timbers when smoking foods
* investigating the relationship between food preparation techniques and the impact on nutrient value including how a recipe can be modified to enhance health benefits, for example stir-frying, steaming vegetables, leaving skin on vegetables or removing skin from chicken
* analysing food preparation techniques used in different cultures including those from countries across Asia and the impact of these on nutrient retention, aesthetics, taste and palatability, for example stir-frying, steaming, poaching and using a wide variety of vegetables
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| **Sub-strand: Technologies context: Materials and technologies specialisations** |
| analyse how characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions AC9TDE8K06 | * investigating the significance of hafting in First Nations Australians’ traditional toolkit, including how the characteristics and properties of materials are combined to create a designed solution, for example modern hatchets have seen little innovation since the hafted stone hatchet that combines the benefits of a lever and a wedge to create durable tools that reduce effort
* investigating aspects of technologies specialisations, for example in architecture, critiquing the design of an existing building to identify features of passive design or, in fashion, evaluating the sustainability of different fibres
* investigating a broad range of technologies – tools, equipment, processes, materials, systems and components − when designing for a range of technologies contexts, for example analysing the benefits and disadvantages of building an animal shelter such as a dog kennel with wood, metal and synthetic fabric in terms of function, tools and equipment needed to produce it and expected durability
* considering the ways in which the characteristics and properties of technologies will impact on designed solutions, for example the choice of building materials and housing design in Australia and a country in Asia; the properties of textile fibres and fabrics that determine end use in a range of settings such as architecture, medicine, sport and automotive
* explaining safe work practices for using specific equipment or materials, for example producing a safety information video that details risk management practices for using tools or equipment including considering how the properties of some materials suit certain designs and may cause harm if manipulated in an unsafe way in the classroom or within a community such as ventilation when sanding timber
* testing and selecting the most appropriate hand tools, equipment, processes and materials to produce a product, for example a stool or smartphone stand that can be assembled from bending and interlocking cardboard pieces or from wood using a laser cutter or other digital tools
* investigating carbon fibres (reinforced polymers) and graphite fibres which are strong, stiff, lightweight material used in specialised high-performance products, for example on the design of sporting equipment
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| **Strand: Processes and production skills** | **Years 7–8** |
| **Sub-strand: Investigating and defining** |
| **Content descriptions***Students learn to:* | **Content elaborations***This may involve students:* |
| analyse needs or opportunities for designing, and investigate and select materials, components, tools, equipment and processes to create designed solutions AC9TDE8P01 | * considering First Nations Australian community needs when identifying opportunities for designing, for example considering the needs of local groups when designing energy supply or community housing solutions in areas classified as remote
* considering community needs when identifying opportunities for designing, for example gardens for a community centre, cost-effective food service for a sport club
* experimenting with traditional and contemporary technologies when developing designs, and discovering the advantages and disadvantages of each approach, for example comparing a hand-sewn product with one produced using a sewing machine
* investigating emerging technologies and their potential impact on design decisions, for example flame-retardant fabrics, self-healing materials, virtual reality or aquaponics
* examining, testing and selecting a variety of suitable materials, components, tools and equipment for each design project, for example the durability differences between natural hardwood and plantation softwood timbers, which determine their suitability for interior or exterior use
* analysing the viability of using different techniques and materials in areas considered remote, isolated areas or less developed countries and selecting appropriate materials to acknowledge sustainability needs by using life cycle thinking
* creating a survey to determine students’ food choices and developing a range of healthy food items such as snacks, juices, breakfast or nourish bowls such as a Buddha bowl which could be sold at the school canteen
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| **Sub-strand: Generating and designing** |
| generate, test, iterate and communicate design ideas, processes and solutions using technical terms and graphical representation techniques, including using digital tools AC9TDE8P02 | * using a variety of strategies such as brainstorming, sketching, 3D modelling and experimenting to generate innovative design ideas to present to others
* considering which ideas to further explore and investigating the benefits and drawbacks of ideas including identifying factors that may hinder or enhance project development, for example using digital polling to capture the views of different groups in the community to inform the production of a solution designed with intercultural understanding
* developing models, prototypes or samples using a range of materials, tools and equipment to test the functionality of ideas
* producing annotated concept sketches and drawings, using technical terms, scale, symbols, pictorial and aerial views to draw environments; production drawings, perspective drawings, orthogonal drawings; patterns and templates to explain product design ideas
* documenting and communicating the generation and development and selection of design ideas for an intended audience, for example developing a digital portfolio with images and text which clearly communicate each step of a design process
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| **Sub-strand: Producing and implementing** |
| select, justify and use suitable materials, components, tools, equipment, skills and processes to safely make designed solutions AC9TDE8P03 | * developing innovative ways of manipulating technologies by comparing and choosing the most appropriate options to design a solution using traditional or contemporary materials, components, tools, equipment and techniques and considering alternatives including emerging technologies that could be substituted to reduce waste or time
* practising techniques to improve expertise, for example handling animals, cutting and joining materials such as metal, textiles, timber
* developing technical production skills (techniques) and safe independent inclusive working practices to produce quality solutions designed for sustainability
* identifying and managing risks in the development of various projects, for example working safely, responsibly, cooperatively and ethically on design projects; assessing and responding to uncertainty and risk in relation to long-term health and environmental impacts, for example ensuring appropriate personal protective equipment (PPE) is worn or that ventilation is appropriate where solvents, glues or 3D printers are used
* considering how to improve technical expertise required to use tools or equipment needed to design a solution, for example using an online tutorial to learn to use software for design or production
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| **Sub-strand: Evaluating** |
| develop design criteria collaboratively including sustainability to evaluate design ideas, processes and solutions AC9TDE8P04 | * developing design criteria collaboratively to evaluate designed solutions in terms of accessibility, aesthetics, functionality and sustainability, for example recording design goals from people interviewed as prospective users of the finished product, service or environment or including life cycle assessment criteria
* developing design criteria including Safety by Design principles, for example do the ideas promote safety through prevention, protection and proactive change
* re-evaluating, iterating and modifying design processes to improve efficiency and increase production, for example when mass producing a product for an enterprise or improving sustainability
* evaluating designed solutions and processes and transferring new knowledge and skills to future design projects, for example considering project planning skills learnt in producing an engineered product and using them in future projects
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| **Sub-strand: Collaborating and managing** |
| develop project plans to individually and collaboratively manage time, cost and production of designed solutions AC9TDE8P05 | * interpreting drawings to plan resources and production steps needed to produce products, services or environments for specific purposes, for example identifying resource requirements from specifications on a labelled drawing and collaboratively developing a detailed procedure
* identifying risks and how to minimise them, organising time, evaluating decisions and managing resources to ensure successful project completion, for example using digital tools to keep track of tasks, resources, expenses and deadlines
* investigating the time needed for each step of production, for example estimating time allocations on a planning template for the different stages of the design process needed to produce a clock, acoustic speaker or desk lamp using prior knowledge, research and testing
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Years 9–10

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| **Band level description** |
| By the end of Year 10 students should have had the opportunity to design and produce at least 4 designed solutions focused on one or more of the 4 technologies contexts: * Engineering principles and systems
* Food and fibre production
* Food specialisations
* Materials and technologies specialisations.

Students should have opportunities to experience creating designed solutions for products, services and environments.Students use design and technologies knowledge and understanding, processes and production skills and design thinking to produce designed solutions for identified needs or opportunities of relevance to individuals and local, regional or global communities. They work independently and collaboratively. Problem-solving activities acknowledge the complexities of contemporary life and make connections to related specialised occupations and further study. Increasingly, study has a global perspective, with opportunities to understand the complex interdependencies involved in the development of technologies and enterprises. Students specifically focus on preferred futures, taking into account ethics; legal issues; social values; and economic, environmental and social sustainability factors; and use strategies such as life cycle thinking. They use critical thinking, creativity, innovation and enterprise skills with increasing confidence, independence and collaboration. Students analyse data, evaluate design ideas and technologies, respond to feedback, and evaluate design processes used to inform designed solutions for preferred futures.Using a range of technologies including a variety of graphical representation techniques to communicate, students generate and represent original ideas and production plans in 2-dimensional and 3-dimensional representations. These techniques will be specific to the technologies context and may include scale, perspective, orthogonal and production drawings with sectional and exploded views. Students produce rendered, illustrated views for marketing and use graphic visualisation software to produce dynamic views of design ideas and designed solutions.Students identify the steps involved in planning the production of designed solutions. They develop detailed project management plans, incorporating elements such as sequenced time, cost and action plans, to manage design tasks safely. Students apply management plans, making adjustments when necessary, to successfully complete design tasks. They identify and establish safety procedures that minimise risk and manage projects with safety and efficiency in mind, maintaining safety standards and management procedures to ensure success. |

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| **Achievement standard** |
| By the end of Year 10 students explain how people consider factors that impact on design decisions and the technologies used to design and produce products, services and environments for sustainable living. They explain the contribution of innovation, enterprise skills and emerging technologies to global preferred futures. For one or more of the technologies contexts, students explain the features of technologies and their appropriateness for purpose, and create designed solutions based on an analysis of needs or opportunities. Students create, adapt and refine design ideas, processes and solutions and justify their decisions against developed design criteria that include sustainability. They communicate design ideas, processes and solutions to a range of audiences, including using digital tools. Students independently and collaboratively develop and apply production and project management plans, adjusting processes when necessary. They select and use technologies skilfully and safely to produce designed solutions. |

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| **Strand: Knowledge and understanding** | **Years 9–10** |
| **Sub-strand: Technologies and society** |
| **Content descriptions***Students learn to:* | **Content elaborations***This may involve students:* |
| analyse how people in design and technologies occupations consider ethical, security and sustainability factors to innovate and improve products, services and environments AC9TDE10K01 | * examining sustainability factors influencing the design and production of a solution developed by First Nations Australians, such as the sustainable production of culturally significant pigments, for example in many places throughout Australia white and red pigments are not freely available and must be manufactured through a complex process of calcination by firing rocks or clays in a kiln
* analysing design and technologies professions and their contributions to society, for example engineers working in disaster recovery or empowering communities to improve access to clean, safe energy
* recognising the impact of past designed solutions when creating solutions for preferred futures, for example the design of public transport systems that use renewable energy and are accessible, and the design of rural community environments to reduce fire risk
* considering the factors that influence design and manufacture, and the work of professional designers, engineers and technologists, including time, access to skills, knowledge, finance, expertise in global engineering and manufacturing, for example Australian designers and engineers working with rapid prototyping manufacturers in a country in Asia or the significance of the collaboration between Australia and Vietnam on the development of the Cao Lanh Bridge
* 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
* examining 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 and support complete product life cycle strategies
* explaining the consequences of ethical and sustainability decisions for products, services and environments, for example the accessibility of a managed public environment, the design of roads to include aerial bridges for wildlife and signage powered with solar technologies
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| analyse the impact of innovation, enterprise and emerging technologies on designed solutions for global preferred futures AC9TDE10K02 | * investigating how the knowledges of First Nations Australians have led to the discovery of potential innovative solutions, for example biodegradable polymers using spinifex grass to reduce landfill and strengthen latex, plastics and concrete
* exploring the ways commercial enterprises respond to the challenges and opportunities of technological change, for example e-commerce, and considering their carbon footprint
* investigating scenarios of how the future may unfold and what opportunities and impacts there may be for society and particular groups in a preferred future, for example by using forecasting and backcasting techniques
* examining real-world problems and understanding basic needs when considering designed solutions, for example students collaborating to design solutions to challenges in the Asia region; or artists from a country in South-East Asia creating posters for the world to take action in a pandemic
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| **Sub-strand: Technologies context: Engineering principles and systems** |
| analyse and make judgements on how the characteristics and properties of materials are combined with force, motion and energy to control engineered systems AC9TDE10K03 | * investigating the engineering innovations of First Nations Australians, such as spearthrowers and bow and arrow, and how the characteristics and properties of materials are used, such as rigidity, flexibility and hardness
* explaining the way common machines or engineered systems interact and combine properties of materials, force, motion and energy efficiently, for example examining the structure and function of cranes on building sites or in a system, or examining the structure and function of car safety features such as seatbelts, airbags and crumple zones
* calculating forces, reactions and loads in structures and 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
* investigating how the placement of wind turbines in a wind farm affects their performance, for example designing a layout to maximise the productivity of a wind farm within a given space
* investigating the main types of chargers for electric vehicles (EV) and their capabilities, for example making a recommendation for the best charger for an EV owner who uses their vehicle for commuting to work
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| **Sub-strand: Technologies context: Food and fibre production** |
| analyse and make judgements on the ethical, secure and sustainable production and marketing of food and fibre enterprises AC9TDE10K04 | * analysing grain sources used by First Nations Australians, such as acacia, for their nutrient content, including energy, fat and protein and suitability as a sustainable food source in drought or famine-prone, semi-arid, and tropical regions, as compared with cereal crops such as wheat and rice
* examining emerging production technologies and methods in terms of productivity, profitability and sustainability, for example taking account of animal welfare considerations in food and fibre production enterprises, protected cropping, hydroponics or aquaculture
* investigating how digital tools could be used to enhance food production systems, for example global positioning systems (GPS) for managing animals, crop sensors, automated animal-feeding or milking systems, or drones for locating and managing weeds
* investigating the interdependence of plants and animals and comparing the environmental impacts of intensive and extensive production systems and their contribution to food and fibre production, for example the impact of pesticide use on bee populations or comparing caged and free-range chicken production
* considering the meaning of food and water security and how they may influence design decisions for creating preferred futures, for example using water-efficient irrigation, protected cropping where crops are grown under cover to increase production over a longer period or choosing drought-resistant varieties of plants and animals
* examining the marketing chain of a range of agricultural products and outlining the effect of product processing and advertising on demand and price including the impact of cash crops on communities
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| **Sub-strand: Technologies context: Food specialisations** |
| analyse and make judgements on how the sensory and functional properties of food influence the design and preparation of sustainable food solutions for healthy eating AC9TDE10K05 | * analysing how First Nations Australians have long understood techniques to turn plant products into food sources with high nutritional value, for example throughout much of northern Australia, cycad nuts have been detoxified to prepare them for safe consumption
* 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 a lunchbox
* conducting sensory and nutritional 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 with commercial juices or locally grown fruit with imported fruit
* 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
* reflecting on food trends and how they may influence choosing food or designing food solutions for healthy eating, for example choosing organic ingredients or plant-based foods to reduce environmental impact, food delivery systems, insect protein or non-dairy milk or virtual cooking classes
* investigating ways innovations may influence human health and sustainability, for example 3D printing of foods, Internet of Things (IoT) network in the food supply chain or use of augmented reality (AR) in food labelling
* considering factors that influence the preparation and presentation of 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 tools to promote the item in a healthy eating campaign
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| **Sub-strand: Technologies context: Materials and technologies specialisations** |
| analyse and make judgements on how characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions AC9TDE10K06 | * analysing how First Nations Australians identified the superior thermal properties of possum fur in their development of products such as cloaks and blankets including making judgements on how these fibres are sourced, and how these knowledges continue to be used today as seen in the emerging market of high-performance thermal clothing made from blended possum and wool fibre
* critiquing the design of an existing product to identify environmental consequences of material selection and investigating emerging materials and their impact on design decisions, for example examining the properties of common plastic bags and researching innovative materials that could be used as a sustainable alternative such as bioplastics or renewable materials such as seaweed
* justifying decisions when selecting from a broad range of technologies − tools, equipment, processes, materials, systems and components, for example selecting low-emission paints and locally sourced materials such as bamboo for cross-laminated timbers (CLT)
* 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 minimising weight to reduce transport costs in rural Australia
* investigating emerging materials and their impact on design decisions, for example researching products such as sustainable bioplastic material made from discarded potato peels which can be used for a variety of applications including buttons and eyeglasses
* investigating fibre-based medical textile products and structures used in a medical environment for treatment of an injury or the clinical treatment of a wound or an illness, for example collagen fibre used as a suture is as strong as silk and biodegradable
* investigating soft robotics including nanomaterials which enable them to function like human muscles
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| **Strand: Processes and production skills** | **Years 9–10** |
| **Sub-strand: Investigating and defining** |
| **Content descriptions***Students learn to:* | **Content elaborations***This may involve students:* |
| analyse needs or opportunities for designing; develop design briefs; and investigate, analyse and select materials, systems, components, tools and equipment to create designed solutions AC9TDE10P01 | * analysing First Nations Australians’ traditional grains for their potential for providing nutritional and commercial solutions and developing a design brief to highlight the materials, systems, components and tools or equipment needed
* analysing the design of new products to identify how well design ideas respond to sustainability issues, for example swimming pool covers, ultraviolet lights and lamps for disinfection, or disposable household products
* developing design briefs that take into consideration the needs of users, for example considering universal design principles or Safety by Design principles to improve accessibility and safety
* analysing a range of design and technologies ideas, for example assessing those that draw on the intellectual property of others, including Indigenous cultural and intellectual property rights
* considering the needs of community groups to identify rich design tasks, for example interviewing community members about accessibility requirements to develop the initial brief and then during specific phases of the design process to determine the best possible designed solution for the community
* examining tools, techniques, equipment and relationships of properties for complementary materials for product development, for example examining compressive and tensile strengths of materials
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| **Sub-strand: Generating and designing** |
| apply innovation and enterprise skills to generate, test, iterate and communicate design ideas, processes and solutions, including using digital tools AC9TDE10P02 | * using techniques including combining and modifying ideas and exploring functionality to generate solution concepts and reimagining designs to feature emerging technologies, for example designing wearable technology that could help or give independence to elderly people, such as wearable blood glucose monitors
* undertaking functional, structural and aesthetic analysis of benefits and constraints of design ideas, for example assessing how a design is suitable for different communities and environments including a country in Asia, for example the design of skyscrapers in Japan to withstand earthquakes
* considering competing variables that may hinder or enhance project development, for example weight, strength and price of materials; laws; sustainability; accessibility; social protocols, user needs and community consultation processes
* producing drawings, models and prototypes to explore design ideas, for example using technical drawing techniques (for example perspective and orthogonal drawings), digital imaging programs, 3D printers or augmented reality (AR) 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 and processes for an intended audience including justification of decisions, for example developing a digital portfolio with images and text which clearly communicate each step of a design process
* using design thinking and enterprise skills to create innovative approaches to processes and solutions, for example brainstorming novel ideas inspired by nature or transforming a solution into an enterprise for a target market
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| **Sub-strand: Producing and implementing** |
| select, justify, test and use suitable technologies, skills and processes, and apply safety procedures to safely make designed solutions AC9TDE10P03 | * refining technical skills and using production skills with independence to produce quality designed solutions and reducing risks in production with appropriate, safe working practices required for a specific design project, for example independently setting up a lathe and wearing appropriate personal protective equipment (PPE) to produce a part to specified dimensions
* 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
* modifying production processes to respond to opportunities, risks or unforeseen challenges, for example when producing bulk quantities of recipes in terms of workload and coordination, the impact of lower-than-average rainfalls on crop growth or using materials with unexpected faults
* experimenting with the functional and sensory properties of food to determine the most successful approach, for example preparing vegetables 3 different ways to maximise colour, flavour and nutritive value
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| **Sub-strand: Evaluating** |
| develop design criteria independently including sustainability to evaluate design ideas, processes and solutions AC9TDE10P04 | * establishing specific design criteria for evaluating designed solutions, for example determining necessary function of a product, service or environment such as an acceptable load for an engineered structure to carry and making a judgement about whether these have been met after stress testing or user testing
* evaluating and justifying the use and best combination of traditional, contemporary and emerging technologies during project development, including consideration of sustainability, for example considering farming methods that improve soil quality including those methods used in South-East Asia
* reflecting on learning including processes or choices made at various stages of a design process and modifying plans when needed with consideration of design criteria
* responding creatively to evaluation feedback to iterate and modify design ideas and processes to improve sustainability measures, for example considering opportunities to use sustainable materials, such as plant-based timber oils or bioplastics
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| **Sub-strand: Collaborating and managing** |
| develop project plans for intended purposes and audiences to individually and collaboratively manage projects, taking into consideration time, cost, risk, processes and production of designed solutions AC9TDE10P05 | * producing, explaining and interpreting drawings and planning production timelines using digital tools, for example establishing materials and equipment needs using spreadsheets, or creating production flowcharts to ensure efficient, safe and sustainable workflows
* collaborating to develop production plans for equitable distribution of work including discussing roles, tasks and deadlines and considering flexibility and contingencies
* investigating manufacturing processes to identify strategies to enhance production, for example identifying techniques to reduce use, cut costs, speed up processes or to form beneficial partnerships with others in production
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