Design and Technologies

Victorian Curriculum F–10 Version 2.0

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East Melbourne VIC 3002

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# Introduction

## Rationale

In an increasingly technological and complex world, we need to develop citizens with the knowledge and confidence to analyse, critique and creatively respond to design needs and opportunities for a circular economy. Knowledge, understanding and skills involved in the design, development and use of technologies have a role in transforming societies, and in natural, managed and constructed environments.

In the Design and Technologies curriculum, students consider ethical factors including the economic, environmental and social impacts of technological change, and how the choice and use of technologies may contribute to a sustainable future. Students consider the legal, aesthetic and functional factors that inform the design processes.

Design and Technologies engages students to create quality designed solutions for identified needs and opportunities across a range of technologies contexts. Students plan and produce designed solutions and manage projects independently, collaboratively and in teams, from conception to realisation. They apply design and systems thinking and design processes to investigate, generate, evaluate, iterate and improve design ideas, processes and solutions. They plan and produce designed solutions. They develop a sense of pride, satisfaction and enjoyment from their ability to design and produce innovative designed products, services and environments.

Design and Technologies offers students opportunities for authentic learning challenges that foster curiosity, confidence, persistence, innovation, creativity, respect and cooperation. The study of Design and Technologies also offers learning experiences for young people that can be transferable to other contexts, including broader communities.

## Aims

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

* develop awareness and confidence as critical users of technologies of designed solutions
* investigate, generate, iterate and analyse to determine ethical and innovative designed solutions for sustainable futures
* use design and systems thinking to generate design ideas and communicate these to a range of audiences
* produce designed solutions suitable for a range of technologies contexts by selecting and manipulating a range of tools, materials, systems and components competently and safely, and managing processes
* evaluate processes and designed solutions, and transfer and apply knowledge and skills to new situations
* understand the roles and responsibilities of people in design and technologies occupations and how these occupations contribute to society.

## Structure

The Design and Technologies curriculum comprises the 3 related strands of Technologies and Society, Technologies Contexts and Creating Designed Solutions. The Technologies Contexts and Creating Designed Solutions strands are further organised into sub-strands, as shown below.

| Strand | **Technologies and Society**  | **Technologies Contexts**  | **Creating Designed Solutions**  |
| --- | --- | --- | --- |
| Sub-strands | No sub-strands | Engineering principles and systemsFood and fibre productionFood specialisationsMaterials and technologies specialisations | Investigating and definingGenerating and designingProducing and implementingEvaluatingPlanning and managing |

### Technologies and Society

The Technologies and Society strand focuses on how people use and develop technologies while taking into account ethical considerations such as legal, aesthetic and functional factors. It includes sustainability dimensions (economic, environmental and social), as well as the impact of technologies on individuals, families, communities (local, regional and global), the economy and the environment – now and into the future.

### Technologies Contexts

The Technologies Contexts strand focuses on the characteristics and properties of technologies contexts, and how they can be used to create innovative designed solutions. This strand explores 4 particular contexts, organised into the following sub-strands.

#### Engineering principles and systems

This sub-strand focuses on how energy and forces (e.g. chemical, electromagnetic, electrostatic, frictional, gravitational and mechanical forces) can be used to produce and control light, sound, heat and movement in products and systems. Engineering provides opportunities for students to make sense of and integrate scientific and mathematical principles and concepts by applying engineering design processes and practical skills. This enables the design and production of ethical, including sustainable, engineered solutions.

Students should have opportunities to understand how ethical, including sustainable, engineered products, services and environments can be designed and produced as some resources diminish and environments change. They should progressively develop knowledge and understanding of how forces and the properties of materials affect the behaviour and performance of designed engineering solutions.

#### Food and fibre production

Food and fibre are the human-produced or harvested resources used to sustain life. They are produced in managed environments such as farms, gardens and plantations or harvested from wild populations. Challenges for world food and fibre production include an increasing world population and an uncertain climate, and competition for resources such as land and water. These pose ethical challenges, for example in relation to economic, environmental and social sustainability.

Students have opportunities to engage in these challenges by understanding the processes of food and fibre production, and by investigating innovative and ethical, including sustainable, ways of supplying agriculturally produced raw materials. They progressively develop knowledge and understanding about the managed systems that produce food and fibre by creating designed solutions.

#### Food specialisations

This sub-strand includes the application of nutrition principles (as described in Health and Physical Education) and knowledge about food, its systems and technologies, selection and preparation, and contemporary technology-related food issues. Community awareness of, and interest in, accessing quality nutritious food from ethical, including sustainable, food systems is increasing. Individuals and communities are becoming empowered to make informed food selections and preparation choices to meet their needs.

Students have opportunities to appreciate the importance of having access to and eating a variety of foods, and to gain a sound understanding of nutrition principles. They develop an understanding of contemporary technology-related food issues, such as ensuring the supply and consumption of food that reflects ethical, including sustainable, practices, and the importance of skills in food preparation when making food decisions to support healthy eating. They progressively develop knowledge and understanding about food, food systems and technologies, and how to make informed and appropriate food preparation choices when experimenting with and preparing healthy food. The healthy eating recommendations from the [Australian Dietary Guidelines](https://www.eatforhealth.gov.au/), including the Australian Guide to Healthy Eating and the Aboriginal and Torres Strait Islander Guide to Healthy Eating, should be followed when teaching about food.

#### Materials and technologies specialisations

This sub-strand focuses on a broad range of traditional, contemporary and emerging materials and specialist areas that typically involve extensive use of technologies. We depend on designed products, services and environments for communication, housing, employment, health care, recreation and transport; however, we face increasing ethical concerns, including about long-term sustainability.

Students have opportunities to develop the confidence to make decisions about processes and solutions that are ethical, including sustainable processes and solutions. They can do this by learning about and working with materials, components and production processes. Students progressively develop knowledge and understanding of the characteristics and properties of a range of materials, either when investigating particular materials or through producing designed solutions for a technologies specialisation. Examples of these specialisations are advanced manufacturing, architecture, electronics, exhibition design, fashion design, graphic design, product design, service design (infrastructure, leisure, transport) and textiles design.

### Creating Designed Solutions

The Creating Designed Solutions strand is based on design thinking, design processes, and production processes and skills. This strand reflects a process of design and would typically be addressed by identifying needs or opportunities, and may involve developing a design brief.

Content is organised into 5 sub-strands. These are the skills that students use throughout a design project. If students have been taught content from these sub-strands in one technologies context, they do not need to be taught the same content again; they can apply their skills to another technologies context.

#### Investigating and defining

This sub-strand involves students analysing, exploring and investigating information, needs and opportunities. As creators and citizens, students critically reflect on the intention, purpose and operation of technologies and designed solutions. Analysing encourages students to examine values, and to question and review processes and systems. Students reflect on how decisions they make may have implications for individuals, society, and local, regional and global environments – now and in the future. They explore and investigate technologies, systems, products, services and environments as they consider needs and opportunities. They progressively develop effective investigation strategies and consider the contributions of technologies to their lives, and make judgements about them. Students develop design criteria in response to needs and opportunities, and may respond to or develop design briefs.

#### Generating and designing

This sub-strand involves students developing and communicating design ideas for a range of audiences. Students generate and iterate ideas, make choices, weigh up options, consider alternatives and document various design ideas and possibilities. They use critical and creative thinking strategies to generate, evaluate, critique and document ideas to meet needs or opportunities that have been identified by an individual, a group or a wider community.

Generating creative ideas involves thinking differently; it entails proposing new approaches to existing solutions and identifying new design opportunities reflecting ethical, including sustainable, considerations. Generating and developing ideas involves identifying various competing factors that may influence and dictate the focus of the idea. Students use speculative thinking to imagine, explore and consider possibilities that may or may not exist or happen in the future. They engage in creative and hypothetical thought processes to speculate about different scenarios, outcomes or ideas that go beyond what is currently known or proven. They use speculative thinking to explore new perspectives, challenge existing assumptions and stimulate innovation. Speculative thinking is nurtured by asking thought-provoking ‘what if’ questions and embracing alternative possibilities. By doing so, students expand their understanding and knowledge, and use their imagination in new ways.

Students evaluate, justify and synthesise what they learn and discover. They use graphical representation techniques when they sketch, draw, model, simulate and design ideas that focus on well-considered designed solutions. Students use physical representation techniques when they make models and prototypes. The use of modelling and prototyping to accurately develop simple and complex simulated or physical models supports the production of successful designed solutions. Prototypes allow designers to identify and address potential issues, and to make necessary improvements before moving to the final production stage. Therefore, making prototypes is an integral part of the design process, allowing designers to validate their ideas, gather feedback, and refine their designs for better performance and end-user experience.

#### Producing and implementing

This sub-strand involves students learning and applying a variety of skills and techniques to make designed solutions to meet specific purposes and end-user needs. Students apply knowledge about components and materials, and their characteristics and properties, to ensure these are suitable for use. They learn about the importance of adopting safe work practices. They develop accurate production skills to achieve quality designed solutions. Students develop the capacity to select and use appropriate tools, processes, materials, systems and components; and use work practices that respect ethical, including sustainable, considerations.

#### Evaluating

This sub-strand involves students reviewing design ideas, processes and solutions. Evaluating occurs throughout a design process. Students seek feedback and make judgements throughout a design process, including about the quality and effectiveness of their and others’ designed solutions. Students identify design criteria for needs or opportunities in the investigating and defining stage and then use these criteria to consider the implications and consequences of actions and decision-making throughout the remainder of the process. They determine effective ways to test, judge, critique and improve their ideas, concepts and designed solutions. They reflect on processes and transfer their learning to other design needs or opportunities.

#### Planning and managing

This sub-strand involves students learning to work cooperatively, and to manage time and other resources, to effectively create designed solutions. Planning and managing occur throughout a design process. Progressively, students develop the ability to communicate and share ideas throughout the design process, negotiate roles and responsibilities and make compromises to work collaboratively as well as effectively as a team. Students work individually and in groups to plan, organise and monitor timelines, activities and the use of resources. They progress from planning steps in a project through to more complex project management activities that require them to co-design and co-develop. They also need to consider factors such as time, cost, risk assessment, and management and quality control.

### Achievement standards

Achievement standards describe what students are typically able to understand and do, and they are the basis for reporting student achievement.

In Design and Technologies, students progress along a learning continuum that provides the first achievement standard at Level 2, and then subsequent achievement standards at Levels 4, 6, 8 and 10.

### Content descriptions

In Design and Technologies, content descriptions sequence and describe the knowledge, understanding and skills that teachers need to teach and students are expected to learn.

### Elaborations

Elaborations are examples that provide guidance on how the curriculum may be transformed into a classroom activity or learning opportunity. They are provided as advisory material only.

## Learning in Design and Technologies

In Design and Technologies, students are actively engaged in the processes of creating designed solutions for personal, local, regional and global settings for sustainable futures. For younger children, this usually involves personal and family settings, where there is an immediate, direct and tangible outcome, and where play and practical exploration are focuses. Students work on projects as they investigate needs and opportunities; generate and evaluate ideas; and plan, manage, produce and evaluate designed solutions. They evaluate throughout the process of engaging with a design process by using predetermined design criteria that have been provided or negotiated with the class, or developed by students.

### Integrating the strands

Teaching and learning programs typically integrate content from each strand. By the end of each band, students have had opportunities to create different types of designed solutions that address all 4 sub-strands of Technologies Contexts. For example, a teaching and learning unit in Design and Technologies may integrate content descriptions from the Technologies and Society and Creating Designed Solutions strands, and at least one sub-strand from Technologies Contexts, or it may address several sub-strands from the Technologies Contexts strand and include a design brief. The combination of contexts and types of designed solutions is a school decision.

### Design brief

A design brief is a concise statement clarifying a project task and defining the need to be addressed or opportunity to be explored, and enabling a broad range of possible responses. After some investigation and research analysis, a design brief typically identifies intended end users, design criteria, constraints, available resources and a timeframe for the project. A design brief may also include possible consequences and impacts.

A design brief is a tool for clarifying a problem or, when a design brief is externally imposed, a guideline for design. In the earlier levels of learning, design briefs may be fairly prescriptive and teacher directed. As design skills and design thinking develop, students have greater input into the development of design briefs for specific, identified needs or opportunities.

### Factors influencing design decisions

In Design and Technologies, students apply knowledge, practical skills and processes when using technologies and other resources to create innovative solutions to meet current and future needs. In doing so, they consider ethical factors including economic, environmental and social sustainability. At each band, students begin by considering environmental dimensions, then environmental and social dimensions, and, finally, broader ethical considerations including environmental, social and economic dimensions of sustainability. Students make ethical decisions about the practice and use of design and technologies, considering legal (e.g. intellectual property), health and sustainability implications, as well as aesthetic and functional requirements. They also consider the suitability of enterprise and marketing for the designed solution.

### Progression of production skills

Students spend a substantial amount of time engaged in developing production processes and skills. Through the practical application of technologies, students develop fine motor skills, which include dexterity and coordination, through experiential activities. The overall quality of their solutions (e.g. quality of finishes and complexity of the design tasks) improves as their production skills improve.

Students produce designed solutions using production processes involving natural and fabricated materials, components and digital tools. The types of technology they use may become progressively more sophisticated. As students engage in the process of generating, developing and communicating their ideas to diverse audiences within various technologies contexts, they acquire more skill in using drawings as a means of graphical representation including both rendered drawings and rendered views.

Students may use manual and digital tools to progress from producing concept sketches or basic drawings to three-dimensional (3D) drawings. They also develop physical representation skills when the focus of the design project is on producing a designed solution. Physical representations show how an actual or virtual product will look and work, to inform the production of the designed solutions. Students progress from basic modelling and prototyping to producing sophisticated models and prototypes using manual and digital tools. They use technical terms and techniques when developing both graphical and physical representations.

### Planning and managing projects

In Design and Technologies, students are actively involved in projects. At earlier levels, students plan, with teacher support, simple steps and follow directions to complete their own projects or manage their roles within team projects. As students progress through primary school, they take more responsibility for specific roles within a project, with increasing collaboration and teamwork. Students develop project plans to outline the tasks and steps required to make a designed solution.

At Levels 7 and 8, students begin to manage projects that involve co-designing and co-developing solutions, with support from peers and teachers. At Levels 9 and 10, students use their increasing skills to fully manage projects and teams when co-designing and co-developing. They develop more comprehensive project management plans, which detail management of an entire project. They use both manual and digital tools to support their project management. They coordinate teams and collaborate with others locally, regionally and globally.

### Design thinking

Design thinking involves the use of strategies for understanding design needs and opportunities; visualising and generating creative ideas; planning; and analysing, evaluating and critiquing the ideas that best meet the design criteria. Design thinking includes the act of working creatively, critically and speculatively, and uses both divergent and convergent thinking strategies. Divergent and convergent thinking are essential in fostering both critical and creative thinking processes, supporting the development of innovative and well-reasoned solutions. These types of thinking provide opportunities to extend students’ understanding and application of the Critical and Creative Thinking capability.

Creative thinking is where ideation occurs. Creative thinking stimulates the broadening of ideas that are imaginative and unique, and this aligns with divergent thinking aspects of a design process. Students progress from simple to more complex creative thinking skills. In the earlier levels, students explore simple and straightforward ideas, allowing their imagination to grow and develop. As they advance, their creative thinking becomes more sophisticated, encompassing a wider range of ideas. They learn to think divergently, investigating different possibilities and considering many perspectives to generate innovative and unique solutions.

Critical thinking involves the process of evaluating, reasoning and comparing information. It includes conducting research, performing tests and refining ideas. This aligns with the convergent aspects of a design process. As students advance, they move from exploring ideas to analysing, evaluating and critiquing design concepts and solutions.

Speculative thinking involves the use of critical and creative thinking to synthesise information, and to consider the appropriateness and usefulness of a range of ideas or suggestions, with a focus on the future. At Levels 5 and 6, students begin to hypothesise, propose and recommend ideas and suggestions, based on research of their selected technologies, that contribute positively to sustainability and worldviews. Students progress to more sophisticated and nuanced speculative thinking in the later levels. They engage in deeper research, analyse information, and consider the ethical consequences of their design and production decisions as they progress. This includes a focus on ethical consequences of designing and making, including environmental, social, economic and worldview considerations.

Design thinking underpins learning in Design and Technologies. Design processes require students to identify and investigate a need or an opportunity; generate, plan, manage and create designed solutions; and evaluate products and processes. Ethical considerations, which include economic, environmental and social impacts that result from designed solutions, are core to design thinking, design processes and Design and Technologies.

### Safety

Identifying and managing risk in Design and Technologies involves addressing the safe use of technologies, as well as risks that can affect project timelines. Technologies covers all the necessary aspects of health and safety, and injury prevention, as well as (in any technologies context) the use of potentially dangerous materials and tools. Technologies includes ergonomic considerations and – when communicating and collaborating online – safety (e.g. cyber safety and data security) and ethics (e.g. legal considerations).

Technologies learning experiences may involve the use of potentially hazardous substances and/or hazardous tools. It is the responsibility of schools to ensure that a duty of care is exercised in relation to the health and safety of all students, and that school practices meet the requirements of Victoria’s Occupational Health and Safety Act 2004 and Privacy and Data Protection Act 2014, and the Commonwealth’s Work Health and Safety Act 2011.

In implementing projects with a focus on food, care must be taken with regard to food safety and specific food allergies, including food allergies that may result in anaphylactic reactions. The Australasian Society of Clinical Immunology and Allergy has published [guidelines for prevention of anaphylaxis](http://www.allergy.org.au/health-professionals/papers/prevent-anaphylaxis-in-schools-childcare) in schools, preschools and childcare. For information specific to Victorian government schools, see the [Victorian Department of Education policy on allergies](https://www2.education.vic.gov.au/pal/allergies/policy).

### Ethics

#### Animal ethics

Any teaching activities that involve caring for, using or interacting with animals must comply with the National Health and Medical Research Council’s [Australian Code for the Care and Use of Animals for Scientific Purposes](https://www.nhmrc.gov.au/about-us/publications/australian-code-care-and-use-animals-scientific-purposes). In accordance with legislative requirements, every Victorian school using animals for scientific teaching and learning must be covered by a Scientific Procedures Premises Licence. A single licence held by the Victorian Department of Education covers all government schools.

Catholic and independent schools must apply for individual licences, obtained through [Agriculture Victoria](https://agriculture.vic.gov.au/livestock-and-animals/animal-welfare-victoria/animals-used-in-research-and-teaching/licensing-to-use-animals-in-research-or-teaching/about-teaching-with-animals).

The [Victorian Schools Animal Ethics Committee](https://www2.education.vic.gov.au/pal/teaching-with-animals/guidance/about-victorian-schools-animal-ethics-committee) (VSAEC) assists Victorian schools to comply with relevant legislation in the responsible care of animals used in teaching. VSAEC is available to government, Catholic and independent schools.

For further information about relevant guidelines, or to access your local animal ethics committee, see the Victorian Department of Education guidelines [Care and Use of Animals in Victorian Schools](https://www.education.vic.gov.au/Documents/school/principals/curriculum/animalguidelines.pdf)[.](https://www.education.vic.gov.au/Documents/school/principals/curriculum/animalguidelines.pdf%22%20%5Co%20%22Opens%20in%20a%20new%20window%22%20%5Ct%20%22_blank)

### Curriculum connections

Design and Technologies has strong connections with several learning areas within the Victorian Curriculum.

#### Design

Design thinking and design processes feature significantly in Design and Technologies, Digital Technologies and the Arts. Design thinking and design processes are also examples of critical, creative and speculative thinking.

The Creating Designed Solutions strand in Design and Technologies develops design thinking and design processes. Designing in Design and Technologies involves design thinking and the explicit use of design processes to create designed solutions for an identified end user and purpose (usually to fulfil some wider practical purpose). Designing involves developing designed solutions that consider a range of ethical factors (e.g. sustainability) and functionality related to the identified need or opportunity and that can be evaluated using identified design criteria. Designing involves experimenting with technologies through drawing, modelling and the manipulation of materials.

#### Food and nutrition

Student attitudes and behaviour regarding healthy living can be influenced by providing students with opportunities to learn about where their food comes from, how it is produced and how they can prepare it. In the Victorian Curriculum F–10, students are taught about food and nutrition in Health and Physical Education and in Design and Technologies.

In Health and Physical Education, students develop knowledge and understanding of nutrition principles to enable them to develop positive food behaviours and consider the range of influences on these behaviours.

In Design and Technologies, students learn how to apply knowledge of the sensory and functional properties of food, along with the nutrition principles described in Health and Physical Education, to select and prepare food. They do this through the design and preparation of food for specific purposes and consumers. They also develop understandings of contemporary technology-related food issues considering ethical factors, including sustainability, in food systems. They explore issues such as food security within Australia, food wastage, food packaging, ultra-processed foods and food transport.

It is important that the premise of healthy eating, which underpins the teaching of food and nutrition, does not target individual choices or behaviours. It is equally important to provide information about food in a positive and non-judgemental way, avoiding phrases like ‘good versus bad’ or ‘healthy versus unhealthy’ foods. Additionally, it is essential to avoid promoting a narrow view of food choices considered to be appropriate, and to use non-stigmatising language to foster healthy attitudes and behaviours towards food and nutrition. This includes avoiding associating food with weight gain or loss. Refer to the Victorian Department of Education Healthy Eating and Canteens and Other Food Services policy for further information about healthy eating.

#### Home Economics

Home Economics supports students to develop the capacity to make decisions, solve problems, and develop critical and creative responses to practical concerns of individuals, families and communities. Where Home Economics is offered as a subject, the teaching and learning program is based on curriculums of both Health and Physical Education and Design Technologies.

Content drawn from the Health and Physical Education curriculum relates to food and nutrition, growth and development, identity and connecting to others. Students develop the knowledge to make considered choices about food and nutrition, explore the range of influences on these choices, and build the skills to access and assess nutritional information that can support healthy food choices.

In Health and Physical Education, students become increasingly aware of the stages of human growth and development. They take increasing responsibility for their own growth and development by exploring and learning how to manage the many different factors that influence their identities. Students also develop a practical understanding of how connections to other people influence wellbeing. They learn positive ways to communicate, interact and relate to others in a range of social and movement-based situations.

#### Multimedia

Students use multimedia in a range of curriculum areas to communicate evidence of their learning. Explicit content descriptions detailing the knowledge, understanding and skills that students must acquire in relation to multimedia are found in Digital Technologies.

In Design and Technologies, students may produce designed solutions through the strand of Technologies Contexts, for example a graphics technologies specialisation with a multimedia focus.

In Digital Technologies, the multimedia focus relates to the technical aspects of digital multimedia solutions, and privacy and intellectual property. The technical aspects cover the digital representation of multimedia and text as forms of structured data, and the digital tools required to capture and display that data. They also include the algorithms required to create or manipulate data. An understanding of design elements and principles in digital media, and of how people interact with digital media solutions (the ‘user experience’), is addressed.

#### Digital literacy and Design and Technologies

Digital tools are powerful technologies that can support student learning. Students can develop and demonstrate their understanding of concepts and content in Design and Technologies using a range of digital tools. It is important that students know how to use these digital tools efficiently and responsibly, as well as to learn how to protect themselves and secure their data.

# Curriculum

## Foundation to Level 2

### Band description

In Foundation to Level 2, students have opportunities to create designed solutions at least once in each of the following Design and Technologies sub-strands:

• Engineering principles and systems

• Food and fibre production

• Food specialisations

• Materials and technologies specialisations.

Students have opportunities to experience designing and producing products, services and environments.

Students explore and investigate technologies – tools, processes, materials, systems and components – including the purposes of these and how they meet personal and social needs within familiar local and community settings. They explore technologies – materials and tools – through play experiences in familiar contexts and generate ideas to design a solution for a purpose, and choose the most suitable idea. Students learn about how society and environmental sustainability factors influence design and technologies decisions. They begin to consider the impact of their decisions and of technologies on others and the environment.

They consider designed solutions using questions such as ‘How does it work?’, ‘What purpose does it meet?’, ‘Who will use it?’, ‘What do I like about it?’ and ‘How can it be improved?’. They reflect on their participation in a design process. This involves students using design thinking to develop new perspectives, and engaging in different forms of exploring products, services and environments based on their personal preferences.

Students use a range of methods to communicate and describe design ideas, including drawings and models. They label drawings and draw objects as two-dimensional (2D) images from different views, for example changing perspectives from front view to top view (plan view). They explore working with materials such as cardboard, fabric and other common household items and using tools under supervision, for example scissors, glues, trowels and kitchen equipment.

With teacher support, they plan simple steps, follow directions and manage their own role to complete their own or group design projects. Students are aware of the need to work safely and cooperatively when making designed solutions.

### Achievement standard

By the end of Level 2, students identify and describe the purpose of familiar products, services and environments. For each of the 4 Technologies Contexts sub-strands, they identify the features and uses of technologies, and create designed solutions. Students explore and select design ideas based on their personal preferences, and communicate these using simple models and drawings. Students follow sequenced steps to use tools and materials to safely produce designed solutions.

### Content descriptions and elaborations

#### Strand: Technologies and Society

| Content descriptionsStudents learn about: | ElaborationsThis may involve students: |
| --- | --- |
| how familiar products, services and environments are designed and produced by people to meet personal or local community needs and sustainabilityVC2TDE2S01 | * investigating how Aboriginal and Torres Strait Islander Peoples have long understood their dependence on living systems to meet their local and community needs, for example investigating the cultural artefacts of the Wurundjeri People in the sustainable making of woven baskets from grass fibres, or investigating the complex system of eel traps engineered by the Gunditjmara People
* exploring how particular services meet different needs of people in communities, for example describing why doctors provide medical care to people in many ways including by phone, videoconference, visiting patients by plane or car and providing outdoor clinics, or describing different forms of public transport such as trains, buses, scooters and walking tracks
* asking questions about the design of a range of shelters provided for the public and how they meet the needs of people in communities, for example the structures of a school or local sportsground, or asking questions about how to improve accessibility in the local community such as at a shopping centre or school
* exploring how local delivery services meet different needs of people, for example describing how online shopping items arrive at a person’s home, or how gift packages can be sent to and from people who live in different locations
* exploring how local products are designed, for example brainstorming the materials and processes needed to create a costume for a school or community event, including using recycled clothing or components to minimise waste
* describing how community gardens, public swimming pools, parks, playgrounds and bike tracks are designed to improve the health of people
* exploring how people come up with new ideas or modify existing designs, for example preventing water wastage when caring for plants, and minimising food spoilage or wastage at home
 |

#### Strand: Technologies Contexts

##### Sub-strand: Engineering principles and systems

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explore how technologies affect movement in products and systems VC2TDE2C01 | * investigating, through play, Aboriginal and/or Torres Strait Islander Peoples’ traditional toys and how such toys are designed and made to produce movement, for example consulting with local community to construct a football with tightly bound recycled wool or felt to represent the ball used in marngrook (a football game traditionally played by some Aboriginal groups at gatherings and celebrations)
* exploring how to manipulate materials using a range of tools and techniques to create movement, for example when constructing a toy boat that floats or a kite that flies
* exploring a system such as a marionette, Indonesian wayang kulit shadow puppet or simple balloon-powered toy car to see that movement can be created by combining materials with forces
* exploring systems used in the classroom or community for creatively dealing with problems and needs, for example storage systems for tools, traffic flow for drop-and-go zones, and the use of hoists and ramps to facilitate access
* testing materials to see how they affect movement and speed, for example the movement of a wheeled toy on different surfaces such as timber, carpet, rubber and plastic
 |

##### Sub-strand: Food and fibre production

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explore how plants and animals are grown for food, clothing and shelter VC2TDE2C02 | * investigating conservation and hunting practices for food of Aboriginal and/or Torres Strait Islander Peoples, for example how land is managed and taken care of to utilise natural resources such as murnong (yam daisy) on Wurundjeri Country (Melbourne region), or how natural landscapes have been used by the Gunditjmara People to hunt and acquire fish and other local food sources
* investigating where plants and animals are grown for food, clothing and shelter, for example citrus fruits or cotton (which is harvested and made into yarn and fabric for clothing in northern Victoria), and timber for building homes from plantation forests in Gippsland in south-eastern Victoria
* identifying which plants and animals can provide food or materials for clothing and shelter, for example looking at a range of household items and sorting them according to source (plant or animal)
* identifying products that can be designed and produced from plants and animals, for example food products, paper and wood products, fabrics and yarns
* considering a range of tools that can be used to grow plants for a purpose, and their suitability, for example naming and describing tools such as a spade and rake used to cultivate or mulch a home vegetable garden, or tools such as a seed spreader and a global positioning system tractor to sow wheat, or a tubestock planting tool and drones to manage forestry plantations
 |

##### Sub-strand: Food specialisations

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explore how food can be selected and prepared for healthy eating VC2TDE2C03 | * identifying a wide range of foods from their own cultural background/s, categorising them into the 5 food groups according to the Australian Guide to Healthy Eating or the Aboriginal and Torres Strait Islander Guide to Healthy Eating, and then discussing ways to eat a variety of food groups, including cooking methods and tools needed to prepare the foods for healthy eating
* examining foods that are native to Australia that have sustained Aboriginal and Torres Strait Islander Peoples for at least 65 000 years
* exploring the local supermarket to observe the variety of foods including those representing their cultural background/s, and also the placement of foods on shelves, in aisles and displays, and considering how supermarket design may influence the purchase of foods for healthy eating
* exploring the influence of students’ cultural practices, and using locally available tools and different ways of preparing produce from the school kitchen garden, locally grown fresh food, and a source such as a farmers’ market or a supermarket, for example preparing vegetables for an Asian-style salad and identifying different colours of ingredients, or steaming or stir-frying vegetables and noticing the changes in flavour and texture
* conducting a taste-testing session to explore different types of vegetables or fruits, and identifying different colours, textures, tastes and preferences
 |

##### Sub-strand: Materials and technologies specialisations

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explore the characteristics and properties of materials and components that are used to create designed solutionsVC2TDE2C04 | * exploring designed solutions to meet individual, family and community needs with a focus on materials, for example fabrics used for sports clothing, impact-absorbing rubber for play spaces and materials used for drinking cups
* exploring different materials or objects (e.g. paper, plastic, wood and fabric) in the classroom or at home and investigating the properties of each material, for example texture, flexibility and transparency, or sorting them into groups based on their properties, for example rough/smooth, hard/soft and transparent/opaque, or on their characteristics, for example colour
* investigating how material properties are appropriate for designed solutions, for example materials that enable sliding, floating or flying
* developing new meanings for objects and action during play, for example exploring how household packaging such as cardboard boxes can be used to represent other objects such as a car and a house
* exploring materials, components and tools through play to discover potential uses when making products or modelling services and environments, for example when designing and making clothes, toys and shelters or modelling a design of a park or walking/exercise track
 |

#### Strand: Creating Designed Solutions

##### Sub-strand: Investigating and defining

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explore needs or opportunities, materials, components, tools and processes for designing and creating designed solutionsVC2TDE2D01 | * investigating designs and types of materials used by Aboriginal and/or Torres Strait Islander Peoples to make jewellery, for example shells, stones, bones, native seeds and feathers
* discussing the design and construction of coolamons and their traditional uses by some Aboriginal Peoples to carry water, fruits and nuts, as well as to cradle babies
* exploring different uses of materials used in a range of products, for example clothing, musical instruments, shelters, handmade tools and jewellery
* exploring different ways to mulch a garden bed or to water vegetable seedlings and identifying the types of tools and steps required to do each task
* exploring different uses of or recipes for a variety of foods or ingredients including those representing students’ cultural backgrounds, for example milks, eggs, bread, apples, pumpkin or other fruits or vegetables, or identifying different ways to cook or prepare foods and the different kitchen equipment required
* identifying different purposes for common household equipment, for example buckets, tea towels, cushions and string
 |

##### Sub-strand: Generating and designing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explore, generate and communicate design ideas through describing, drawing or modelling, using manual and digital toolsVC2TDE2D02 | * identifying a purpose or reason for designing and making a solution, for example ‘People with disability need to know where they can park at school’, ‘Birds keep flying into the waste bins and taking food scraps’ or ‘Sand keeps blowing out of the sandpit’
* exploring ideas by drawing or modelling, and choosing the most suitable idea, for example drawing or modelling designs for bee hotels to attract native bees to the school garden and choosing one to make
* practising a range of technical skills for using tools safely, for example joining techniques when using materials to make a product such as a greenhouse to keep seedlings warm or a trellis to support tomato plants
* comparing and contrasting features of existing products to develop new ideas, for example designing a puppet with a movable part after experimenting with other toys with several movable parts, or designing a garden salad by exploring and experimenting with different types and shapes of vegetables, and exploring different dressings for a salad
* communicating design ideas by modelling or producing and labelling 2D drawings using a range of technologies, for example designing a new environment such as a cubbyhouse or animal shelter and showing different views (front view and top view), with descriptions of materials and features
* exploring how materials can be used or re-used in construction play, for example using blocks and rain gutters or cardboard to make a ramp to roll a ball or toy car down and evaluating success using a smiley-face Likert scale
* assembling components of systems and checking they function as planned, for example making and testing a bowling, stacking or obstacle game with discarded food containers or packaging
* communicating an opinion about their design ideas, for example making an audio recording to express their own likes and dislikes about a design idea for felt finger puppets, including how they have made changes to their design ideas
* describing the results of exploring design ideas, for example recording the results of people’s taste-testing of a food product such as vegetable juice or evaluating design ideas using personal preferences with a smiley-face Likert scale
 |

##### Sub-strand: Producing and implementing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| use materials, components, tools and techniques to safely make designed solutions VC2TDE2D03 | * exploring how materials can be used or re-used in construction play to minimise waste, for example re-using wrapping paper and gift cards to design and make decorations or signage for the classroom or a school event, or repurposing plastic containers such as water bottles and yoghurt cups to create an organiser for small items
* practising a range of technical skills for using tools safely, for example joining techniques when making products, watering and mulching gardens, and using a knife safely while following a recipe to prepare food
* assembling components and checking they function as planned, for example containers, contents and the joining materials when making musical shakers
* threading pieces of fruit onto plastic or wooden skewers, with teacher supervision, to make colourful fruit kebabs, or threading old beads, buttons or fabric scraps onto string or elastic to make bracelets or necklaces
* exploring growth of plants by planting vegetable or flower seeds in recycled containers such as yoghurt cups, egg cartons and small pots
 |

##### Sub-strand: Evaluating

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| describe and select design ideas and solutions based on personal preferences and including sustainability VC2TDE2D04 | * reflecting on and recording a judgement about design ideas, for example using audio-recording or video-recording software to describe how design ideas meet the needs of those who will use a solution
* sharing design strengths and weaknesses, for example explaining how the equipment in a playground might be unsuitable for some children to use, and suggesting areas for design improvement
* considering the positives and negatives, including environmental impacts, of diverse food packaging options, for example glass, soft and hard plastics, aluminium and paper/cardboard, as well as compostable and/or biodegradable materials
* reflecting on the environmental impacts of the production of a solution, for example types of plants, mulching techniques and timing of water usage when designing a vegetable garden
* reflecting on the challenges of designing and producing a solution and recording these reflections, for example when growing a food product, designing a structure to take a load or making a nutritious snack
 |

##### Sub-strand: Planning and managing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| sequence steps for making designed solutions cooperativelyVC2TDE2D05 | * using lists or storyboarding when planning and making, for example when creating an electronic planting calendar
* recording the procedure for making a product, for example the ordered steps for making a salad or propagating a seedling, or instructions for making a container or bag
* identifying roles for each member of a group when working together, for example when making several items for a school fair or when planting vegetable seedlings in a garden
 |

## Levels 3 and 4

### Band description

In Levels 3 and 4, students have opportunities to create designed solutions at least once in each of the following Design and Technologies sub-strands:

• Engineering principles and systems

• Food and fibre production

• Food specialisations

• Materials and technologies specialisations.

Students have opportunities to experience designing and producing products, services and environments.

Students investigate technologies – tools, processes, materials, systems and components – developing a sense of self and ownership of their ideas, and thinking about their peers, communities and themselves as consumers. They consider the purpose of technologies and how these address needs and opportunities. Students explore and learn to harness their creative and imaginative ideas and approaches to achieve designed products, services and environments. They do this through using critical and creative thinking, and planning with teacher assistance and a growing awareness of the characteristics and properties of materials and the use of tools.

Students learn to reflect on their actions to refine their processes, develop their decision-making skills and improve their designed solutions. Students examine social and environmental sustainability implications of existing products and processes.

Students clarify and present ideas using a range of technologies and graphical representation techniques, for example drawing annotated diagrams and modelling objects as 3D images from different views.

Students become aware of appropriate ways to manage their time, and collaborate and work in teams and use design criteria. They list the major steps needed to complete a design task. They show an understanding of the importance of planning when designing solutions, in particular when working in teams. Students identify safety issues and learn to follow safety rules when producing designed solutions.

### Achievement standard

By the end of Level 4, students explain how people design products, services and environments to address needs or opportunities that consider sustainability. For each of the 4 Technologies Contexts sub-strands, they describe the features and uses of technologies, and create designed solutions. Students describe needs or opportunities for designing, and they produce, document and select design ideas against design criteria. They communicate design ideas, using models and drawings as well as annotations and symbols, and they test materials and processes needed to create designed solutions. Students plan and sequence steps, and use technologies and techniques to safely produce designed solutions.

### Content descriptions and elaborations

#### Strand: Technologies and Society

| Content descriptionsStudents learn about: | ElaborationsThis may involve students: |
| --- | --- |
| the role of people in design and technologies occupations and factors including sustainability that impact on the design of solutions to meet community needsVC2TDE4S01 | * investigating the reasons why many Aboriginal and/or Torres Strait Islander Peoples have been and continue to be recognised for their specialist skills in designing and producing products made from local materials and providing related services, and using sustainable practices to ensure future access to meet community needs, for example traditional woven baskets, jewellery made from shells and eel trap design
* discussing Aboriginal scar trees across Victoria, such as Yingabeal in Heidelberg (Melbourne), the bark of which was removed by the Wurundjeri and Woiwurrung Peoples to make shields and coolamons (carrying vessels)
* exploring how design and technologies occupations in the local area (urban, suburban, regional or rural) meet community needs, for example those of bakers, builders, engineers, farmers, seafood industry workers, mechanics, radiographers, textile designers and vegetable growers
* examining the suitability of a service or system and proposing improvements, for example a water-saving system for a bathroom at home or school, traffic management systems to reduce traffic jams around the school, and remote and regional services including medical services
* exploring how Australian designers consider sustainability when designing products, services or environments, for example designing products from 100% recycled materials, designing services that use minimal energy, and designing landscapes that require minimal water
* examining products and environments to discover the factors that may have influenced the design and choice of technologies used, for example discussing energy-efficient cooking with a wok, or sustainable wood products for home use including furniture made from plantation timbers, bamboo toothbrushes and coconut-shell bowls
* conducting a survey to identify a community need that involves accessibility and social sustainability, for example design features that improve access to the school, a community playground, local park or nature reserve, or use of public transport
 |

#### Strand: Technologies Contexts

##### Sub-strand: Engineering principles and systems

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| describe how forces affect function in a product or system VC2TDE4C01 | * researching how Aboriginal and/or Torres Strait Islander Peoples consider buoyant forces as they select materials for traditional watercraft, for example making bark or dugout canoes
* investigating bark canoes built by the Wadawurrung People and the role of these canoes in moving across waterways and during floods
* looking at models to identify how forces and materials are used and movement is started, for example in the design of a toy with wheels or moving parts
* exploring through play how movement can be started by combining materials and using forces, for example releasing a wound rubber band to propel a model boat, how different materials may impact marble roll speed, or how various surfaces such as carpet, grass and concrete might affect a robot’s movement
* deconstructing a product or system to identify how motion and forces affect performance, for example in a puppet such as a Japanese bunraku puppet or a model windmill with moving sails
* identifying engineered systems and experimenting with available local materials and tools to solve problems, for example designing a container or parachute that will keep an egg intact when dropped from a height, or designing a pop-up card, tower or vehicle
* conducting investigations to understand the characteristics and properties of materials, and forces that may affect the behaviour and performance of a product or system, for example woomera design
* identifying and exploring properties and construction relationships of an engineered product or system, for example a structure that floats or a bridge that carries a load
 |

##### Sub-strand: Food and fibre production

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| describe the ways of producing food and fibre VC2TDE4C02 | * researching food and fibre production techniques and technologies developed by Aboriginal and/or Torres Strait Islander Peoples, such as burning, tilling, planting, transplanting, watering, irrigating, weeding, thinning, cropping, storing and trading
* discussing the values and principles of traditional practices to ensure the sustainability of food and fibre sources, such as the creation of Aboriginal possum skin cloaks and using the remaining parts of the animal material for other purposes
* describing tools and procedures to improve plant and animal production, for example when growing vegetables in the school garden and producing environments such as a glasshouse (protected cropping) or animal housing, including safe chicken shelters
* comparing farming methods for food in Australia and a country in Asia, for example the use of different types of plants and animals and how diverse technologies are used to produce them
* researching how animal fibres (e.g. sheep wool and alpaca fleece) and plant fibres (e.g. timber, cotton, hemp and bamboo) are produced in Australia, for example how production of plantation timbers may be different from bamboo production
 |

##### Sub-strand: Food specialisations

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| describe the ways food can be selected and prepared for healthy eating VC2TDE4C03 | * investigating how Aboriginal and/or Torres Strait Islander Peoples consider the nutrient content of seasonal foods as a means of maintaining a balanced diet
* describing foods using the senses, for example describing the colour, aroma, sound, texture and taste of the ingredients in a salad or stir-fry and how our senses influence what we select to eat
* recognising the benefits of technologies to food safety and health and to helping ensure that a wide variety of food is available and can be prepared for healthy eating, for example refrigeration of meats and dairy products to enable them to last longer and reduce waste, pasteurisation of milk for food safety, and freezing, pickling or fermentation of vegetables to retain nutrients and reduce food wastage
* exploring the differences between fresh and minimally processed foods and ultra-processed foods by researching nutrient content using a nutrition calculator app and/or examining nutrition information panels
* considering creative ways foods can be prepared for maximum taste and appeal, for example locating and discussing images online that show colourful or fun ways to present food that might encourage healthy eating
* investigating the different colours of vegetables and selecting vegetables to make a colourful salad or stir-fry
 |

##### Sub-strand: Materials and technologies specialisations

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| describe how the properties of materials affect function in a product or systemVC2TDE4C04 | * exploring the properties of materials to determine suitability, for example the absorbency of different fabrics or the strength of different resistant materials
* conducting experiments and tests to understand some physical properties of materials, for example strength, durability, insulating ability and elasticity
* investigating the mass-production of products to ensure standardisation, for example students setting up a production line to produce a product for a school fair
* comparing how different components interrelate and complement each other in a designed solution, for example investigating and playing with joining processes for a variety of materials in the production of common products such as cushions, sneakers, wooden toys and bicycles
* investigating local constructed environments to compare building construction in the past and in the present, and noting innovations such as use of energy-efficient insulation and green roofs, for example rooftop gardens, to contribute to environmental sustainability
* analysing designed solutions from a range of technologies contexts with consideration of possible innovative solutions and impacts on the local community and environmental sustainability, for example electric vehicles (including buses), bike-sharing programs, composting programs, vertical farming and rooftop gardens
 |

#### Strand: Creating Designed Solutions

##### Sub-strand: Investigating and defining

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explore needs or opportunities for designing and testing materials, components, tools and processes needed to create designed solutions VC2TDE4D01 | * investigating the designs and performance of models of Aboriginal and/or Torres Strait Islander Peoples’ watercraft, and the opportunities for these designs to inform the design of a floating toy
* examining the production of local products, services and environments to enhance their own design ideas, for example discussing the processes and systems that might be used to distribute hot food, such as vegetable soup, to a large number of people at a community event
* testing different planting techniques, such as direct sowing or transplanting, to observe the impact of these on seedling establishment and plant growth
* testing different cooking methods when making vegetable fritters, for example frying, baking and air-frying, to determine which method yields the best texture and taste
* selecting and making decisions about appropriate joining techniques for materials to produce designs, prototypes or working models, for example joining fabric, paper or cardboard in various ways
* exploring and testing a range of materials under different conditions for suitability including sustainability considerations, for example the compostability of paper-based materials or the strength and durability of natural materials such as bamboo, timbers and stone
* exploring the different uses of materials in a range of products, including those from a country in Asia, to inform design decisions, for example in shelters, boats, handmade tools, baskets, wooden items, musical instruments, clothing and fabric
 |

##### Sub-strand: Generating and designing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| generate and communicate design ideas and decisions using technical terms and graphical representation techniques, using manual and digital tools VC2TDE4D02 | * communicating design ideas using annotated diagrams, for example labelling a diagram for a billycart with technical terms and explanations about components such as the chassis, axle, wheels and steering
* generating design ideas for solutions using Safety by Design principles, for example designing communication that is accessible for all parents and carers
* visualising creative design ideas by producing thumbnail sketches, models and labelled drawings to explain features and modifications, for example drawing one or more designs for a machine to collect waste, and including labels and descriptions to explain materials used, their properties and the intended function of components or the whole system
* planning, sharing and documenting creative design ideas and processes using digital tools, and appropriate terms and privacy considerations, for example a class blog or collaborative document that has been selectively shared with peers
* developing design criteria that consider universal design principles to address social sustainability, for example including criteria that specify flexible or intuitive use, or low physical effort
 |

##### Sub-strand: Producing and implementing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| select and use materials, components, tools and techniques to safely make designed solutionsVC2TDE4D03 | * exploring ways of joining, connecting and assembling components that ensure success including the impact of digital tools on these processes, for example using virtual reality or simulations to experience assembling materials or using tools
* using tools accurately when measuring, marking and cutting, for example when creating a template or pattern, measuring ingredients in a recipe or preparing a garden bed for sowing seeds
* explaining the importance of safe, responsible, inclusive and cooperative work practices when designing and making, for example when handling sharp tools such as knives and scissors
* selecting and using materials, components, tools and processes with consideration of the environmental impact at each stage of the production process, for example considering how packaging and offcuts could be recycled or used for other purposes before choosing materials for a project
* using appropriate technologies terms to describe and share with other students the procedures and techniques for making, for example how to safely make an engineered solution such as a robotic device
 |

##### Sub-strand: Evaluating

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| use given or predetermined design criteria including sustainability to evaluate design ideas and solutions VC2TDE4D04 | * using design criteria to evaluate, revise and select design ideas, for example when designing an e-textile toy for a young child to ensure it will be safe
* comparing the amount of waste that would be produced from different design ideas and the potential for recycling waste, for example exploring the choice of materials to construct a toy, as part of the evaluation process and whether the materials are repairable or able to be recycled after the product stops working or is no longer wanted
* reflecting on how well their designed solution meets design criteria, such as ensuring the safety and wellbeing of end users and meeting the needs of communities or different cultures, for example reviewing and discussing the choice of fabrics used to make re-usable bags and how they could be made more appealing to all cultural groups by considering modifications to style
 |

##### Sub-strand: Planning and managing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| sequence steps to individually and collaboratively make designed solutions VC2TDE4D05 | * determining and collaboratively planning processes as a class, for example recording when parts of a project need to be completed on a timeline, as a flow chart, or in a spreadsheet, calendar or list
* discussing the importance of managing time and resource allocation throughout production, for example discussing the roles different people might take in a team such as identifying and designing the tasks they will complete and the resources each person will need
* identifying the steps in a mass-production process, for example drawing a flow chart or making a video recording of a procedure for packing identical boxes of food for community members in need, where each student in a group has a separate task as part of the production process
 |

## Levels 5 and 6

### Band description

In Levels 5 and 6, students have opportunities to create designed solutions at least once in each of the following Design and Technologies sub-strands:

• Engineering principles and systems

• Food and fibre production

• Food specialisations

• Materials and technologies specialisations.

Students have opportunities to experience designing and producing products, services and environments.

Students investigate technologies − tools, processes, materials, systems and components − that are used in the home and in local, national, regional or global communities, considering ethical factors including social and environmental sustainability. Students consider why and for whom technologies were developed. They engage with ideas beyond the familiar, exploring how design and technologies and the people working in technologies occupations contribute to society. They seek to explore innovation. Students are given new opportunities to clarify their thinking and creativity, as well as to problem-solve and make decisions. They begin to explore speculative thinking through exploring trends and data to imagine what the future might be like, and suggest design decisions that contribute positively to sustainability and worldviews.

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

Students work individually and collaboratively to identify, sequence and co-design steps needed for a design task, including negotiating design criteria that include ethical considerations. They work independently, collaboratively and in teams to develop and follow plans to complete design tasks safely, adjusting when necessary. Students identify and maintain safety standards and practices when making designed solutions.

### Achievement standard

By the end of Level 6, students explain how people address ethical considerations when designing products, services and environments to meet the needs or opportunities of communities. For each of the 4 Technologies Contexts sub-strands, they explain how the features of technologies impact on design decisions, and work collaboratively and in teams to create designed solutions to address identified needs or opportunities. Students work collaboratively to negotiate and develop design criteria that include worldviews or sustainability considerations. They select and explain design ideas, and communicate these design ideas to an audience using technical terms and graphical representation techniques. Students develop project plans, including production processes, and follow the project plans to select technologies and techniques to safely produce designed solutions.

### Content descriptions and elaborations

#### Strand: Technologies and Society

| Content descriptionsStudents learn about: | ElaborationsThis may involve students: |
| --- | --- |
| how people in design and technologies occupations consider competing ethical factors including sustainability in the design of products, services and environments VC2TDE6S01 | * consulting with the local Aboriginal community to investigate and learn about their sustainability practices, which may include harvesting of bush tucker, use of other seasonal resources, fire management, land stewardship and water conservation
* investigating how the Gunditjmara People have long considered competing factors, especially those related to sustainability, in the design of hunting technologies, for example eel traps that allow for selective harvesting to match food needs as compared with high-yield, non-selective harvesting practices such as trawling
* describing the impact and sustainability implications of designed products, services or environments on local, regional and global communities, for example the emergence of small businesses that are recycling materials such as plastic tags and bottle tops into prosthetics or homewares
* explaining the importance of aesthetics, function and sustainability in product design, for example a textile product that gives ultraviolet protection and is appealing, an odour-fighting wool fabric that minimises washing, a motor that moves a vehicle and uses a sustainable power source, a modification to a home to reduce environmental impact, or restoring a natural environment and enabling low-impact access for the public such as boardwalks in fragile wet heath or swamp ecosystems
* identifying the components of a service that contribute to its success and assessing potential risk or failure, for example a community service announcement to communicate a message in the school or to a wide audience, or a service such as Clean Up Australia Day that manages an aspect of the environment in different communities
* considering how engineers resolve competing factors to produce innovative solutions, for example investigating ways biomimicry could be used to design a new transportation system, considering competing factors such as energy efficiency, reducing carbon emissions, and minimising environmental impact by examining the efficient aerodynamics of birds or the streamlined shape of fish to inspire designed engineered solutions, or researching soft robotic devices, like the soft robotic glove developed for rehabilitation, which are designed to replicate and support human movements based on the natural functionality of muscles and tendons
* considering how Safety by Design principles have been used in the design of products, services or environments, for example considering how prevention, protection and proactive change can be used to improve safety of designed solutions
 |

#### Strand: Technologies Contexts

##### Sub-strand: Engineering principles and systems

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explain how electrical energy can be transformed into movement, sound or light in a product or system VC2TDE6C01 | * investigating how advancements in engineering systems, including photovoltaic systems, are expected to provide opportunities for Aboriginal and Torres Strait Islander people to support and contribute to the use of clean energy, both domestically and potentially in industrial and commercial settings, through the Traditional Owner Renewable Energy program, as seen with the Wadawurrung People
* explaining how Sun tracking of solar panels assists renewable energy production in communities that are classified as remote
* describing the process needed to carefully plan and select components for a system to perform a specific task, for example planning the arrangement of switches, light bulbs and a power source in a lighting design
* producing models using materials and tools to show how to control movement, sound or light, for example constructing an automation or lifting system including a simple hand pulley to raise a bucket or toy
* deconstructing a product or system to investigate how movement, sound or light can be controlled, for example deconstructing a torch or buzzer and exploring circuit design
* investigating the properties of materials to solve problems requiring the control of movement, sound or light, for example directing light through a maze using mirrors
 |

##### Sub-strand: Food and fibre production

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explain how and why food and fibre are produced in managed environments VC2TDE6C02 | * investigating how, before European colonisation, Aboriginal and Torres Strait Islander Peoples lived in individual communities and nations that cared for, protected and sustainably harvested food and fibre resources, some of which are now cultivated to meet domestic and international demand, for example bunya nuts, macadamias and woven baskets
* investigating and experimenting with different tools and methods of preparing soil and the effect on soil quality and sustainability, including conserving and recycling nutrients, for example building a food composting system, including mulch, when designing a sustainable school vegetable garden or cropping area
* describing relationships between plant types and animal breeds and their environmental suitability when selecting suitable plants or animals for an environment, for example growing tropical fruits in northern Australia due to the warmer climate, and raising certain livestock such as Jersey dairy cattle, Merino sheep, Huacaya alpacas and Rhode Island Red chickens in the cooler regions of Australia
* sequencing the process of converting on-farm food or fibre products into a product suitable for retail sale, for example creating a digital flow chart to record a paddock-to-plate supply chain or the fibre-to-garment life cycle (fibre, yarn, fabric, garment)
* visiting a farm or participating in a virtual tour to ask questions about how and why food and fibre are produced in that environment
 |

##### Sub-strand: Food specialisations

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explain how the properties of foods influence selection and preparation for healthy eating VC2TDE6C03 | * investigating Aboriginal and/or Torres Strait Islander practices for selecting and preparing foods for healthy eating, for example based on their nutritional value, availability, spoilage, preparation and processing requirements in consultation with local community, discussing sources of food from Country and Place
* determining, using the Australian Guide to Healthy Eating, what is a serve of vegetables and discussing different ways to achieve one serve of particular vegetables, considering fresh and processed options, such as frozen and canned food, and including various cooking methods such as steaming, boiling and stir-frying
* investigating how foods with different textures require different preparation methods; for example, crisp vegetables like carrots or capsicums can be used as raw ingredients in salads to retain their crunchiness, while starchy vegetables like potato and sweet potato are often cooked to a softer texture
* discussing ways that sounds produced when preparing or consuming food can influence sensory experiences, for example the crunch of biting into a crisp apple, the sizzle of food cooking on a hot grill and the popping sound of popcorn kernels when heated
* experimenting with tools, ingredients and techniques to design and make food products or meals for selected groups for healthy eating, taking into consideration environmental impacts and nutritional benefits, for example experimenting with preserving techniques including pickling, fermentation, air-drying and sun-drying, and presenting information on the benefits to an audience
* exploring a variety of tastes and how they may influence the selection or preparation of food, for example the sour, salty, sweet, spicy and umami flavours of many foods from countries across Asia
* exploring the food service options of a local restaurant, cafe, fast food or takeaway establishment and identifying the food preparation skills needed to prepare food for healthy eating
 |

##### Sub-strand: Materials and technologies specialisations

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explain how characteristics and properties of materials, systems, components and tools affect their use when producing designed solutions VC2TDE6C04 | * investigating how the Gunditjmara People have long used material science knowledge to identify materials and preparation techniques to meet performance needs, for example twining techniques for string and rope fibres to ensure suitability for use in wet, dry, freshwater and saltwater applications
* investigating traditional use of sinew and resin in the coating materials of bark canoes by Aboriginal and/or Torres Strait Islander people to ensure waterproofing
* identifying and examining the properties of materials for the design and construction of a household product or system to improve household sustainability, for example a product for storing harvested water or reducing energy consumption
* describing the materials and systems used in public places and facilities that affect the way people live, for example community exercise environments, arts facilities, water treatment plants and garbage collection services
* comparing and describing the tools and techniques used to manufacture products in factories with those used by local and regional enterprises, including cost and impacts, for example clothing made in factories
* comparing the design and production of products, services or environments in Australia and a country in Asia, for example comparing the diversity, availability and properties of preferred materials and the design of public shelters and housing in Indonesia and Australia
* investigating the properties of fibres and how these are used to create products, for example designing an experiment to test which fabrics are the best insulators, and explaining how those properties influence their uses
 |

#### Strand: Creating Designed Solutions

##### Sub-strand: Investigating and defining

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| investigate needs or opportunities for designing, and the materials, components, tools and processes needed to create designed solutions VC2TDE6D01 | * investigating traditional fibre sources as potential commercial solutions for biodegradable string or rope, and researching the materials, systems, components and tools needed
* surveying people in the school community about their needs in order to design an appropriate product, service or environment that addresses the need, for example planning the requirements for a community meal, creating more shade in the school by determining where trees could be planted or designing a security system for a community garden
* investigating designed solutions from around the world to make suitable, quality decisions that meet needs or opportunities, for example locating information online about small-space gardening ideas from different countries and judging the suitability of these ideas for the local environment
* investigating the importance of complementary parts of working systems by deconstructing the components, structure and purpose of products, services or environments, for example labelling a diagram of a robotic weeder or vacuum cleaner and explaining the function of its parts
* testing a range of materials, components and tools to determine the appropriate technologies needed to make products, services or environments, for example the materials for a product such as a rubber-band-powered vehicle or item of protective clothing
* investigating how to minimise material use and manage waste by comparing the environmental and social impacts of materials, components and tools, for example comparing the cost and environmental impact of repurposing an old item of clothing to create a carry bag with that of buying a new bag, or using wilted vegetables to make a vegetable soup instead of buying takeaway soup
 |

##### Sub-strand: Generating and designing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| generate, iterate and communicate design ideas, decisions and processes using technical terms and graphical representation techniques, using manual and digital tools VC2TDE6D02 | * generating a range of design ideas for products, services or environments using prior knowledge, skills and research, for example a security system for a community garden, a product made from a repurposed item of clothing, a permaculture vegetable patch or a healthy meal for a family picnic
* analysing, modifying and developing design ideas to enhance and improve the sustainability of a product, service, environment or system, for example conducting a life cycle assessment and analysing eco-friendly alternatives to non-recyclable decorations for a community event or replacing paper-based newsletters with online formats
* representing and communicating design ideas using modelling and drawings, including the use of digital tools, for example including a scale, symbols and codes in plans and diagrams, using thumbnail sketches and labelled drawings, using pictorial maps and aerial views, and using digital mapping applications or infographics to present research and ideas to others
* developing and using models to iterate and improve design ideas, for example using modelling applications to design the layout and features of an enclosure for a chosen animal
* experimenting with materials and tools to refine design decisions and processes, for example considering the selection of materials and joining techniques to suit the purpose of a product, such as a pop-up book, fabric bag or electric circuit
* considering the social values and ethical considerations of end users when designing an environment, for example interviewing end users of a space or seeking permission to use designs or images created by others, including respect of cultural and intellectual property
 |

##### Sub-strand: Producing and implementing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| select, explain and use suitable materials, components, tools and techniques to safely make designed solutions VC2TDE6D03 | * matching material and joining techniques to a design intention, for example accurately and safely cutting and sewing fabric pieces to make a community banner or joining components to produce an electric circuit
* using appropriate personal protective equipment required for the use of some tools, for example protective eyewear, and working safely, responsibly and cooperatively to ensure safe work areas, for example safely using tools when making a water-resistant floating craft
* choosing appropriate materials, tools and techniques for a specific purpose, for example when safely and hygienically preparing food, cultivating garden beds or constructing electronic products
* identifying work practices that show an understanding of environmental considerations and food safety when designing and making a food product, for example washing freshly picked fruit, vegetables and herbs to remove soil, safely disposing of cooking oils to avoid environmental damage, refrigerating highly perishable foods and being aware of food allergies
 |

##### Sub-strand: Evaluating

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| negotiate design criteria that address ethical considerations, including sustainability, to evaluate design ideas, processes and solutions VC2TDE6D04 | * deciding on design criteria collaboratively for a designed solution, for example including an environmental sustainability criterion such as ‘a product should be recyclable’ or ‘materials selected should be renewable or recycled’, a criterion related to fair and equal access to a product such as inclusive design, accessibility considerations or affordability, or a criterion related to addressing ethical supply chain considerations such as those for responsibly sourced timber
* developing design criteria with others to evaluate the suitability of materials and tools for specific purposes, for example considering the most suitable fabric and tools needed to make beeswax wraps
* iterating and modifying design ideas based on evaluation to improve solutions, for example modifying the sensitivity of sensors in the design of an automated light
* evaluating their designed solutions including considering the benefits and costs of production processes and the environmental impact, for example to produce an animal shelter, in considering ergonomic design or when conducting product testing to ensure safety standards are met
* reflecting on designed solutions to evaluate and assess suitability and sustainability, and determine how well these solutions meet design criteria, for example gathering relevant data to make judgements about a school or community fundraising event in relation to waste reduction, attendance and funds raised, and considering how these aspects could be handled for future events
 |

##### Sub-strand: Planning and managing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| develop project plans that include consideration of resources to individually and collaboratively make designed solutions VC2TDE6D05 | * setting milestones for production processes and allocating roles to team members, for example using a cloud-based or server-based document or spreadsheet to list tasks, deadlines and roles for team members working on a project collaboratively, including setting document-sharing permissions for selected people
* identifying the human resources, materials and tools needed to make a designed solution as part of the project plan and specifying when these will be needed, for example access to a wildlife expert at the planning stage, and scheduling access to shared tools when building a habitat for local animals
* planning production steps needed to produce a product, service or environment using digital tools, for example making a flow chart or using a digital planner to record the sequence of tasks and deadlines needed to complete a project
* using a storyboard to visually plan the process of making a product, service or environment, for example the process to make a healthy vegetable fritter or to prepare a garden bed and plant vegetable seedlings
 |

## Levels 7 and 8

### Band description

In Levels 7 and 8, students have opportunities to create designed solutions at least once in each of the following Design and Technologies sub-strands:

• Engineering principles and systems

• Food and fibre production

• Food specialisations

• Materials and technologies specialisations.

Students have opportunities to design and produce products, services and environments.

Students investigate and select from a range of technologies − tools, processes, materials, systems and components. They discuss how the characteristics and properties of technologies can be combined to design and produce designed solutions to address needs and opportunities for individuals and communities, considering ethical factors including economic, environmental and social sustainability. They use speculative thinking to examine data to suggest design decisions that contribute positively to ethical considerations, including sustainability. Students work collaboratively to use innovation and enterprise skills with increasing independence to co-develop designed solutions. They respond to feedback from others, and evaluate design processes and designed solutions in relation to sustainability and worldviews. Students investigate design and technologies professions and the contributions of each 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 adapt ideas through sketching, modelling and drawing techniques (e.g. perspective and orthogonal drawings such as top view and side views). 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.

Independently and collaboratively, students identify the sequences and steps involved in design tasks. They develop and co-develop plans to manage design tasks, including safe and responsible use of materials and tools, and implement their plans to successfully complete these tasks. Students apply and evaluate safety procedures that minimise risk, and manage a project with safety and efficiency when making designed solutions.

### Achievement standard

By the end of Level 8, students explain how people design, innovate and produce products, services and environments that address ethical considerations. For each of the 4 Technologies Contexts sub-strands, they discuss how the features of technologies impact on design decisions, and create designed solutions based on analysis of needs or opportunities. Students generate and adapt design ideas, processes and solutions, and justify their decisions against their own and others’ predetermined design criteria for ethical considerations, including sustainability and worldviews. They communicate design ideas and solutions to audiences using technical terms, graphical representation techniques and appropriate attributions. They document production processes independently and collaboratively, and develop and co-develop the production and implementation of these processes to safely produce designed solutions.

### Content descriptions and elaborations

#### Strand: Technologies and Society

| Content descriptionsStudents learn about: | ElaborationsThis may involve students: |
| --- | --- |
| how people in design and technologies occupations consider ethical factors to design and produce products, services and environments VC2TDE8S01 | * researching current information on animal welfare when designing an animal shelter; or the significance of 3D printed design in the Victorian manufacturing industry; or intellectual property related to product design; or sustainable food packaging options, including biodegradable or compostable materials in the food industry; or sustainable materials, such as recycled or biodegradable materials, in the building or fashion industry
* researching the rights and responsibilities of those working in design and technologies occupations, for example considering Aboriginal and/or Torres Strait Islander protocols and Indigenous Cultural and Intellectual Property rights
* investigating ways designers demonstrate social responsibility throughout a supply chain, for example fair labour practices, safe working conditions and respecting human rights, and discussing the social impact of the work
* investigating traditional and contemporary design and technologies, and predicting how these might change or be sustained in the future in response to technological, environmental, social or economic change, for example the production of contemporary textile designs by Ngali or Paul McCann
* comparing the design and production of products, services and environments in Australia to other countries by identifying needs and opportunities for design and enterprise, for example design, promotion and marketing of murnong (yam daisy) as a sustainable starchy vegetable for culinary and domestic use on Gunaikurnai Country (Gippsland in south-eastern Victoria) and Yuin Country (south coast of New South Wales and far south-eastern coastal Victoria)
* analysing 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
 |
| the impacts of innovation and the development of technologies on designed solutions for ethical considerations including sustainable living VC2TDE8S02 | * investigating biomimicry influences on the design and development of manufactured products and processes, for example how air vents were inspired by the efficient airflow in structures such as termite mounds, and how the roof of the Margaret Court Arena in Melbourne imitates the way a sunflower opens and closes, helping with natural light and ventilation as weather changes
* investigating techniques used by land managers for managing and reducing bushfires in forests, for example cool burning techniques used by Victorian Aboriginal communities or use of smart technologies such as Internet of Things (IoT) sensors, artificial intelligence, cameras and drones
* investigating traditional, contemporary and emerging design and technologies, and the need for more sustainable patterns of living, and predicting how these might change in the future in response to technological, environmental, social or economic changes, for example the diversity of house design, energy-efficient solutions in housing such as smart thermostats, energy-monitoring systems and renewable energy sources, waste management practices, traditional food preservation techniques such as fermenting and drying, and the future of transportation considering the rise of electric vehicles, autonomous technologies and shared mobility systems
* investigating influences affecting manufactured products and processes, for example historical developments such as invention of plastics in the early 20th century, establishment of international standards like the International Organization for Standardization (which develops voluntary standards to ensure quality, safety and efficiency in the manufacturing industry), increased awareness of environmental issues and the need for sustainable manufacturing practices or new materials, or establishment of accessibility guidelines to ensure equal access and usability in product design, services and environments for people with disability
* examining influences affecting designed solutions, for example how societal change has resulted in a shift in consumer preferences for eco-friendly products, use of new materials (e.g. graphene, self-healing materials, aerogels and shape memory alloys), the impact of accessibility guidelines on the integration of universal design principles, inclusive features and assistive technologies into products, services and environments, or how control systems such as the exploration of the use of robotics, machine learning or Internet of Things (IoT) systems have enhanced production efficiency, quality control and customisation capabilities
* researching contemporary designers who use new materials to design and produce innovative products such as the origami-inspired Kami compact furniture
* considering factors that impact on innovation such as developing original or novel ideas, adapting swiftly to change, establishing a unique selling point, creating societal value, reducing costs and enhancing efficiency, for example the denim upcycling company Nobody Denim
 |

#### Strand: Technologies Contexts

##### Sub-strand: Engineering principles and systems

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| analyse how force, motion and energy are used to manipulate and control engineered systems that are ethicalVC2TDE8C01 | * 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 the BayWa r.e. wind power and solar farm on Millewa–Mallee Country (near Mildura in north-western Victoria)
* investigating the technologies in a control system for an identified need or opportunity and end user, for example the Corriong or Millowl (Phillip Island in Victoria) penguin weighbridge, which 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, and testing functionality of an idea by producing prototypes and jigs, including the use of rapid prototyping tools such as 3D printers
* investigating an engineered system’s outputs, for example calculating speed, light brightness or sound volume to determine when the system might fail, or using 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
* investigating components and tools in terms of force, motion or energy, for example testing the durability of batteries and determining the effective range of wireless devices
 |

##### Sub-strand: Food and fibre production

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| analyse how food and fibre are produced in managed environments and how these can become ethicalVC2TDE8C02 | * analysing both traditional and contemporary approaches, including Aboriginal and/or Torres Strait Islander protocols and connection to Country and Place, for food and fibre sources of plants that offer benefits in sustainability such as conserving water and other resource use, supporting biodiversity and promoting resilience to local climatic conditions
* discussing the reasons for the development of the Victorian Traditional Owner Native Food and Botanicals Strategy
* examining how Aboriginal and/or Torres Strait Islander people may use seasonal calendars to source foods according to natural cycles
* comparing Australia to selected countries in Asia in relation to uses of robots, drones, global positioning system technologies, minimum-tillage cropping, water-efficient irrigation and smart farm monitoring, and controlling systems for increasing efficiency of farm operations and crop protection
* comparing the impacts of Australian cash crops and staples on economic and social sustainability with those in selected countries in Asia
* investigating how animal and plant crops are grown and the ethical, including 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 and ethical, including sustainable, production techniques
* investigating different animal nutrition strategies such as grazing and supplementary feeding, and the effects on quality when producing food and fibre products, for example meat tenderness, wool fibre diameter (micron), milk fat content and protein content
* recognising the importance of food and fibre production to Australia’s food security and economy, including exports to and imports from countries across Asia, for example exports of Victorian wagyu beef cattle farmed on Yorta Yorta Country (central Murray–Goulburn region in north-eastern Victoria and southern New South Wales)
* analysing sustainable forestry practices that promote responsible timber harvesting, reforestation and biodiversity conservation, and investigating how timber and fibre production can be managed in a way that minimises environmental impact and supports long-term sustainability
 |

##### Sub-strand: Food specialisations

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| analyse how properties of foods determine preparation and presentation techniques when designing solutions for healthy eating and other ethical considerationsVC2TDE8C03 | * analysing how Aboriginal and/or Torres Strait Islander people prepare traditional 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 selecting wood for roasting and smoking to complement the flavours of foods
* investigating the current applications of Aboriginal and/or Torres Strait Islander foods such as use of Kakadu plum as a natural preservative and flavour enhancer
* explaining how food preparation techniques impact on food’s sensory properties such as flavour, appearance, texture and aroma, for example how using a variety of seasonings and spices impacts the flavour profile of food, how different cooking methods such as grilling, steaming and baking can alter the texture and flavour of food, how different grains such as quinoa, barley, oats and rice have varying water absorption properties when cooked (which impacts cooking time, texture, taste and appearance), and how selecting timbers for smoking foods influences flavour
* 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, blanching, steaming or fermenting vegetables, retaining skin on vegetables such as pumpkin, eggplant, carrot and potato, or fruits such as kiwifruit and apples, or fish such as salmon, and 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, fermentation and using a wide variety of vegetables and grains
 |

##### Sub-strand: Materials and technologies specialisations

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| analyse how characteristics and properties of tools, materials, systems and components can be selected, manipulated and combined to create designed solutions that are ethicalVC2TDE8C04 | * investigating the significance of hafting in Aboriginal and/or Torres Strait Islander Peoples’ traditional toolkits, 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, which combines the benefits of a lever and a wedge to create durable tools that reduce effort
* comparing the different types of boomerangs for their various uses, and investigating the specific designs tailored for hunting different animals
* investigating a broad range of technologies – tools, 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 and tools needed to produce it, and expected durability, or investigating carbon fibres (reinforced polymers) and graphite fibres (strong, stiff, lightweight materials) used in specialised high-performance products such as sporting equipment
* considering the ways in which the characteristics and properties of technologies impact on designed solutions, for example the choice of building materials and housing design in Australia and a country in Asia, and the properties of textile fibres and fabrics that determine use in a range of settings such as architecture, medicine, sport and automotive
* explaining safe work practices for using specific tools or materials, for example producing a safety information video that details risk management practices, such as use of ventilation and personal protective equipment, for using specific tools, 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
* testing and selecting the most appropriate hand tools, processes and materials to produce a product, for example a stool or smartphone stand that can be assembled by bending and interlocking cardboard pieces, or made from wood using a laser cutter or other digital tools
 |

#### Strand: Creating Designed Solutions

##### Sub-strand: Investigating and defining

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| explain needs or opportunities for designing, and investigate and select tools, materials, processes and components to create designed solutionsVC2TDE8D01 | * considering Aboriginal and/or Torres Strait Islander 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 in vegetable gardens for a community centre, as part of a cost-effective food service for a sporting club, by researching sustainability and community reports from local councils, or by creating a questionnaire for students from local schools to determine their food choices and then developing a range of food items made primarily from grains and vegetables such as snacks, vegetable juices, breakfast or nourish bowls such as a Buddha bowl, which could be sold at school canteens
* investigating emerging technologies and their potential impact throughout a product’s life cycle on design decisions, for example flame-retardant fabrics, self-healing materials, virtual reality devices and aquaponics systems
* examining, testing and selecting a variety of suitable materials, components and tools for each design project, for example identifying the durability differences between natural hardwood and plantation softwood timbers (which determine their suitability for interior or exterior use), comparing a hand-sewn product with one produced using a sewing machine, and comparing handmade jewellery with mass-produced jewellery
 |

##### Sub-strand: Generating and designing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| generate, test, iterate and communicate design ideas, processes and solutions using technical terms and graphical representation techniques and appropriate attributions, using manual and digital tools VC2TDE8D02 | * using a variety of strategies, including digital tools, to brainstorm, sketch, create 3D models and conduct experiments to generate creative design ideas that are presented to others
* using critical thinking strategies to evaluate the advantages and disadvantages of ideas, and speculative thinking to identify factors that may support or hinder project development, for example conducting digital polling to gather input from diverse community groups, fostering intercultural understanding and informing the creation of the designed solution
* developing models or prototypes using a range of materials and tools to test the functionality of design ideas
* producing annotated concept sketches and drawings using technical terms, scale and symbols; producing drawings such as pictorial and aerial views to represent environments; producing working drawings, perspective drawings and orthogonal drawings; and producing patterns and templates to explain product design ideas
* documenting and communicating the generation, development and selection of design ideas for an intended audience, for example developing a digital record of evidence, with images and text, that clearly communicates each step of a design process
* using manual and/or digital tools to generate design ideas by sketching them on paper or using digital drawing software, and then adding annotations or labels to explain specific features or functionalities of the design and including appropriate attributions of the sources of inspiration or references used
 |

##### Sub-strand: Producing and implementing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| select, justify and use suitable tools, materials, processes and components to safely make designed solutions VC2TDE8D03 | * developing innovative ways of manipulating technologies by comparing and choosing the most appropriate options to design a solution using traditional or contemporary tools, processes, materials and components; and considering alternatives, including emerging technologies, that could reduce waste or time
* practising techniques to improve expertise, for example adapting recipes to incorporate more whole grains or vegetables, handling animals, cutting and joining materials such as metal, textiles and timber, and experimenting with different components such as resistors, capacitors and LEDs to understand how circuits function and how to troubleshoot potential issues
* using materials like clay, cardboard, paper and polystyrene to manually create physical prototypes to test functionality, ergonomics or aesthetics, or using digital tools such as 3D modelling software to create virtual prototypes that can be visualised and tested in a simulated environment
* developing technical production skills or processes and adopting safe, independent, inclusive working practices to produce quality solutions designed with ethical considerations including sustainability, for example designing an eco-friendly and re-usable alternative to a single-use plastic bag, such as a versatile tote bag made out of recycled fabric or upcycled materials, that considers the accessibility needs of different individuals
* identifying and managing risks in the development of various projects, for example working safely, responsibly, cooperatively and ethically on design projects, and assessing and responding to uncertainty and risk in relation to both short-term and long-term health and environmental impacts (e.g. ensuring appropriate personal protective equipment 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 to design a solution, for example using an online tutorial to learn to use software for design or production
 |

##### Sub-strand: Evaluating

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| collaboratively develop design criteria that include ethical considerations to evaluate design ideas, processes and solutionsVC2TDE8D04 | * 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 end users of a finished product, service or environment, including life cycle assessment criteria to consider a smartphone’s potential recycling or disposal methods at the end of its life, and brainstorming to generate suggestions for design criteria
* discussing and developing, as a class, design criteria that include Safety by Design principles, for example exploring how the design of new cars integrates safety through prevention (e.g. in enhanced lighting and advanced driver assistance systems, including adaptive cruise control), protection (e.g. incorporation of safety features such as airbags, seat belts and crumple zones) and proactive changes such as autonomous driving technology
* collaboratively developing criteria to evaluate sustainability considerations such as seasonality of produce, food miles, types of packaging for a meal, and water use and pest control for a vegetable garden
* re-evaluating, iterating and modifying design processes, including integrating passive design principles, 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 these in future projects
 |

##### Sub-strand: Planning and managing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
| --- | --- |
| develop project plans to individually, collaboratively and in teams manage time, cost and production of designed solutionsVC2TDE8D05 | * 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 such as construction of a herb garden, or cultivation of herbs and medicinal plants such as basil, mint, chamomile, lavender and aloe vera in pots
* 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 using prior knowledge, research and testing to estimate time allocations on a planning template for the different stages of the design process needed to produce a clock, acoustic speaker, desk lamp, chicken coop, vegetable garden bed or compost
 |

## Levels 9 and 10

### Band description

In Levels 9 and 10, students have opportunities to create designed solutions at least once in each of the following Design and Technologies sub-strands:

• Engineering principles and systems

• Food and fibre production

• Food specialisations

• Materials and technologies specialisations.

Students have opportunities to design and produce innovative designed solutions for products, services and environments considering ethical factors, including sustainability.

Students use design and technologies knowledge and understanding, processes and production skills, and apply design thinking – critical, creative and speculative thinking – to analyse and then produce designed solutions for identified needs or opportunities of relevance to individuals and local, regional or global communities. They work independently, collaboratively and in teams to co-design and co-develop. Problem-solving activities acknowledge the complexities of contemporary life and make connections to related specialised occupations and further study. Increasingly, the study of Design and Technologies has a global perspective, with opportunities to understand the complex interdependencies involved in the development of technologies and enterprises.

Students specifically focus on ethical considerations including sustainability and worldviews, considering legal issues; social values; and economic, environmental and social sustainability factors; and use strategies such as life cycle thinking. They use critical, creative and speculative thinking, 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 ethical considerations, including sustainability.

Using a range of technologies, including a variety of graphical representation techniques, to communicate, students generate and represent original ideas in 2D and 3D representations. Students also use digital tools to produce models and simulations. They produce rendered, illustrated views for marketing and use graphic visualisation software to produce dynamic views of design ideas, and designed solutions to demonstrate enterprise skills. These techniques are specific to the technologies context and may include scale, perspective, orthogonal and working drawings with sectional and exploded views.

Students identify the steps involved in planning the production of designed solutions. They develop project management plans, incorporating elements such as sequenced time, costs, roles and responsibilities and risk management to manage design tasks safely. Students implement project management plans, making documented modifications when necessary, to successfully complete design tasks. They manage and justify safety procedures that minimise risk and manage to implement projects with safety and efficiency in mind, maintaining safety standards and management procedures to ensure success.

### Achievement standard

By the end of Level 10, students explain how people consider factors that affect design decisions, and the technologies used to design and produce products, services and environments that address ethical considerations. They explain and critique the contribution of innovation, enterprise skills and emerging technologies to sustainability and worldviews. For one or more of the Technologies Contexts sub-strands, students discuss the features of technologies and their appropriateness for purpose, and use design thinking to develop and co-develop designed solutions based on an analysis of identified needs or opportunities. Students create, adapt and refine design ideas, processes and solutions, and justify their decisions against predetermined design criteria that address ethical considerations. They critique and communicate design ideas, processes and solutions to a range of audiences using technical terms, graphical representation techniques and appropriate attributions. Students work independently, collaboratively and in teams to develop and implement project management plans, making adjustments when necessary. They select and use appropriate technologies skilfully to safely produce designed solutions.

### Content descriptions and elaborations

#### Strand: Technologies and Society

| Content descriptionsStudents learn about: | ElaborationsThis may involve students: |
| --- | --- |
| how people in design and technologies occupations consider ethical factors to innovate and improve products, services and environments VC2TDE10S01 | * examining ethical factors influencing the design and production of solutions developed by Aboriginal and/or Torres Strait Islander Peoples, for example the traditional and sustainable use of natural fibres in various ways – to weave baskets to gather and carry food, to make fish and eel traps, and to make thermoplastic resin (a sticky black substance used to create tools such as spears, woomeras and axes, and strong enough to bind rock to wood)
* analysing design and technologies professions and their contributions to society, for example the work of engineers in disaster recovery, Australia’s role in the global edible insect industry, and the co-design and co-development of designed solutions to improve access to clean, safe energy and to empower local communities
* using speculative thinking to examine the impact of past designed solutions when creating designed solutions that address ethical considerations, for example considering the design of public transport systems that use renewable energy and are accessible or the design of rural community environments to reduce fire risk
* considering factors that influence design and manufacture, and the work of designers, engineers and technologists, including time, access to skills, knowledge, finance and expertise, for example the work of Australian designers and engineers 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 Lãnh Bridge
* explaining how 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 or redesigning to use less material
* explaining the impacts of decisions for ethical products, services and environments, for example the accessibility of a managed public environment such as a community garden, the design of roads to include aerial bridges for wildlife and signage powered with solar technologies
* examining mass-production systems in industries such as those for food, clothing, furniture and shoes, and considering their impact on sustainability and other ethical factors, for example environmental impact, social impact, labour practices, resource management, and product recycling and disposal
 |
| the impacts of innovation, enterprise and emerging technologies on designed solutions for ethical considerations including sustainable living VC2TDE10S02 | * investigating how the knowledges of Aboriginal and/or Torres Strait Islander Peoples 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 fashion retailers, and considering the carbon footprint of these
* investigating scenarios and using speculative thinking to consider future opportunities and impacts for society and particular groups, for example analysing autonomous vehicles and the potential widespread adoption of electric and alternative fuel-powered vehicles, and considering how this shift might impact transportation accessibility for elderly people and people with disability, urban planning, reduction of air pollution, and changes in job opportunities for the transportation industry, or examining increasing use of artificial intelligence and automation in the manufacturing industry and the potential effects on job markets, retraining needs for displaced workers, ethical considerations about artificial intelligence decision-making, and how society might adapt to a more automated workforce
* examining real-world problems and responding to challenges in countries in Asia, and collaborating in design solutions that understand people’s basic needs, for example students addressing landfill waste in China, and artists from a country in South-East Asia creating posters for the world to take action in a pandemic
* examining impacts of innovation, enterprise and emerging technologies influenced by biomimicry, for example in construction of lightweight and robust structures for buildings and bridges (drawing inspiration from the strength and efficiency of natural structures such as honeycombs, spiderwebs and bones), in sustainable architecture and material construction (e.g. bio-bricks and bio-cement), in wastewater treatment systems that replicate natural wetlands to efficiently purify water and minimise environmental effects, in revolutionising industries like surveillance and environmental monitoring using drones modelled after bird flight, in design of wind turbine blades (inspired by the fins of humpback whales, enhancing energy capture and efficiency), in modelling of packaging solutions (based on the way leaves and petals are arranged on plants to optimise surface area for sunlight exposure and water collection to reduce waste and promote eco-friendly practices), and in efficient ventilation systems inspired by ant hills
* examining how engineers and designers use computational thinking to design smart home systems that aim to save energy and promote sustainable living
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#### Strand: Technologies Contexts

##### Sub-strand: Engineering principles and systems

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
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| analyse and make judgements on how the characteristics and properties of materials are combined with force, motion and energy to control engineered systems that are ethicalVC2TDE10C01 | * investigating the engineering innovations of Aboriginal and/or Torres Strait Islander Peoples, such as spearthrowers, and how the characteristics and properties of materials (e.g. rigidity, flexibility and hardness) are used
* 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
* analysing the relationship between properties of materials, calculating forces, reactions and loads in structures and the safety in engineered systems such as bridges
* discussing and then critiquing the effectiveness of the combinations of materials, kinetic 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 turbine 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 and their capabilities, for example making a recommendation for the best charger for an electric vehicle owner who uses their vehicle to commute to work
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##### Sub-strand: Food and fibre production

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
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| analyse and make judgements on the ethical and secure production and marketing of food and fibre enterprises VC2TDE10C02 | * analysing and comparing root vegetable sources used by Aboriginal and/or Torres Strait Islander Peoples, such as murnong (yam daisy) for nutrient content, including energy, fat and protein, and suitability as a sustainable food source in drought on Millewa–Mallee Country (near Mildura in north-western Victoria), with cereal crops such as wheat and rice
* discussing the ways in which the development of the Victorian Traditional Owner Native Food and Botanicals Strategy has the potential for cultural, economic and environmental gains
* investigating engineering innovations of Aboriginal and/or Torres Strait Islander Peoples, such as spearthrowers, bows and arrows, basket strength, thermal properties of possum skin cloaks and how the characteristics and properties of materials such as rigidity, flexibility and hardness are used
* examining the productivity, profitability and sustainability of emerging production technologies and methods in the food and fibre industries, for example taking account of animal welfare considerations in food and fibre production enterprises, protected cropping, hydroponics and aquaculture
* investigating how digital tools could be used to enhance food production systems, for example global positioning systems for managing animals, crop sensors, automated animal-feeding or milking systems, and 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 the contributions of these systems to food and fibre production, for example investigating 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 these may influence design decisions for creating sustainable futures, for example using water-efficient irrigation and protected cropping (growing crops under cover to increase production over a longer period) and choosing drought-resistant varieties of plants and animals
* examining the market 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: Food specialisations

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
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| analyse and make judgements on how the sensory and functional properties of food influence the design and preparation of ethical including sustainable food solutions for healthy eating VC2TDE10C03 | * analysing how Aboriginal and/or Torres Strait Islander Peoples have long-understood techniques to turn plant products into food sources with high nutritional value; for example, throughout Victoria, murnong (yam daisy) tubers were baked in earth ovens
* experimenting with food preservation methods such as freezing and dehydrating to determine changes to food structure and how these affect designing food solutions where vegetables are the ‘hero’ ingredients, for example dehydrating vegetables like zucchini, tomato or capsicum or herbs like parsley and thyme and discussing ways to use them in a soup
* 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 animal milks, and seed- and nut-milk alternatives
* examining current food trends and reflecting on the potential impact on food choices for ethical, including sustainable, considerations, for example discussing selection of organic ingredients or plant-based foods to address food security and environmental sustainability, cultural barriers to the consumption of protein sources from insects, or environmental and economic sustainability issues related to cultured or lab-grown meats and the use of seed and nut milks
* conducting taste comparisons of different apple varieties to analyse and make judgements about taste, texture, flavour, aroma and crispness, and make recommendations about apples, for example as a snack, to use in a salad or to add during cooking
* 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 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 snack in a healthy eating campaign
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##### Sub-strand: Materials and technologies specialisations

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
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| analyse and make judgements on how characteristics and properties of materials, systems, components and tools can be combined to create designed solutions that are ethical VC2TDE10C04 | * analysing how Aboriginal and/or Torres Strait Islander Peoples identified the superior thermal properties of possum fur in their traditional 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 such as critiquing disposable plastic cutlery or food containers or integrating passive design principles
* investigating emerging materials and their impact on design decisions, for example examining the properties of common plastic bags and researching innovative materials, such as bioplastics, that could be used as a sustainable alternative, or renewable materials such as seaweed
* justifying decisions when selecting from a broad range of technologies − tools, processes, materials, systems and components – for example selecting low-emission paints and locally sourced materials such as bamboo for cross-laminated timbers
* 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, for example 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 such as buttons and eyewear
* 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 it is biodegradable
* investigating soft robotics nanomaterials, which are able to function like human muscles
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#### Strand: Creating Designed Solutions

##### Sub-strand: Investigating and defining

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
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| analyse needs or opportunities for designing; develop design briefs; and investigate, analyse and select materials, systems, components and tools to create designed solutions VC2TDE10D01 | * analysing Aboriginal and/or Torres Strait Islander Peoples’ use of local grains for their potential for providing nutritional and commercial solutions and developing a design brief to highlight the materials, systems, components and tools 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, and disposable household products
* developing design briefs that consider the needs of end 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
* discussing why anthropometric data is essential in many fields, including clothing design, architecture, industrial design and health care, and ways designers and engineers use anthropometric data to create products, systems and environments that are comfortable, safe and suitable for end users
* considering the needs of community groups to identify design briefs that meet end-user requirements, for example interviewing community members about accessibility requirements to develop the initial brief and then during specific stages of the design process, to determine the best possible designed solution for the community
* examining the relationships between complementary materials, tools and their properties and the techniques required for product development, for example examining compressive and tensile strengths of materials
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##### Sub-strand: Generating and designing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
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| apply innovation and enterprise skills to generate, test, iterate and communicate design ideas, processes and solutions, using technical terms and graphical representation techniques and appropriate attributions using manual and digital tools VC2TDE10D02 | * 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 designed solutions, 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, end-user needs and community consultation processes
* producing drawings, models and prototypes to explore design ideas using drawing techniques (e.g. perspective and orthogonal drawings), digital imaging programs, 3D printers or augmented reality modelling software, or 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, that clearly communicates each step of a design process, or developing a nutrition information panel according to the Food Standards Australia New Zealand standards
* using design thinking and enterprise skills to create new and novel 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

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
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| select, justify, test and use suitable technologies, including processes, and skills, and apply safety procedures to safely make designed solutions VC2TDE10D03 | * 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 to produce a part to specified dimensions
* using materials, components, tools and techniques safely and considering alternatives to maximise sustainability, for example using sustainably harvested timber because it stores carbon and offsets the demand for alternative products
* experimenting with innovative combinations and new ways of manipulating traditional and contemporary materials, components, tools 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, as a response to the impact of lower-than-average rainfall on crop growth and in using materials with unexpected faults
* experimenting with the functional and sensory properties of food to determine the most successful approach, for example preparing vegetables in 3 different ways to maximise colour, flavour and nutritional value
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##### Sub-strand: Evaluating

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
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| develop design criteria including sustainability to evaluate design ideas, processes and solutions VC2TDE10D04 | * developing specific design criteria for evaluating designed solutions, for example determining the 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 the criteria have been met after stress testing or end-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 and bioplastics
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##### Sub-strand: Planning and managing

| Content descriptionsStudents learn to: | ElaborationsThis may involve students: |
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| develop project management plans for intended purposes and audiences to individually and collaboratively and in teams manage projects, taking into consideration time, cost, risk, processes and production of designed solutions VC2TDE10D05 | * producing, explaining and interpreting drawings and planning production timelines using digital tools, for example establishing materials and equipment needs using spreadsheets, and creating production flow charts to ensure efficient, safe and sustainable workflows
* collaborating to develop a project management plan 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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