Curriculum Framework Curriculum Guide – Technology and Enterprise

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Curriculum Council

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The *Curriculum Framework Curriculum Guides* were developed by the Curriculum Council under the direction of members of the Curriculum Framework Committee. Advice was also received from various learning area and phase of development related working parties and critical readers.

The Curriculum Council acknowledges the research, writing and consultation role undertaken by members of the Council Secretariat during the development of the *Curriculum Framework Curriculum Guides*.

This project was made possible by funding from the Public Education Endowment Trust

Foreword

'A focus on student learning lies at the heart of everything the Curriculum Council does'.

This focus is captured in the outcomes of the *Curriculum Framework* that are considered to be important for students to achieve as a result of their K-12 education.

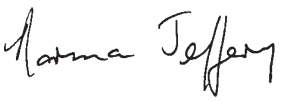
Since the release of the *Curriculum Framework* teachers and schools have been designing and developing learning and teaching programs, which focus on the outcomes and students' learning needs in relation to them. Teachers indicated, through the *Putting the Children First* report *(2001)*, the need for support materials to provide advice about what students should be taught to progress their achievement of outcomes across the phases of development. The result has been the development of *Curriculum Framework Curriculum Guides*, which are designed to support the flexibility teachers and schools have in building educational programs that ensure students achieve the outcomes.

The *Curriculum Framework Curriculum Guides* for each learning area build on the advice provided in the Scope of the Curriculum sections of the *Curriculum Framework*. With the support of a Public Endowment Education Trust grant the Curriculum Council has been able to involve many teachers to scope and sequence content across the years K to 12.

Several principles have underpinned the articulation of content. These include ensuring the content and contexts identified enable students to make a positive contribution to society. For depth of understanding, key concepts and contexts are described in more sophisticated and challenging ways from the early childhood phase to the late adolescent phase. Advice drawn from the *Curriculum Framework* is provided on particular contexts that could be used at each phase of development so that gaps or overlaps in learning are minimised.

The *Curriculum Framework Curriculum Guides* and accompanying CD-ROM provide guidance that informs the development of learning and teaching programs in schools and thereby are a valuable support to improve student learning.

THERESE TEMBY
CHAIR



NORMA JEFFERY
CHIEF EXECUTIVE OFFICER

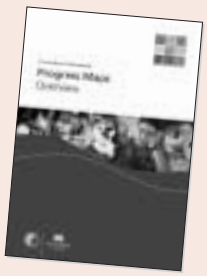
Contents

Curriculum Framework support documents

The *Curriculum Framework Progress Maps, Outcomes and Standards Framework* and the *Curriculum Framework Curriculum Guides* are intended to support implementation of the *Curriculum Framework*.

***Curriculum Framework Progress Maps* Overview**

Contains level descriptions for outcomes in all learning areas of the *Curriculum Framework*.



Outcomes and Standards Framework* Overview

Contains the *Progress Maps* overlayed with the Department of Education and Training's (DET's) Achievement Targets.

***Curriculum Framework Progress Maps* Learning Area Books**

Each book contains outcome level descriptions and elaborations for a particular learning area.

Outcomes and Standards Framework* Learning Area Books

Each book contains outcome level descriptions and elaborations overlayed with DET's Achievement Targets.

***Curriculum Framework Curriculum Guides K-12* Learning Area Books**

Each book contains content to be taught in relation to learning area outcomes across the four phases of development.

***Curriculum Framework Progress Maps* and *Curriculum Guides* CD-ROM**

Contains *Curriculum Framework Progress Maps* and *Curriculum Guides K-12*. It also contains in-phase curriculum guides which provide further sequences of content within each phase of development for particular learning area outcomes.

Curriculum Improvement Program Phase 2 CD-ROM*

Contains DET's *Curriculum, Assessment and Reporting Policy*, *Outcomes and Standards Framework* and *Curriculum Framework Curriculum Guides K-12*. It also contains in-phase curriculum guides which provide further sequences of content within each phase of development for particular learning area outcomes.

* Produced specifically for Western Australian Government Schools.

Introduction

Purpose of *Curriculum Framework Curriculum Guides*

The *Curriculum Framework* identifies the outcomes all students should achieve as a result of the learning programs they undertake in Western Australian schools. Schools and teachers develop learning programs according to their circumstances, ethos and the needs of their students to ensure they achieve these outcomes. Through ongoing judgements of student achievement, students' progress is monitored and plans are developed for further growth.

The purpose of the *Curriculum Framework Curriculum Guides* is to support the implementation of the *Curriculum Framework* by articulating the content (knowledge, skills, understandings and values) to be taught for students to achieve the *Curriculum Framework* Overarching and Learning Area outcomes. They inform the development of learning programs in schools that provide continuity and coherence for students in their achievement of outcomes and thereby are a valuable support for improving student learning.

Although the *Curriculum Framework Curriculum Guides* provide advice for each outcome of the Curriculum Framework there is no expectation that students focus on the content for all the learning outcomes in each year of schooling. There will be times when particular outcomes may be emphasised and periods when some learning outcomes are not included in learning programs. Learning program planning may focus on particular outcomes across the four overlapping phases of development identified in the *Curriculum Framework* as indicated below.

EARLY CHILDHOOD	MIDDLE CHILDHOOD	EARLY ADOLESCENCE	LATE ADOLESCENCE
The focus is mainly on development of the processes and skills that will underpin future learning. Literacy, numeracy, social-emotional and physical development are key emphases. Conceptual outcomes are mainly included as contexts for the development of processes. Teachers select these outcomes according to the needs of children.	Students continue to require learning experiences that support them in acquiring processes. The application of processes becomes a greater focus, as does acquisition of learning area concepts. Conceptual outcomes begin to be targeted more systematically.	The focus shifts to the application of processes in the acquisition of knowledge. The scope and depth to which content is learned broadens and there is increased focus on the development and application of understandings. Learning programs usually provide opportunities to achieve outcomes across all learning areas.	Content becomes more specialised and diverse. Learning programs may not provide learning opportunities across the full range of outcomes of the *Curriculum Framework*. They focus on those outcomes that underpin courses reflecting students' interests and aspirations for post-school destinations.

K → 12

Content of *Curriculum Framework Curriculum Guides*

Content is sequenced over the four phases of development identified in the *Curriculum Framework*. It provides a guide to the breadth and depth of content typically taught in each phase of development for students to progress in their achievement. However, as student learning at each phase needs to be developmentally appropriate, the selection of content to be taught should recognise that each student is developing and achieving in different ways, at different times and at different rates. Further sequences of content within each phase of development are also available in electronic format on CD-ROM and the Curriculum Council website (*www.curriculum.wa.edu.au).* Content for students working towards achievement at Foundation has been represented in age-related contexts at each phase of development.

The Technology and Enterprise *Curriculum Framework Curriculum Guide*

The Technology & Enterprise learning area has seven outcomes. The content for *Technology Process* (**Outcome 1**) describes a generic process that is defined, varied and applied through *Materials, Information* and *Systems* (**Outcomes 2, 3 and 4**). Conversely, the content for *Materials, Information* and *Systems* describes outcome-specific understandings and concepts and their application through the Technology Process. The organisation of content is outlined below.

OUTCOMES	CONTENT ORGANISERS
Technology Process	
• Investigating	• Processes • Features, properties and use
• Devising	• Generating and communicating designs • Conventions and considerations
• Producing	• Techniques • Considerations
• Evaluating	• Outputs • Methods
Materials	
• The nature of materials	• Form and attributes • Context and impact
• The selection and use of materials	• Investigating • Devising • Producing • Evaluating
Information	
• The nature of information	• Form and attributes • Context and impact
• The creation of information	• Investigating • Devising • Producing • Evaluating
Systems	
• The nature of systems	• Form and attributes • Context and impact
• The use and development of systems	• Investigating • Devising • Producing • Evaluating
Enterprise*	
• Enterprising attitudes	• Maximising opportunities
• Enterprising capabilities and skills	• Generating ideas • Communicating and managing • Evaluating outputs • Evaluating methods

OUTCOMES	CONTENT ORGANISERS
Technology Skills*	
• Organisational skills	• Materials • Information • Systems
• Operational skills and manipulative skills	• Materials • Information • Systems
Technology in Society*	
• Influencing factors	• Process – investigating • Materials • Information • Systems
• Consequences	• Process – investigating • Materials • Information • Systems

* Not included in the Department of Education and Training's *Outcomes and Standards Framework*

Content relationships within the learning area

Although discrete content is elaborated for *Enterprise, Technology Skills* and *Technology in Society* (**Outcomes 5, 6** and **7**), achievement of these outcomes generally occurs through integration with various combinations of *Technology Process, Materials, Information* and *Systems*.

Content relationships with other learning areas

Teachers can enrich learning for students by planning to connect content across learning areas. They could integrate parts of the curriculum by drawing together content in various combinations to enhance students' skills, values and understandings: for example, there could be a connection from the Technology and Enterprise learning area to the Science learning area through focussing on techniques for collecting data, designing equipment and sequencing procedures effectively, investigating the form, qualities and properties of materials, and organised and logical ways for recording and classifying information.

Emphasis on specific outcomes

All learning in Technology and Enterprise involves the *Technology Process* outcome. Depending on the nature of activities in which students engage, emphasis will be given to particular conceptual outcomes (*Materials, Information* and *Systems*). In some teaching and learning activities, all three outcomes may be relevant while in other activities one or two of these outcomes may be emphasised. For example, when creating a child's pull-along toy, emphasis will be given to the *Materials* and *Systems* outcomes when applying the Technology Process.

Enterprise, Technology Skills and *Technology in Society* outcomes are developed as an integral part of the Technology Process. When planning teaching and learning activities, opportunities are provided for students to consider the implications of technological developments for societies and environments; develop organisational, operational, manipulative and enterprise skills; and demonstrate innovative thinking and behaviours.

Design of this guide

This guide is designed in two ways.

K-12 design

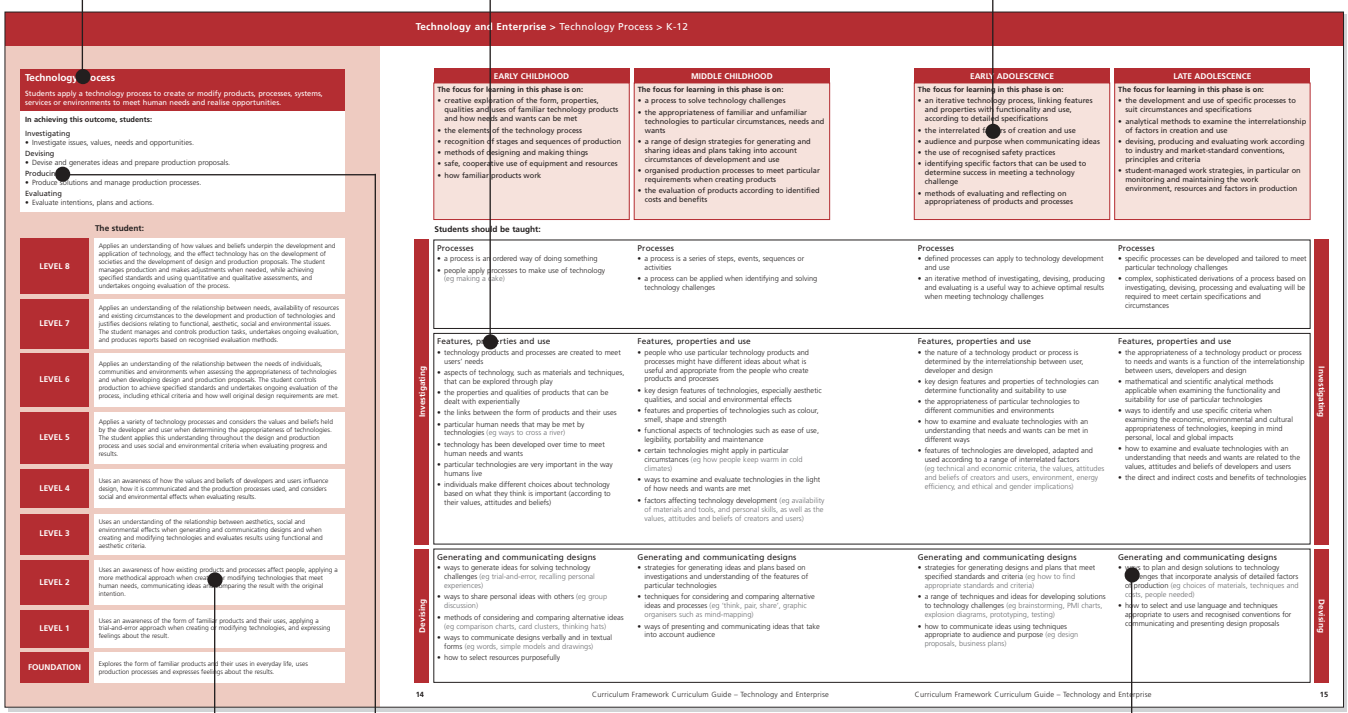
Content is scoped and sequenced for ***all seven outcomes in the Technology and Enterprise learning area***, with the corresponding level descriptions for the outcome being presented.

The focus for the content in each phase is summarised and then the specific content to be taught is listed under each content organiser. Possible contexts for learning are suggested in the phase focus and in examples within the content.

Outcome
The outcome from the *Curriculum Framework*.

Content Organisers
Key concepts are used to categorise and organise content.

Phase focus
The content focus reflecting the developmental needs of students at a phase is summarised.



Outcome level descriptions
A description of student achievement for each level (Foundation, Levels 1 to 8) is provided to assist in maintaining an outcome focus (refer to *Curriculum Framework Progress Maps* or DET *Outcomes and Standards Framework*).

Aspects
The aspects of the outcome are identified under the outcome and aligned to related content for most outcomes.

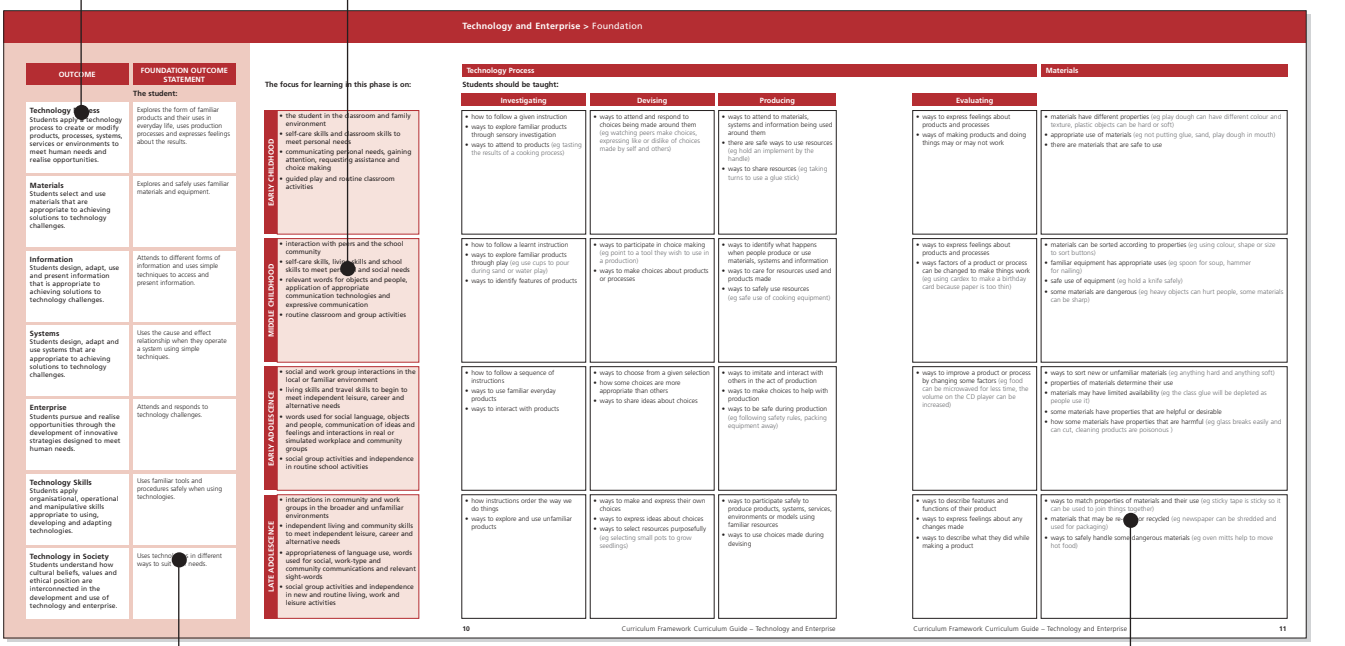
Content
Specific content to be taught for students to develop the key concepts.

Foundation design

For students working at Foundation, content is not sequenced across the phases of development. The content provides a guide to what students need to be taught in age-related contexts across the phases of development. The corresponding Foundation level description for the outcome is presented. The focus for the content in each phase is summarised and is the same for each outcome. The specific content to be taught is listed under each outcome. Possible contexts for learning are suggested in the phase focus and in examples within the content.

Outcome
The outcome from the *Curriculum Framework*.

Focus
Within each phase, the content focus is summarised and remains consistent across outcomes.



Technology and Enterprise > Foundation

OUTCOME	FOUNDATION OUTCOME STATEMENT
	The student:
Technology Process Students apply a technology process to create or modify products, processes, systems, services or environments to meet human needs and realise opportunities.	Explores the form of familiar products and their uses in everyday life, uses production processes and expresses feelings about the results.
Materials Students select and use materials that are appropriate to achieving solutions to technology challenges.	Explores and safely uses familiar materials and equipment.
Information Students design, adapt, use and present information that is appropriate to achieving solutions to technology challenges.	Attends to different forms of information and uses simple techniques to access and present information.
Systems Students design, adapt and use systems that are appropriate to achieving solutions to technology challenges.	Uses the cause and effect relationship when they operate a system using simple techniques.
Enterprise Students pursue and realise opportunities through the development of innovative strategies designed to meet human needs.	Attends and responds to technology challenges.
Technology Skills Students apply organisational, operational and manipulative skills appropriate to using, developing and adapting technologies.	Uses familiar tools and procedures safely when using technologies.
Technology in Society Students understand how cultural beliefs, values and ethical position are interconnected in the development and use of technology and enterprise.	Uses technology in different ways to suit needs.

The focus for learning in this phase is on:

EARLY CHILDHOOD
- the student in the classroom and family environment
- self-care skills and classroom skills to meet personal needs
- communicating personal needs, gaining attention, requesting assistance and choice making
- guided play and routine classroom activities

MIDDLE CHILDHOOD
- interaction with peers and the school community
- self-care skills, living skills and school skills to meet personal and social needs
- relevant words for objects and people, application of appropriate communication technologies and expressive communication
- routine classroom and group activities

EARLY ADOLESCENCE
- social and work group interactions in the local or familiar environment
- living skills and travel skills to begin to meet independent leisure, career and alternative needs
- words used for social language, objects and people, communication of ideas and feelings and interactions in real or simulated workplace and community groups
- social group activities and independence in routine school activities

LATE ADOLESCENCE
- interactions in community and work groups in the broader and unfamiliar environments
- independent living and community skills to meet independent leisure, career and alternative needs
- appropriateness of language use, words used for social, work-type and community communications and relevant sight-words
- social group activities and independence in new and routine living, work and leisure activities

Technology Process

Students should be taught:

Investigating	Devising	Producing
• how to follow a given instruction • ways to explore familiar products through sensory investigation • ways to attend to products (eg tasting the results of a cooking process)	• ways to attend and respond to choices being made around them (eg watching peers make choices, expressing like or dislike of choices made by self and others)	• ways to attend to materials, systems and information being used around them • there are safe ways to use resources (eg hold an implement by the handle) • ways to share resources (eg taking turns to use a glue stick)
• how to follow a learnt instruction • ways to explore familiar products through play (eg use cups to pour during sand or water play) • ways to identify features of products	• ways to participate in choice making (eg point to a tool they wish to use in a production) • ways to make choices about products or processes	• ways to identify what happens when people produce or use materials, systems and information • ways to care for resources used and products made • ways to safely use resources (eg safe use of cooking equipment)
• how to follow a sequence of instructions • ways to use familiar everyday products • ways to interact with products	• ways to choose from a given selection • how some choices are more appropriate than others • ways to share ideas about choices	• ways to imitate and interact with others in the act of production • ways to make choices to help with production • ways to be safe during production (eg following safety rules, packing equipment away)
• how instructions order the way we do things • ways to explore and use unfamiliar products	• ways to make and express their own choices • ways to express ideas about choices • ways to select resources purposefully (eg selecting small pots to grow seedlings)	• ways to participate safely to produce products, systems, services, environments or models using familiar resources • ways to use choices made during devising

Evaluating	Materials
• ways to express feelings about products and processes • ways of making products and doing things may or may not work	• materials have different properties (eg play dough can have different colour and texture, plastic objects can be hard or soft) • appropriate use of materials (eg not putting glue, sand, play dough in mouth) • there are materials that are safe to use
• ways to express feelings about products and processes • ways factors of a product or process can be changed to make things work (eg using cardex to make a birthday card because paper is too thin)	• materials can be sorted according to properties (eg using colour, shape or size to sort buttons) • familiar equipment has appropriate uses (eg spoon for soup, hammer for nailing) • safe use of equipment (eg hold a knife safely) • some materials are dangerous (eg heavy objects can hurt people, some materials can be sharp)
• ways to improve a product or process by changing some factors (eg food can be microwaved for less time, the volume on the CD player can be increased)	• ways to sort new or unfamiliar materials (eg anything hard and anything soft) • properties of materials determine their use • materials may have limited availability (eg the class glue will be depleted as people use it) • some materials have properties that are helpful or desirable • how some materials have properties that are harmful (eg glass breaks easily and can cut, cleaning products are poisonous)
• ways to describe features and functions of their product • ways to express feelings about any changes made • ways to describe what they did while making a product	• ways to match properties of materials and their use (eg sticky tape is sticky so it can be used to join things together) • materials that may be re-used or recycled (eg newspaper can be shredded and used for packaging) • ways to safely handle some dangerous materials (eg oven mitts help to move hot food)

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Foundation level descriptions
The corresponding description of Foundation achievement for each outcome.

Content
Specific content to be taught is identified in age-related contexts.

Technology and Enterprise > Foundation

OUTCOME	FOUNDATION OUTCOME STATEMENT The student:
Technology Process Students apply a technology process to create or modify products, processes, systems, services or environments to meet human needs and realise opportunities.	Explores the form of familiar products and their uses in everyday life, uses production processes and expresses feelings about the results.
Materials Students select and use materials that are appropriate to achieving solutions to technology challenges.	Explores and safely uses familiar materials and equipment.
Information Students design, adapt, use and present information that is appropriate to achieving solutions to technology challenges.	Attends to different forms of information and uses simple techniques to access and present information.
Systems Students design, adapt and use systems that are appropriate to achieving solutions to technology challenges.	Uses the cause and effect relationship when they operate a system using simple techniques.
Enterprise Students pursue and realise opportunities through the development of innovative strategies designed to meet human needs.	Attends and responds to technology challenges.
Technology Skills Students apply organisational, operational and manipulative skills appropriate to using, developing and adapting technologies.	Uses familiar tools and procedures safely when using technologies.
Technology in Society Students understand how cultural beliefs, values and ethical position are interconnected in the development and use of technology and enterprise.	Uses technologies in different ways to suit their needs.

The focus for learning in this phase is on:

EARLY CHILDHOOD

- the student in the classroom and family environment
- self-care skills and classroom skills to meet personal needs
- communicating personal needs, gaining attention, requesting assistance and making choice
- guided play and routine classroom activities

MIDDLE CHILDHOOD

- interaction with peers and the school community
- self-care skills, living skills and school skills to meet personal and social needs
- relevant words for objects and people, application of appropriate communication technologies and expressive communication
- routine classroom and group activities

EARLY ADOLESCENCE

- social and work group interactions in local or familiar environments
- living skills and travel skills to begin to meet independent leisure, career and alternative needs
- words used for social language, objects and people, communication of ideas and feelings and interactions in real or simulated workplace and community groups
- social group activities and independence in routine school activities

LATE ADOLESCENCE

- interactions in community and work groups in broad and unfamiliar environments
- independent living and community skills to meet independent leisure, career and alternative needs
- appropriateness of language use, words used for social, work-type and community communications and relevant sight words
- social group activities and independence in new and routine living, work and leisure activities

Technology Process

Students should be taught:

Investigating	Devising	Producing
• how to follow a given instruction • ways to explore familiar products through sensory investigation • ways to attend to products (eg tasting the results of a cooking process)	• ways to attend and respond to choices being made around them (eg watching peers make choices, expressing like or dislike of choices made by self and others)	• ways to attend to materials, systems and information being used around them • there are safe ways to use resources (eg hold an implement by the handle) • ways to share resources (eg taking turns to use a glue stick)
• how to follow a learnt instruction • ways to explore familiar products through play (eg use cups to pour during sand or water play) • ways to identify features of products	• ways to participate in making choices (eg point to a tool they wish to use in a production) • ways to make choices about products or processes	• ways to identify what happens when people produce or use materials, systems and information • ways to care for resources used and products made • ways to safely use resources (eg safe use of cooking equipment)
• how to follow a sequence of instructions • ways to use familiar, everyday products • ways to interact with products	• ways to choose from a given selection • how some choices are more appropriate than others • ways to share ideas about choices	• ways to imitate and interact with others in the act of production • ways to make choices to help with production • ways to be safe during production (eg following safety rules, packing equipment away)
• how instructions order the way we do things • ways to explore and use unfamiliar products	• ways to make and express personal choices • ways to express ideas about choices • ways to select resources purposefully (eg selecting small pots to grow seedlings)	• ways to participate safely to produce products, systems, services, environments or models using familiar resources • ways to use choices made during devising

Evaluating	Materials
• ways to express feelings about products and processes • ways of making products and doing things may or may not work	• materials have different properties (eg play dough can have different colour and texture, plastic objects can be hard or soft) • appropriate use of materials (eg not putting glue, sand, play dough in mouth) • there are materials that are safe to use
• ways to express feelings about products and processes • ways factors of a product or process can be changed to make things work (eg using cardex to make a birthday card because paper is too thin)	• materials can be sorted according to properties (eg using colour, shape or size to sort buttons) • familiar equipment has appropriate uses (eg spoon for soup, hammer for nailing) • safe use of equipment (eg hold a knife safely) • some materials are dangerous (eg heavy objects can hurt people, some materials can be sharp)
• ways to improve a product or process by changing some factors (eg food can be microwaved for less time, the volume on the CD player can be increased)	• ways to sort new or unfamiliar materials (eg anything hard and anything soft) • properties of materials determine their use • materials may have limited availability (eg the class glue will be depleted as people use it) • some materials have properties that are helpful or desirable • how some materials have properties that are harmful (eg glass breaks easily and can cut, cleaning products are poisonous)
• ways to describe features and functions of their product • ways to express feelings about any changes made • ways to describe what they did while making a product	• ways to match properties of materials and their use (eg sticky tape is sticky so it can be used to join things together) • materials that may be re-used or recycled (eg newspaper can be shredded and used for packaging) • ways to safely handle some dangerous materials (eg using oven mitts to move hot food)

Information	Systems
Students should be taught:	
• how information can be gained through the senses (eg listening to the school bell, looking at an image, feeling an object) • information can be expressed through objects (eg using a toy to indicate a desire to play)	• ways to communicate difficulties in operating a system • pressing a switch will make something happen (eg CD player starts, single switch toy moves) • assistance may be required to operate a system
• ways to gain information through the senses (eg listening and looking at a person when they speak, touching and tasting a new food) • how information can be expressed through a photograph (eg a photograph of a holiday destination) • responses can be made to information	• pressing and operating a switch from a choice of switches can make something happen (eg two switches in toilets: one for fan, one for lights) • pressing switches or buttons in a sequence can make something happen • ways to use familiar systems • imitating the actions of others can help provide a model of how to use a particular system • trial and error and persistence may be required to successfully operate a system (eg initially using the wrong side of a knife to spread butter) • operating some systems needs specific procedures (eg put in CD then press play) • ways to seek assistance (if required) to operate a system
• information can be represented in different forms (eg pictures, sounds, images) • information can be expressed through pictures or drawings • ways to respond to information (eg returning to class when the school bell goes, standing up when the train reaches a station with a familiar landmark)	• pressing a switch or sequence of switches and waiting a short time should result in something happening (eg microwave, kettle, popcorn maker) • using own tried and tested strategies to operate a system can be successful (eg correct edge of a knife to butter bread) • operating a system may require specific skills or knowledge (eg knowing how to fast forward to a favourite track on a CD) • some systems may not always operate successfully
• information can be expressed through symbols or words • the same information can be represented in different ways (eg finishing time can be represented by looking at a clock or listening to a supervisor)	• pressing a switch or sequence of switches and waiting for a period of time should produce a desired result (eg clothes will be clean when the washing machine has finished its full cycle) • unknown systems may need specific skills (eg ask for help, look at instructions, identify 'on') • ways to seek assistance (if required) to operate a system

Enterprise	Technology Skills	Technology in Society
• ways to problem-solve within the immediate classroom environment (eg persisting in putting a lid on a container, hanging a bag up if it falls off the hook, trying a puzzle piece in different positions) • ways to approach adults or peers to assist with problems • ways to learn from others (eg watching another person identify and solve a problem can provide a solution)	• ways to manipulate tools (eg trace on a line with a pencil) • ways to pack away materials (eg put lid on glue stick) • ways to use tools safely (eg carry scissors safely)	• using technologies can help (eg a pencil to draw) • ways to use various technologies (eg flower pots for flowers, paint pots for paints)
• ways to problem-solve within the school environment (eg approach staff to assist with tying shoe laces, asking librarian to help fit book into library bag, watching others) • how to identify helpful solutions (eg use trial and error methods to determine that using a roller is quicker than a paint brush to paint a large area)	• ways to choose appropriate tools (eg scissors to cut paper) • ways to choose appropriate materials (eg sticky tape or glue to fix torn paper) • ways to pack away similar materials (eg collect all glue sticks in group and put in container) • ways to store tools safely (eg place scissors point end down in container)	• ways technologies can assist (eg Velcro shoes instead of laces) • ways technologies can benefit self and others (eg heaters and fans in classrooms)
• ways to problem-solve within the local community (eg asking shopkeeper to help locate milk) • tried and tested methods can be used repeatedly (eg mend a torn page using sticky tape) • independent process skills involving repetition (eg sorting items then placing in snap-lock bags)	• ways to choose appropriate tools or materials (eg spoon to scoop icecream) • certain materials should be placed in particular environments (eg store cold foods in fridge or freezer) • ways to identify hazardous materials (eg visual signs for poison or flammable substances) • ways to handle materials safely (eg wearing safety glasses in a workshop)	• ways technologies can assist (eg microwave to heat food) • benefits of specific technologies for self (eg can opener to open tins of food)
• ways to problem-solve within the wider community (eg squash a drink carton if it won't fit in the bin, approach information desk at recreation centre). • independent process skills involving repetition in the school, work or home environment (eg bagging groups of 20 bolts)	• ways to choose tools in the school, work or home environment (eg trays for handling foods, aprons, hairnets) • estimation of materials for personal use (eg number of slices of bread needed to make lunch) • ways to identify materials that are no longer useable (eg checking 'use by' date stamp on food)	• benefits of independent use of technologies (eg using the microwave to heat food, TV/DVD or CD player for entertainment)

Technology and Enterprise >
Technology Process

Technology Process

Students apply a technology process to create or modify products, processes, systems, services or environments to meet human needs and realise opportunities.

In achieving this outcome, students:

Investigating
- Investigate issues, values, needs and opportunities.

Devising
- Devise and generates ideas and prepare production proposals.

Producing
- Produce solutions and manage production processes.

Evaluating
- Evaluate intentions, plans and actions.

	The student:
LEVEL 8	Applies an understanding of how values and beliefs underpin the development and application of technology, and the effect technology has on the development of societies and the development of design and production proposals. The student manages production and makes adjustments when needed, while achieving specified standards and using quantitative and qualitative assessments, and undertakes ongoing evaluation of the process.
LEVEL 7	Applies an understanding of the relationship between needs, availability of resources and existing circumstances to the development and production of technologies and justifies decisions relating to functional, aesthetic, social and environmental issues. The student manages and controls production tasks, undertakes ongoing evaluation, and produces reports based on recognised evaluation methods.
LEVEL 6	Applies an understanding of the relationship between the needs of individuals, communities and environments when assessing the appropriateness of technologies and when developing design and production proposals. The student controls production to achieve specified standards and undertakes ongoing evaluation of the process, including ethical criteria and how well original design requirements are met.
LEVEL 5	Applies a variety of technology processes and considers the values and beliefs held by the developer and user when determining the appropriateness of technologies. The student applies this understanding throughout the design and production process and uses social and environmental criteria when evaluating progress and results.
LEVEL 4	Uses an awareness of how the values and beliefs of developers and users influence design, how it is communicated and the production processes used, and considers social and environmental effects when evaluating results.
LEVEL 3	Uses an understanding of the relationship between aesthetics, social and environmental effects when generating and communicating designs and when creating and modifying technologies and evaluates results using functional and aesthetic criteria.
LEVEL 2	Uses an awareness of how existing products and processes affect people, applying a more methodical approach when creating or modifying technologies that meet human needs, communicating ideas and comparing the result with the original intention.
LEVEL 1	Uses an awareness of the form of familiar products and their uses, applying a trial-and-error approach when creating or modifying technologies, and expressing feelings about the result.
FOUNDATION	Explores the form of familiar products and their uses in everyday life, uses production processes and expresses feelings about the results.

EARLY CHILDHOOD	MIDDLE CHILDHOOD
The focus for learning in this phase is on: • creative exploration of the form, properties, qualities and uses of familiar technology products and how needs and wants can be met • the elements of the technology process • recognition of stages and sequences of production • methods of designing and making things • safe, cooperative use of equipment and resources • how familiar products work	**The focus for learning in this phase is on:** • a process to solve technology challenges • the appropriateness of familiar and unfamiliar technologies to particular circumstances, needs and wants • a range of design strategies for generating and sharing ideas and plans taking into account circumstances of development and use • organised production processes to meet particular requirements when creating products • the evaluation of products according to identified costs and benefits

Students should be taught:

Investigating

Processes

EARLY CHILDHOOD	MIDDLE CHILDHOOD
• a process is an ordered way of doing something • people apply processes to make use of technology (eg making a cake)	• a process is a series of steps, events, sequences or activities • a process can be applied when identifying and solving technology challenges

Features, properties and use

EARLY CHILDHOOD	MIDDLE CHILDHOOD
• technology products and processes are created to meet users' needs • aspects of technology, such as materials and techniques, that can be explored through play • the properties and qualities of products that can be dealt with experientially • the links between the form of products and their uses • particular human needs that may be met by technologies (eg ways to cross a river) • technology has been developed over time to meet human needs and wants • particular technologies are very important in the way humans live • individuals make different choices about technology based on what they think is important (according to their values, attitudes and beliefs)	• people who use particular technology products and processes might have different ideas about what is useful and appropriate from the people who create products and processes • key design features of technologies, especially aesthetic qualities, and social and environmental effects • features and properties of technologies such as colour, smell, shape and strength • functional aspects of technologies such as ease of use, legibility, portability and maintenance • certain technologies might apply in particular circumstances (eg how people keep warm in cold climates) • ways to examine and evaluate technologies in the light of how needs and wants are met • factors affecting technology development (eg availability of materials and tools, and personal skills, as well as the values, attitudes and beliefs of creators and users)

Devising

Generating and communicating designs

EARLY CHILDHOOD	MIDDLE CHILDHOOD
• ways to generate ideas for solving technology challenges (eg trial-and-error, recalling personal experiences) • ways to share personal ideas with others (eg group discussion) • methods of considering and comparing alternative ideas (eg comparison charts, card clusters, thinking hats) • ways to communicate designs verbally and in textual forms (eg words, simple models and drawings) • how to select resources purposefully	• strategies for generating ideas and plans based on investigations and understanding of the features of particular technologies • techniques for considering and comparing alternative ideas and processes (eg 'think, pair, share', graphic organisers such as mind-mapping) • ways of presenting and communicating ideas that take into account audience

EARLY ADOLESCENCE	LATE ADOLESCENCE
The focus for learning in this phase is on: • an iterative technology process, linking features and properties with functionality and use, according to detailed specifications • the interrelated factors of creation and use • audience and purpose when communicating ideas • the use of recognised safety practices • identifying specific factors that can be used to determine success in meeting a technology challenge • methods of evaluating and reflecting on appropriateness of products and processes	**The focus for learning in this phase is on:** • the development and use of specific processes to suit circumstances and specifications • analytical methods to examine the interrelationship of factors in creation and use • devising, producing and evaluating work according to industry and market-standard conventions, principles and criteria • student-managed work strategies, in particular for monitoring and maintaining the work environment, resources and factors in production
Processes • defined processes can apply to technology development and use • an iterative method of investigating, devising, producing and evaluating is a useful way to achieve optimal results when meeting technology challenges	**Processes** • specific processes can be developed and tailored to meet particular technology challenges • complex, sophisticated derivations of a process based on investigating, devising, processing and evaluating will be required to meet certain specifications and circumstances
Features, properties and use • the nature of a technology product or process is determined by the interrelationship between user, developer and design • key design features and properties of technologies can determine functionality and suitability to use • the appropriateness of particular technologies to different communities and environments • how to examine and evaluate technologies with an understanding that needs and wants can be met in different ways • features of technologies are developed, adapted and used according to a range of interrelated factors (eg technical and economic criteria, the values, attitudes and beliefs of creators and users, environment, energy efficiency, and ethical and gender implications)	**Features, properties and use** • the appropriateness of a technology product or process to needs and wants is a function of the interrelationship between users, developers and design • mathematical and scientific analytical methods applicable when examining the functionality and suitability for use of particular technologies • ways to identify and use specific criteria when examining the economic, environmental and cultural appropriateness of technologies, keeping in mind personal, local and global impacts • how to examine and evaluate technologies with an understanding that needs and wants are related to the values, attitudes and beliefs of developers and users • the direct and indirect costs and benefits of technologies
Generating and communicating designs • strategies for generating designs and plans that meet specified standards and criteria (eg how to find appropriate standards and criteria) • a range of techniques and ideas for developing solutions to technology challenges (eg brainstorming, PMI charts, explosion diagrams, prototyping, testing) • how to communicate ideas using techniques appropriate to audience and purpose (eg design proposals, business plans)	**Generating and communicating designs** • ways to plan and design solutions to technology challenges that incorporate analysis of detailed factors of production (eg choices of materials, techniques and costs, people needed) • how to select and use language and techniques appropriate to users and recognised conventions for communicating and presenting design proposals

Investigating

Devising

Students should be taught:

Devising

Conventions and considerations

EARLY CHILDHOOD

- specific terminology relevant to particular technologies (eg paper sizes, measures of quantity)

MIDDLE CHILDHOOD

- recognisable conventions, symbols and terms used when communicating and presenting ideas and plans
- how to consider the circumstances of development and use (eg availability of materials and tools, personal skills, and the values, attitudes and beliefs of creators and users when planning and devising)

Producing

Techniques

EARLY CHILDHOOD

- how to make simple products, systems, services, environments and models using everyday resources
- ways to experiment with techniques and equipment
- simple, sequenced planning and production processes
- strategies for recognising and incorporating personal ideas and skills (eg deviating from instructions when making a model)

MIDDLE CHILDHOOD

- how to meet particular functional and aesthetic requirements when creating products, systems, services and/or environments
- organised processes for creating products
- how to follow plans and designs, and strategies for variation when circumstances demand (eg using plastic as an alternative to wood in a wet environment)

Considerations

EARLY CHILDHOOD

- ways to use available resources wisely
- strategies and techniques for using resources and basic tools safely
- when and how to care for and share resources and equipment

MIDDLE CHILDHOOD

- ways to efficiently select and use resources
- strategies and techniques for identifying and avoiding risks and hazards
- ways to maintain and care for tools, materials and equipment
- ways to work with others when meeting technology challenges

Evaluating

Outputs

EARLY CHILDHOOD

- ways to describe thoughts about things designed and made (eg using a journal)
- how to identify and communicate functions and features in products (eg labels)
- ways to explain how personal creations work (eg a poster)
- ways to modify products and methods in response to discussion

MIDDLE CHILDHOOD

- ways to set criteria based on design requirements to assess personal products
- methods of considering the functional, social and environmental costs and benefits of products created
- strategies for modifying and adapting personal work in response to new ideas and problems identified

Methods

EARLY CHILDHOOD

- ways to compare products with personal intentions (eg charts, tables)
- ways to consider success in sharing and cooperation (eg spokesperson reporting on group work)

MIDDLE CHILDHOOD

- methods of reviewing and modifying plans, techniques and processes used in creating personal products
- strategies for considering and discussing organisation of time, resources and cooperative roles in the production process (eg written report, web log)

EARLY ADOLESCENCE	LATE ADOLESCENCE	
Conventions and considerations • functional, aesthetic, social and environmental issues to be addressed when devising solutions to technology challenges • how to determine and qualify specific factors when developing solutions (eg user needs and wants, availability of resources, energy use and underlying values, attitudes and beliefs)	**Conventions and considerations** • mathematical and scientific principles appropriate for use in developing plans and proposals • criteria and methods allowing the justification of designs, concepts and proposals in terms of personal, local and global impacts • the ethical, financial, social and economic principles and standards which should be addressed when developing technological solutions	Devising
Techniques • how to meet detailed specifications and standards when developing products, systems, services and environments • ways to select and apply appropriate variations of the technology process according to circumstances • strategies for using plans critically, finding ways to identify and overcome constraints and problems (eg testing parts of a production project before proceeding)	**Techniques** • how to meet detailed specifications and market/ commercial standards when developing products, systems, services and environments • ways to develop, tailor and adjust processes to meet project needs • how to use creative, lateral and scientific thinking to overcome problems and limitations when meeting intentions and standards	Producing
Considerations • ways to control the selection and use of resources, time and equipment • recognised safe work practices • methods of organising and maintaining a variety of tools, resources and equipment • strategies for working cooperatively and independently	**Considerations** • selection and management of resources and equipment, making informed decisions about factors in production (eg use of time and energy) • industry-standard risk management strategies • selection and use of collaborative and independent work strategies according to circumstances • how to monitor and maintain the work environment, taking into account issues of waste and energy use and according to recognised industry and commercial practices	
Outputs • predetermined, detailed specifications and standards that can be used to evaluate personal work • specific factors which determine success in meeting a technology challenge (eg environmental costs and benefits, energy usage, the needs and wants of users, client response)	**Outputs** • commercial specifications and standards of quality, presentation and performance for evaluating technology products • qualitative and quantitative methods of analysing success in meeting technology challenges, taking into account the interrelationship of functional, technical, political, social, economic, environmental and aesthetic criteria	Evaluating
Methods • a variety of methods to critically evaluate and modify plans, techniques, processes and results (eg testing, reflection and comparison) • methods of recording, assessing and reflecting on personal effectiveness when using a technology process, taking into account a range of factors (eg management of time and resources, cooperative and independent behaviours, and safety practices)	**Methods** • strategies for evaluating, modifying and adapting plans, techniques, processes and products using commercial and industry-standard practices (eg market research, performance management) • a range of methods to evaluate and report on personal effectiveness in using and adapting a technology process according to specified criteria (eg individual and collaborative productivity, hazard minimisation, resource management)	

Technology and Enterprise >
Materials

Materials

Students select and use materials that are appropriate to achieving solutions to technology challenges.

In achieving this outcome, students:

The nature of materials
- Understand the properties and nature of materials.

The selection and use of materials
- Apply an understanding of the nature of materials when selecting and using materials to meet technology needs.

	The student:
LEVEL 8	Understands how the physical and chemical structure and properties of existing, new and emerging materials influence their cultural, social, environmental and functional suitability. The student applies this understanding to the selection of appropriate materials, equipment and techniques to achieve solutions that meet a client or intended user's requirements.
LEVEL 7	Understands that research and testing of any materials substantiates the selection of those materials to meet design, production, functional, cultural, social and environmental requirements. The student applies this understanding to the management of suitable production processes that achieve specified standards of quality and safety.
LEVEL 6	Understands that the physical, chemical and aesthetic properties of materials determine their performance. The student applies this understanding when selecting suitable materials, techniques and equipment appropriate to the material and the production processes to achieve defined standards of quality and safety.
LEVEL 5	Understands that when considering aesthetic, functional and environmental requirements, the selection of materials is based on the appropriateness of their properties and suitability for the design. The student applies this understanding to the selection of appropriate equipment, skills and techniques to achieve specified results carefully and safely.
LEVEL 4	Matches the materials to the requirements of their own design, considering values related to aesthetic, functional and environment effects. The student applies their understanding when using appropriate skills, techniques and equipment to work the selected material safely.
LEVEL 3	Considers the need to relate the properties of materials to the requirements of own design, including consideration of the aesthetics, functional and environmental effects. The student selects equipment and processes that are appropriate to work materials safely to achieve intended solutions.
LEVEL 2	Considers properties when selecting materials and relates this understanding to the selection and safe, careful and more controlled use of familiar and appropriate equipment when producing solutions to design challenges using common materials.
LEVEL 1	Recognises the relationship between the use of familiar materials for different purposes and their safe and simple manipulation to achieve a solution.
FOUNDATION	Explores and safely uses familiar materials and equipment.

EARLY CHILDHOOD	MIDDLE CHILDHOOD
The focus for learning in this phase is on: • understanding that people live in a world comprising materials • the concepts of natural and synthetic, and the various properties of materials • the relationship between properties and use • skill development in identifying, manipulating, processing and evaluating common, familiar materials through the application of simple processes	**The focus for learning in this phase is on:** • the properties and use of materials and how people use and select particular materials • the importance of materials in modern life • a technology process that encourages students to learn about, use, create and assess products using a variety of materials • skill development for the creation of products for intended uses whilst avoiding risks and inefficient use of resources

Students should be taught:

The nature of materials

Form and attributes

- some materials are natural and some materials are made (synthetic)
- materials can be described in terms of properties such as strength, shape, size, flexibility and texture
- the properties of a material will determine its suitability for a particular use

Form and attributes

- some materials are mixed, being a combination of natural and synthetic (eg chipboard)
- the properties of some materials can be altered (eg metal can be tempered, flour can be sifted)
- the properties of materials can change according to conditions (eg paper may be weakened by moisture)

Context and impact

- different materials have different uses
- some materials are more appropriate for particular uses than others (eg cardboard versus paper)
- materials are found in immediate environments such as the home and classroom
- some materials have limited availability (eg gold)
- some materials can be reused and recycled (eg paper)
- environmental and safety issues accompany the use of particular materials

Context and impact

- particular materials may have a range of uses
- uses of materials will be subject to a range of factors (eg availability)
- use of particular materials has evolved through history (eg the use of gold has evolved from mostly decorative to a high degree of functionality in electronics)
- product design is partially determined by availability and suitability of materials
- people use and select materials according to availability, needs and wants, and personal values, attitudes and beliefs
- the appropriateness of materials for specific uses can be evaluated from various perspectives (eg energy consumption, cultural traditions)
- particular materials may pose safety hazards
- needs and wants may impact on the development of new materials and processes (eg synthetic timber flooring)
- new materials impact on needs and wants (eg kiwi fruit was unknown in Australia, but when introduced, established a large market)

EARLY ADOLESCENCE

The focus for learning in this phase is on:

- relating the properties of materials to design and techniques, and the various factors which determine suitability for intended use
- the social and environmental impacts of particular materials
- defining and varying a technology process
- developing skills and techniques necessary to work and process materials
- safe, cooperative work practices and efficient use of resources

LATE ADOLESCENCE

The focus for learning in this phase is on:

- interrelationships between factors determining suitability for use of new and emerging materials
- how the use and production of materials is influenced by the varying needs and wants of creators and consumers
- specialised processes and techniques necessary for the safe creation and use of products to detailed specifications and standards appropriate to industry and the marketplace

Form and attributes

- materials have physical properties (eg strength, malleability and durability)
- materials have chemical properties (eg toxicity, biodegradability and resistance to corrosion)
- materials have aesthetic qualities such as colour, texture, grain and flavour, and these qualities may be a function of physical and chemical properties (eg the aroma of a food – an aesthetic quality – is determined by its chemical properties)

Form and attributes

- the form and structure, properties, aesthetic qualities, and methods of processing and working of materials are interrelated factors, variously affecting each other (eg a method of processing fabric by bleaching may affect its property of strength and its aesthetic quality of colour)

Context and impact

- the properties of a specific material will substantially determine its suitability for a particular use
- altering the properties of a material may affect its suitability for a given use (eg freezing a plastic may make it too brittle to use)
- material availability is dependent on various factors (eg distribution channels, geographic location, economic viability)
- the use of certain materials may have social impacts (eg the use of certain fertilisers in rice growing has increased productivity and thus reduced child mortality)
- the use of certain materials may have environmental impacts (eg the use of CFCs as refrigerants has climatic consequences)
- changes in the production and use of particular materials through history have often been in response to prevailing needs, wants, resources and circumstances (eg certain metals and alloys such as steel for sword making were developed in response to military needs and historical events)
- needs and wants may develop in response to the production and use of certain materials (eg the development of nylon)

Context and impact

- a combination of factors in addition to properties such as aesthetic qualities and methods of processing determine suitability for a given use
- governments may seek to exert control over the availability, use and production of certain materials for a range of reasons (eg Japan has regulated the production of rice to protect cultural traditions)
- individuals, households and communities have certain values, attitudes and beliefs which impact in complex ways on the processing and use of particular materials (eg the use of hemp in fabrics)
- complex market forces can influence the use and production of materials (eg companies may seek to control the diamond market to increase price through scarcity)
- interested parties (eg designers, makers, consumers) have competing needs and wants which may impact on the selection and use of materials (eg a car maker may seek to minimise costs, whereas consumers may demand expensive safety devices)

The selection and use of materials

Students should be taught:

EARLY CHILDHOOD

Investigating

- basic properties of familiar materials found in everyday life (eg hard and soft, rough and smooth)
- how to distinguish between natural and synthetic materials
- ways to identify different parts of objects and the materials that comprise them, and to identify the reasons for differences
- methods of handling, identifying and classifying common materials
- specific needs and wants that may be met by the use of common materials

Devising

- ways to generate ideas for selecting and using materials through applying simple processes (eg trial-and-error, drawing a plan, brainstorming)
- criteria by which materials can be selected for a given purpose (eg strength, potential for recycling)
- methods of communicating and sharing selection choices and design ideas (eg drawings and diagrams)
- ways to consider and compare alternative ideas (eg comparison charts, card clusters, thinking hats)
- specific terminology associated with using common materials (eg common terms of quantity and measurement)

Producing

- a range of recognised, safe techniques to manipulate, process and work common materials
- sequenced processes for the making of products and models of products using everyday materials
- ways to incorporate personal ideas when making things (eg using drawings)
- how to work safely when dealing with everyday materials and processing techniques
- when and how to care for and share resources and equipment
- strategies for avoiding waste (eg putting a lid on glue)

MIDDLE CHILDHOOD

Investigating

- ways to test materials so as to determine their properties and thus their suitability for intended tasks
- the development and use of everyday materials through history, including how materials have been adapted and processed
- techniques for examining how everyday products are made, taking into account the use of natural, synthetic and mixed materials, and considering the reasons for differences
- how certain materials will apply in particular circumstances (eg thick cloths for cold climates)
- how to examine materials in the light of how needs and wants are met

Devising

- how to devise and plan ways to process materials, taking into consideration intended solutions, availability, and the perceived needs of users
- how to consider selection, use and disposal of materials, and the degree to which design requirements have been met
- ways of presenting and communicating ideas that take into account audience
- how to consider and compare alternative ideas and processes (eg 'think, pair, share', graphic organisers such as mind-mapping)
- technical names/terms that contribute to selection and use of materials (eg properties of paper such as flammability, texture, moisture absorbency)

Producing

- methods of safely processing, working and transforming particular materials to make a variety of models and usable products
- organised processes suitable for creating specific products (eg selection of tools and equipment, time plans)
- how to read plans and designs (eg how to use scales)
- techniques for identifying and managing risks and hazards
- methods of maintaining and caring for tools and equipment
- strategies for using resources efficiently (eg recycling food containers to hold paint)
- ways to work with others when creating products (eg dividing up tasks on a project)

EARLY ADOLESCENCE	LATE ADOLESCENCE
Investigating • methods of establishing how different materials meet the functional, aesthetic and environmental requirements of intended consumers • particular ways functional, aesthetic and environmental requirements have been met by materials through history (eg the various fabrics used for clothing in particular eras) • how key design features, qualities and properties of materials determine functionality and suitability for intended use • how to examine and evaluate materials with an understanding that needs and wants can be met in different ways	**Investigating** • how to trial, test and analyse the suitability of particular materials for meeting specific requirements according to properties and aesthetic qualities, service requirements, energy use and social and environmental effects • ways to examine and evaluate materials with an understanding that needs and wants are subject to a range of factors (eg the values, attitudes and beliefs of developers and users) • techniques for assessing the capacity of new or uncommon materials to meet design requirements (eg the use of smart fabrics as a substitute for traditional cloths in swimsuit design)
Devising • how to identify the needs and wants of users in the light of costs and benefits when devising and planning solutions involving materials • how to apply knowledge of the physical and chemical properties and aesthetic qualities of materials to devise, plan and achieve specific results and effects, exploring alternative solutions • a range of strategies and ideas for developing solutions to technology challenges involving materials (eg brainstorming, PMI charts, explosion diagrams) • how to communicate ideas using techniques appropriate to audience and purpose (eg drawing in orthogonal view) • standard, appropriate technical terms and expressions used in the working of particular materials (eg gauges of wire)	**Devising** • how to plan and design solutions to technology challenges that incorporate analysis of detailed factors of production (eg choices of materials, techniques and costs, people needed) • specific industry-standard criteria (eg service life, environmental conditions) for matching the physical and chemical properties of materials with design, production and service requirements • mathematical and scientific principles and methods appropriate for use in developing specific plans and proposals • recognised conventions and techniques for communicating and presenting design proposals (eg formal oral presentations, 3D CAD drawings) • detailed, industry-specific language and terminology suitable to developer and intended audience (eg names and specifications of equipment and tools)
Producing • skills, techniques and methods necessary to work and process materials according to set standards of quality, safety, accuracy and presentation • how to select and apply appropriate variations of the technology process according to the project being undertaken • ways to use plans critically and ways to overcome constraints and problems • recognised safe work practices appropriate to materials, tools, equipment and processes • strategies to ensure regular, safe maintenance and organisation of tools and equipment • cooperative and independent work strategies	**Producing** • skills, techniques, methods and quality-control processes necessary to work and process materials to meet detailed specifications and industry/market standards • how to develop, tailor and adjust processes to meet project needs • creative, lateral and scientific thinking strategies that can be used to overcome limitations and problems when meeting intentions and standards • industry-standard risk management and safety practices • industry-standard resource selection and management strategies (eg time-management techniques) • techniques for monitoring and maintaining the work environment according to recognised industry and commercial practices (eg maintenance schedules for machinery) • how to select and use collaborative and independent work strategies according to circumstances (eg when to seek specialist assistance)

Students should be taught:

The selection and use of materials

EARLY CHILDHOOD

Evaluating

- ways to describe thoughts and feelings about products used and created (eg a journal)
- methods of explaining how products (used and developed) work (eg a set of instructions)
- how to modify products and processes in response to discussion
- ways to compare products created with original intentions (eg a PMI chart)
- methods to consider success in sharing and cooperation (eg spokesperson reporting on group work)

MIDDLE CHILDHOOD

Evaluating

- how to set criteria based on design requirements to assess materials and products used and created
- functional, social and environmental criteria that may determine suitability of products used and developed (eg energy usage)
- strategies for modifying and adapting products, techniques and processes in response to new ideas and problems identified
- ways to consider and discuss success of production processes (eg evaluation grid)
- a range of criteria which can be used to determine success in meeting a technology challenge (eg organisation of time, resource use, sharing and cooperation)

EARLY ADOLESCENCE	LATE ADOLESCENCE
Evaluating • predetermined, detailed specifications and standards that can be used to evaluate materials used and products developed • methods and criteria allowing critical examination of the social and environmental consequences of personal choices when processing, working and finishing materials • specific factors which may determine success when using materials and creating products (eg weight and volume, portability) • ways to evaluate production processes for working materials (eg statistical analysis) • a variety of methods and criteria to evaluate personal effectiveness when using a technology process (eg time management, safety)	Evaluating • industry and market-standard specifications and benchmarks of quality, presentation and performance for evaluating materials and products • qualitative and quantitative methods of analysing success in developing products, taking into account the interrelationship of potential criteria (eg functionality, aesthetics) • commercial and industry-standard practices for evaluating, modifying and adapting plans, techniques and processes used • methods to report on personal effectiveness according to specified criteria (eg hazard minimisation, resource management)

Technology and Enterprise >
Information

Information

Students design, adapt, use and present information that is appropriate to achieving solutions to technology challenges.

In achieving this outcome, students:

The nature of information

- Understand the form, structure, quality and purpose of information products and processes.

The creation of information

- Apply an understanding of the nature of information when designing and presenting information products and processes to meet a need.

	The student:
LEVEL 8	Understands how external, local, national and global controls and recognised practices influence the development of information and the impact it has on societies and environments. The student applies these understandings to the selection and use of specialised techniques to develop information products, processes and systems that meet detailed specifications.
LEVEL 7	Understands that the values, attitudes and experiences of individuals, communities and societies influence the nature and development of information products and processes. The student applies this understanding and uses recognised procedures associated with appropriate information technologies when developing information solutions.
LEVEL 6	Understands that the form, transmission and controls applied affect the use of information and that accuracy, privacy, global access and distribution are issues to be considered. The student applies this understanding to the use and creation of information to achieve particular effects.
LEVEL 5	Understands that the meaning audiences make of information is influenced by its form, structure, style and presentation. The student applies this understanding to the creation of information products and processes, using recognised methods, rules and languages.
LEVEL 4	Considers the needs of a particular audience when selecting and using appropriate techniques, resources and equipment to create information products using, for example, sound, images and text.
LEVEL 3	Understands that information has meaning when it is developed for a purpose and relates this understanding to the selection and use of various techniques to gather, send, receive, store and transmit information and create information products.
LEVEL 2	Relates an understanding of the common ways information is used, processed and transmitted to the use of various techniques to gather, send, receive, store and transmit information and create information products.
LEVEL 1	Identifies the various ways information can be used and presented, relating this understanding to the use of simple ways of gathering, sending, receiving, recording and presenting information.
FOUNDATION	Attends to different forms of information and uses simple techniques to access and present information.

EARLY CHILDHOOD	MIDDLE CHILDHOOD
The focus for learning in this phase is on: • understanding that people live in a world of information • the idea that information can be manipulated, used and reacted to in many ways • skill development in accessing, recording, storing, manipulating and transmitting information, and creating information products	**The focus for learning in this phase is on:** • how purpose and audience will affect the ways information is manipulated and presented • a technology process that can be used to plan, create and react to information products • skill development for the creation of products and processes for intended audiences

Students should be taught:

The nature of information

Form and attributes

EARLY CHILDHOOD

- different forms of information (eg words, pictures, sounds)
- fundamental qualities of information (eg visual, aural, multimodal)
- the form of information helps define its use (eg a CD player is needed to play a CD)

MIDDLE CHILDHOOD

- ways which information forms can be classified (eg textual or graphical, efficient or wasteful, paper-based or electronic)
- the form of information will be influenced by purpose and features of intended audience (eg location, size, ethnicity)

Context and impact

EARLY CHILDHOOD

- information can be worked in many ways (eg stored and recorded, recalled, reused, transmitted)
- people use information for a range and variety of purposes (eg recreation, shopping, learning)
- information impacts on people's daily lives in many ways (eg paying bills, receiving letters, writing)
- people react to information in many ways (eg some people don't read the newspaper because it is too depressing, some people enjoy advertisements on television)
- information might not always be useful, requested or meet a need (eg junk mail)
- information can be owned and traded (eg books, cable television)

MIDDLE CHILDHOOD

- audience and context affect the construction of particular information products (eg the different ways news would be presented to a small group or a whole school assembly, the age of intended readers of a book)
- the impact of information on particular groups in society (eg the benefits to scientists through exchange of ideas on the internet, shoppers getting the best prices through newspaper advertisements)
- information is not the same as truth (eg music can change emotional reaction to a documentary, facts can be selected when reporting)
- ethical and legal issues relevant to information (eg privacy, copyright, censorship)

The creation of information

Investigating

EARLY CHILDHOOD

- strategies for determining the intended use of an information product when deciding its form
- particular needs that may be met through the creation of information products
- the basic requirements of an intended information product for a given use (eg size or length, cost)
- specific terminology to clarify meaning and improve communication (eg terms associated with computers, books, television)
- ways to differentiate between personal work and the work of others

MIDDLE CHILDHOOD

- ways to apply a process when identifying and solving a technology challenge
- how to examine and evaluate information products in the light of how needs and wants are met (eg how the internet has created new markets)
- key design criteria appropriate to an intended information product (eg ease of use, environmental effects, portability)
- technical names/terms that contribute to common understandings between creators and users of information
- methods of acknowledging sources of information used

EARLY ADOLESCENCE	LATE ADOLESCENCE
The focus for learning in this phase is on: • how use, impact and meaning made by particular audiences are affected by the information creator's choice • methods of defining and varying a technology process when dealing with information • details of recognised procedures, conventions and languages used to process information and create information products	**The focus for learning in this phase is on:** • the ways form, structure and creation of information products and processes are influenced by the cultural values, experiences and needs of the audience and developers • specialised processes and techniques necessary for the creation of information products to detailed specifications and standards appropriate to industry and the marketplace • the notion that information is a commodity that can be controlled
Form and attributes • the difference between information and data • the evolving standards and conventions on which the various forms of information products are dependent (eg networking protocols, library referencing) • the information medium will contribute to meaning (eg web, paper, video, oral) • stylistic and qualitative choices will contribute to meaning (eg colour, imagery, use of music, language complexity)	**Form and attributes** • information is data organised to form a message, pattern or sensory input and can be differentiated from noise • the standards and conventions of information products have economic value and can be commoditised and challenged (eg some software file formats are protected to discourage competitors) • the values, attitudes, beliefs, experiences and environments of information creators will influence form, style and presentation
Context and impact • information forms are tailored according to context and forms evolve as contexts change • broad social impacts associated with information (eg the invention of the printing press affected literacy levels) • the control of information may represent economic and political power (eg censorship in times of war) • information can be biased to achieve a purpose (eg selective choice of detail, translation) • issues of social justice associated with information technology (eg equity of access) • ethics and practicalities associated with copyright and patents • potential consequences of specific information technologies (eg threats to privacy)	**Context and impact** • information forms, styles and presentations are influenced by audience values, attitudes, beliefs, experiences and environment • the influence and impact on society of information as a global commodity (eg internet commerce) • information can be monitored and influenced by governments and market forces (eg legislators seeking to control the internet) • information's role in society can be positive or negative (eg the boundary between news and propaganda) • information products are subject to extensive laws and regulations (eg intellectual property, libel) • specific controls and practices associated with information to address practical, social and ethical issues (eg identity theft, metadata)
Investigating • ways to define, apply and vary a process that can be used to solve a technology challenge • how to examine and evaluate information technologies with an understanding that needs and wants can be met in different ways (eg some solutions are more efficient) • the critical choices associated with researching and investigating information products (eg meeting user needs, budgets, construction methods) • technical terms and expressions according to the rules and conventions that apply to a particular information technology (eg computer file types, building plans) • established systems for acknowledging sources (eg bibliographies, referencing)	**Investigating** • techniques for developing and tailoring specific processes to meet technology challenges according to circumstance and specifications • how to examine and evaluate information technologies with an understanding that needs and wants are related to the values, attitudes and beliefs of developers and users • the personal, local and global impacts of information products (eg environmental issues, cultural appropriateness) • ways to apply mathematical, scientific and social analysis when investigating and examining information products • detailed industry specific language and terminology suitable to developers and intended audiences • how to identify, generate and use personal and recognised systems and schema for acknowledging sources

The creation of information

Students should be taught:

EARLY CHILDHOOD

Devising

- processes for generating ideas (eg trial-and-error, drawing a plan, brainstorming)
- ways to share and compare ideas (eg orally, maps, plans and diagrams, models)
- factors that determine how an information product can be made (eg cost, time, resources)

Producing

- ways to create, store, use, transmit and retrieve simple information products using everyday resources (eg operate information equipment, follow simple procedures, publish information in text and images)
- simple, sequenced production processes for making information products
- practical constraints when creating and using information products (eg limited amounts of materials, equipment or time)
- how to use resources and basic equipment safely
- ways to share and care for resources and equipment

Evaluating

- a range of ways to classify, sort and analyse information products (eg height, opinion, distance, issues)
- ways to combine relevant information from a number of sources (eg cartoons, books, videos)
- ways to modify, improve and adapt information products based upon reactions and comparisons
- methods of communicating about information products (eg explaining how personal creations work)

MIDDLE CHILDHOOD

Devising

- strategies for generating ideas and planning the production of information products, taking into account purpose, audience and context
- structured ways to consider and compare needs, requirements and processes (eg comparison charts)
- ways of presenting and communicating personal ideas for an information product, considering such factors as delivery medium (eg paper, electronic, graphical), time and available resources
- ways to identify and work within practical constraints when creating information products (eg time, resources, personal skills)

Producing

- ways to create, store, use, transmit and retrieve a range of information products to meet particular functional and aesthetic requirements and for a variety of purposes and audiences (eg present information in a variety of forms, combine images and text to create media products, program devices to perform functions)
- organised processes for creating information products
- ways to follow plans and designs
- how to identify and work within practical constraints (eg time and resources)
- safe, recognised procedures and conventions when using and developing information products, (eg select and use resources efficiently, identify risks and hazards, maintain and care for tools, materials and equipment)
- strategies for working cooperatively with others

Evaluating

- a range of ways to classify, sort and analyse information products for a variety of purposes and audiences (eg how to gather information for defined purposes; how to interpret, transfer and transform information by different means)
- how to evaluate, modify and adapt information products using personal design criteria (eg suitability to purpose, audience and context)
- formal and informal ways to consider and communicate personal work (eg oral reports, slide show presentations, group discussions)
- evaluation frameworks and structures for reviewing and modifying plans, techniques and processes

EARLY ADOLESCENCE	LATE ADOLESCENCE
Devising • how to identify the detailed specifications and standards necessary to generate designs and plans for information products • how to select media and methodology for an information product according to needs, costs and benefits (social, economic and environmental) and context • strategies for developing original solutions to technology challenges (eg lateral thinking, formal design frameworks) • techniques for communicating ideas for information products • procedures, rules and practices for planning information products, taking into account factors such as user needs and wants, availability of resources, energy use and functional and aesthetic requirements	**Devising** • how to plan and design solutions to technology challenges that incorporate detailed factors in production (eg choices of materials, techniques of construction, costs, human resource requirements) • organisation and management procedures for devising information products • mathematical and scientific principles for developing plans and proposals (eg inductive versus deductive reasoning, statistical analysis of needs) • how to select and use language and techniques appropriate to users, and follow recognised conventions when communicating and presenting design proposals • planning criteria for information products aimed at communities and environments (eg equity of access, compatibility with existing products, social and environmental effects)
Producing • ways to create, select, use and adjust appropriate information forms, structures, styles and presentations that meet detailed specifications and standards and the needs of different audiences (eg create information products using combinations of images, sound and text, generate 2D and 3D images by everyday and electronic means) • techniques for recording, sorting, transforming and transferring information using a variety of means and a range of equipment (eg transferring information using electronic systems, using specialised computer software) • variations of the technology process appropriate to circumstances when creating information products • methodologies to overcome constraints and problems (eg time, resources and logistics) • how to safely operate, organise and maintain equipment and resources and identify and manage risks and hazards • collaborative and independent work strategies (eg meeting procedures)	**Producing** • techniques for applying an understanding of form, structure, organisation and management in the creation of sophisticated information products (eg control access to information, principles of data collection, manipulate visual images to create special effects) • techniques for developing, tailoring and adjusting processes to meet identified project needs when creating information products • creative, lateral and scientific thinking strategies to overcome problems and limitations when meeting intentions and standards (eg 'read, encode, annotate, ponder'; remodelling) • methods of selecting and managing resources and equipment, making informed decisions about factors in production (eg the use of time and energy) • a wide range of recognised procedures, equipment and techniques to create, transform and process information (eg appropriate occupational health and safety standards) • formal collaborative and independent work procedures (eg conflict resolution techniques)
Evaluating • recognised procedures, rules and practices for use in evaluating information products (eg assessment tools, notetaking frameworks, surveys and interviews) • how to research and locate design criteria for use in evaluating information products • specific factors for determining success in meeting technology challenges (eg environmental costs and benefits, the needs and wants of users) • a range of criteria to assess and reflect on personal work in the light of new ideas and problems identified (eg time and resources, cooperative and independent behaviour, safety) • frameworks and strategies for implementing and communicating quality control	**Evaluating** • commercial specifications and standards of quality for use in evaluating information products (eg qualitative and quantitative assessment frameworks, principles of data collection, analysis and interpretation) • how to evaluate the consequences and impacts of information products, considering impacts and effects (eg social, political, economic and environmental impacts, aesthetic effects) • a range of methods to evaluate and report on effectiveness in using and adapting a technology process according to specified criteria (eg individual and collaborative productivity, hazard minimisation, resource management) • quality control procedures according to industry-standards

Technology and Enterprise >
Systems

Systems

Students design, adapt and use systems that are appropriate to achieving solutions to technology challenges.

In achieving this outcome, students:

The nature of systems
- Understand that systems have elements and processes.

The use of systems
- Appropriately select and safely use systems.

The development of systems
- Develop or adapt appropriate technology systems

	The student:
LEVEL 8	Understands how the design, operation and management of complex systems influences their impact on communities and environments, and applies this understanding to the design, construction, operation, maintenance, management and evaluation of complex systems.
LEVEL 7	Understands how the nature of complex human and physical systems influences their organisation, control and impact. The student applies this understanding to the design, construction and operation of such systems to optimise output.
LEVEL 6	Understands how particular systems and their sub-systems work, and their influence on communities and the environment. The student applies this understanding when using and adapting existing systems and developing systems that perform specific functions.
LEVEL 5	Understands that the elements of a system, including people and components, are related and can work in a variety of sequences. The student relates this understanding to their design and creation of systems and associated sub-systems and measures performance using a chosen method.
LEVEL 4	Understands how the elements of a system interact and uses this information to control and adapt existing systems, and design and create solutions to technology challenges.
LEVEL 3	Understands simple cause and effect relationships in systems and explores how human and physical systems affect people and the environment. The student uses this understanding to modify and test systems.
LEVEL 2	Understands systems are used for specific purposes and can describe their component parts, the relationships between them and how people make a system work. The student relates this understanding to assembling, controlling, trialling and evaluating simple systems.
LEVEL 1	Identifies some systems in the immediate environment and the role they play. The student fits together the parts of a simple system and carries out a short sequence of steps to operate a system safely.
FOUNDATION	Uses the cause and effect relationship when they operate a system using simple techniques.

EARLY CHILDHOOD	MIDDLE CHILDHOOD
The focus for learning in this phase is on: • understanding that people are surrounded by systems • the nature and characteristics of systems and their role in the immediate environment • experiences with using and devising systems using elements of the technology process • safe use and creation of systems, using basic components and energy sources	**The focus for learning in this phase is on:** • cause and effect relationships between systems • how systems meet needs and wants and the consequent impact on society and the environment • a specific technology process to assist in understanding how systems can be used and created • how to meet users' needs whilst avoiding risks and inefficient use of resources

Students should be taught:

The nature of systems

Form and attributes

- a system is a combination of parts that work together to achieve a specific result
- the characteristics of various systems such as natural and built systems
- systems comprise components that have specific jobs or functions to make the system work (eg a bicycle has many parts, and each part has a function)
- people play an important role in the operation of a system
- humans can create, use, control and be part of a system
- systems can be identified and classified within the immediate environment (eg telephones, cooking systems)

Form and attributes

- cause and effect relationships exist within systems
- component parts impact on the cause and effect relationships within systems (eg a flat tyre may cause the system (bicycle) to fail)
- although some systems are found in nature (eg the solar system) technological systems (providing solutions to technology challenges) have people involved
- structure, organisation, control and evaluation methods affect how the elements of a system interact
- use of the correct mechanism (eg button, switch, connector) impacts on how systems work
- there is a relationship between the role of people and controls of systems (eg a person turning a valve)
- a range of systems can be identified and examined to determine the way they work (eg how energy or information is transferred)

Context and impact

- systems play an important role in everyday life (eg people would not receive letters without a postal system)
- systems surround us and we constantly interact with systems (eg viewing television is interacting with a system)
- some systems have issues of safety such as an electrical system

Context and impact

- systems have been developed over time to satisfy human needs and wants
- systems change according to different needs and wants
- systems can impact on society (eg the invention of traffic lights impacted on transport in cities and rural areas)
- systems can impact on the environment (eg power generation systems produce varying amounts of greenhouse gases)

EARLY ADOLESCENCE

The focus for learning in this phase is on:

- the concepts of linear and non-linear systems
- how systems interact with people and the environment, as well as associated ethical and social issues
- the technology process to encourage the use and development of a range of linear and non-linear systems and sub-systems to meet predetermined specifications and standards
- resource management, hazard minimisation and cooperative work

LATE ADOLESCENCE

The focus for learning in this phase is on:

- complex systems and sub-systems, with consideration of control and feedback
- principles, structure, logic, organisation and control of systems, with a focus on impacts on people, communities and environments
- how the underlying values, attitudes and beliefs of users and developers affect the way systems meet needs and wants
- the development of tailored, iterative processes aimed at creating systems to industry-standard specifications
- analysis of how well systems perform according to a range of social, economic and environmental criteria

Form and attributes

- systems can be defined as simple and complex
- complex systems tend to be non-linear, incorporating sub-systems
- a sub-system is a system that operates as part of another system (eg the water pipes in a house are a sub-system forming part of a town's water distribution system)
- the elements of non-linear systems interact through a variety of steps and sequences and can be controlled to produce a variety of outputs
- controls can be material parts of the system (eg microprocessors and solenoids), or they can be human parts of the system (eg a person setting the gas pressure for welding)
- feedback within the system (and between sub-systems) may be necessary to optimise performance (eg a thermostat improves control of an oven or kiln)

Form and attributes

- complex systems and sub-systems may comprise many layers of controls and feedback loops
- the stability and efficiency of a system are influenced by all parts of the system, including those in the feedback loop (eg a faulty temperature monitor in an air-conditioning system may cause similar inefficiencies in operation to that caused by a faulty compressor)
- as systems increase in complexity, there is a tendency towards a corresponding increase in required maintenance
- the components of systems are developed in an attempt to make life easier by being more economical, simplifying complex procedures or saving time and resources

Context and impact

- particular systems have changed over time, and such change occurs as adaptation to short and long-term needs and wants
- there are ethical and social issues associated with systems (eg genetic modification of foods)
- there are environmental issues associated with the operation and maintenance of systems, particularly in regard to choices of energy source and waste disposal
- systems interact with people and the environment in a variety of complex and often conflicting ways (eg the construction of a freeway system might improve road congestion problems but reduce the economic viability of public transport)
- there are historical gender links to particular systems (eg women were typically associated with systems connected with domestic roles within the home and men associated with mechanical systems)

Context and impact

- the principles, structure, logic, organisation and control of systems influence their impact on people, communities and the environment
- adoption and use of a system are determined by the degree to which the benefits to individuals, communities and societies will outweigh costs
- the costs of systems to individuals, communities and societies include economic costs particularly of energy, and environmental costs such as pollution
- there are cultural implications for individuals, communities and societies when systems are developed and adopted, including changes to the nature of work, gender roles and political systems (eg the introduction of mechanised agricultural systems contributed to the demise of feudalism)

The use and development of systems

Students should be taught:

EARLY CHILDHOOD

Investigating

- ways to describe and illustrate the basic parts and functions of a system (eg a system for getting school lunches)
- the relationship between components of systems
- methods of defining and examining particular needs and wants that may be met through the use and development of a system

Devising

- ways to devise, develop and trial systems using basic components and energy sources (eg devising a way of moving sand from one place to another)
- how to follow graphic and written instructions for using a system
- methods of describing and illustrating the main parts, functions and relationships between components of a system (eg labelled drawings, talking to a group)
- strategies for selecting resources purposefully (eg choosing components according to price)

Producing

- how to assemble, use and control systems and models of systems (eg train track, tape recorder, remote controlled video recorder)
- ways to recognise and incorporate personal ideas and skills (eg deviating from the instructions when making a model)
- sequenced production processes (eg making scones)
- techniques to create and operate systems safely
- when and how to care for and share resources and equipment

MIDDLE CHILDHOOD

Investigating

- how to identify and consider the origin, nature and operation of a range of systems
- methods of experimenting with systems to gain an understanding of how the component parts interact, considering structure, organisation, control and evaluation
- ways to examine the role of component parts through cause and effect relationships within systems
- methods of examining and evaluating systems in the light of how needs and wants are met

Devising

- ways to devise and make systems for given purposes and situations (eg measuring, signalling, monitoring, communicating) taking into account the effect on people and the environment
- ways to generate ideas and plans based on investigations into meeting needs and wants
- strategies for presenting and communicating ideas, taking into account alternative ideas and processes
- the conventions, symbols and terminology appropriate to specific systems under development
- safety considerations when using and devising systems

Producing

- ways to use and control systems through a variety of means, including switches, levers, gears and sequences
- techniques for making systems for given purposes and situations (eg a watering system for plants in the classroom)
- specific organised processes for making systems (eg the steps in assembling a robotic device)
- how to follow plans and designs (eg how to read a floor plan)
- strategies for efficient selection and use of resources, and maintenance and care of materials, tools and equipment
- ways to identify and avoid risks and hazards
- strategies for working with others (eg allocating tasks in a group)

EARLY ADOLESCENCE	LATE ADOLESCENCE
Investigating • how to observe, dismantle, operate and control a range of linear and non-linear systems and their sub-systems to develop an understanding of the principles of their operation • ways to examine and evaluate systems with an understanding that needs and wants can be met in different ways (eg some solutions may be more energy efficient)	**Investigating** • how to operate and manage complex systems to understand structure, logic, sequences and control, and their relationships to communities and environments • mathematical, scientific and organisational principles appropriate to investigating, operating, controlling, constructing, analysing and evaluating complex systems • ways to examine and evaluate systems with an understanding that needs and wants are related to the values, attitudes and beliefs of developers and users (eg a system of centralised childcare might not meet family values in a community)
Devising • techniques to meet specified performance standards and criteria, maximise performance and reduce negative impacts on people and the environment when using and developing linear and non-linear systems • how to efficiently manage the inputs (eg tools, raw materials, plans) needed to use, design and construct sub-systems and systems • techniques for communicating ideas in ways appropriate to audience and purpose • techniques to address specific factors in use and development of a system (eg user needs and wants, availability of resources, terminology and conventions) • strategies for ensuring use and development of systems are safe, and time and resource efficient	**Devising** • usage, planning and designing methods of linear and non-linear systems that incorporate analysis of detailed factors of production (eg choices of materials, techniques, running costs, resources needed) • how to select language and techniques appropriate to users • recognised conventions for communicating and presenting design proposals (eg schematic diagrams, cost projections) • the potential personal, local and global impacts that may need consideration in designs, concepts and proposals • the ethical, financial, social and economic principles and criteria that must be addressed when using and developing systems • industry-standards for safety and resource management that must be considered when using and developing systems
Producing • ways to operate a range of linear and non-linear systems and their sub-systems • ways to meet detailed specifications and standards when developing systems (eg an interactive website that meets W3C coding conventions) • methods of selecting and applying appropriate variations of the technology process according to circumstances • strategies for using plans critically, finding ways to overcome constraints and problems (eg troubleshooting a computer network) • recognised safe work practices for the safe operation of linear and non-linear systems and sub-systems • methods of selecting, organising, using and maintaining tools, resources and equipment when using and building systems • cooperative and independent work practices (eg meeting procedure)	**Producing** • techniques for operating and managing linear and non-linear systems and sub-systems, taking into account impacts on users, the community and the environment (eg CO_2 emissions) • how to meet detailed specifications and market/ commercial standards when using and developing systems • how to develop, tailor, monitor and adjust processes according to the needs of users and developers • strategies for using creative, lateral and scientific thinking to overcome problems and limitations when meeting intentions and standards • techniques for selecting and managing resources and equipment (eg managing use of time and energy) • industry-standard risk management strategies • how to select and use collaborative and independent work strategies according to circumstances • ways to monitor and maintain the work environment according to recognised industry and commercial practices

The use and development of systems

Students should be taught:

EARLY CHILDHOOD	MIDDLE CHILDHOOD
Evaluating • ways to describe thoughts and feelings about systems used and created (eg a journal) • methods of explaining how systems (used and developed) work • ways to modify systems and processes in response to discussion • ways to compare systems created with original intentions (eg a PMI chart) • methods to consider success in sharing and cooperation (eg spokesperson reporting on group work)	Evaluating • ways to set criteria based on design requirements to assess systems used and created (eg listing needs of users) • functional, social and environmental criteria which may determine suitability of systems used and developed • how to modify and adapt systems, techniques and processes in response to new ideas and problems identified • ways to consider and discuss success of production process (eg web log)

EARLY ADOLESCENCE	LATE ADOLESCENCE
Evaluating • predetermined, detailed specifications and standards that can be used to evaluate systems used and developed • specific factors which may determine success when creating a system (eg energy efficiency) • a variety of methods to evaluate plans, techniques and processes (eg statistical analysis) • a variety of methods to evaluate personal effectiveness when using a technology process (eg charts for time management, notating safety record)	Evaluating • commercial specifications and standards of quality, presentation and performance for evaluating systems used and developed • qualitative and quantitative methods of analysing success in creating systems, taking into account the interrelationship of potential criteria (eg functionality, aesthetics) • commercial and industry-standard practices for evaluating, modifying and adapting plans, techniques and processes • methods to report on personal effectiveness according to specified criteria (eg hazard minimisation, resource management)

Technology and Enterprise >
Enterprise

Enterprise

Students pursue and realise opportunities through the development of innovative strategies designed to meet human needs.

In achieving this outcome, students:

Enterprising attitudes

- Display attitudes that support the development of innovative technologies designed to meet human needs.

Enterprising capabilities and skills

- Take initiative, generate innovative ideas and employ skills and strategies to optimise opportunities, recruit and manage resources, and communicate, negotiate and work with others.

	The student:
LEVEL 8	The student understands and employs a range of recognised strategies to realise selected opportunities; explains the merits of different options in innovative design proposals; makes optimum use of resources when organising, implementing and adjusting production processes; monitors and evaluates progress; and negotiates with others to overcome difficulties.
LEVEL 7	The student understands and employs some recognised strategies to assess, select and realise opportunities through creating and preparing innovative design proposals; makes efficient use of resources when organising, implementing and adjusting production processes, monitoring effectively and evaluating progress and collaborating with others.
LEVEL 6	The student understands and employs a recognised strategy to realise opportunities through creating and preparing innovative design proposals, organising, implementing and adjusting production processes creatively, and monitoring systematically and evaluating progress.
LEVEL 5	Identifies opportunities, considering the appropriateness of existing technologies; creates and prepares design proposals that include options considered and reasons for choices made; plans and organises production processes to own specifications; monitors and evaluates progress.
LEVEL 4	Displays initiative and drive when generating and communicating ideas, considering their beliefs and values and those of others. The student identifies, assesses and manages risks, and organises, plans and carries out production steps and monitors and evaluates results.
LEVEL 3	Displays initiative and drive when generating and communicating ideas, planning and undertaking production while considering design requirements and constraints.
LEVEL 2	Uses a purposeful approach when generating ideas, considering alternatives, sharing and communicating ideas and, within given constraints, developing solutions that meet human needs.
LEVEL 1	Applies a trial-and-error approach to generating ideas and developing technologies and modifies work in response to self evaluation and comments from others.
FOUNDATION	Attends and responds to technology challenges.

EARLY CHILDHOOD	MIDDLE CHILDHOOD
The focus for learning in this phase is on: • the concepts of identifying challenges and taking risks • ways to organise work and share ideas • strategies for maximising personal achievement and promoting creative thinking • ordered processes	**The focus for learning in this phase is on:** • challenges, risks and self-management • critical analysis of process and products • the use of process through strategies for creating, communicating, and cooperating • creative thinking through systematic approaches

Students should be taught:

Enterprising attitudes

Maximising opportunities

EARLY CHILDHOOD

- ways to identify solutions to problems (eg brainstorming)
- ways of overcoming barriers and constraints that may prevent success when devising creative solutions to technology challenges (eg using an ordered method or process)
- strategies for making good use of resources (eg putting names on things to avoid loss)
- ways to identify reasons for success or failure (eg PMI charts)
- the notion of ownership of resources (eg copying other people's work)

MIDDLE CHILDHOOD

- frameworks for identifying and managing challenges (eg planning templates)
- risk-management procedures
- strategies for identifying opportunities for creativity, innovation and improvement
- ways to use resources efficiently, making optimal use of materials and ensuring they are suited to the task (eg ways to reduce wastage)
- the practicalities of intellectual property (eg the idea of plagiarism)

Enterprising capabilities and skills

Generating ideas

EARLY CHILDHOOD

- ways to generate ideas and compare alternatives (eg 'think, pair, share')
- strategies for experimenting with ways of doing things (eg using trial-and-error)
- how to generate and instigate plans of action (eg drawing and labelling intended products)

MIDDLE CHILDHOOD

- thinking strategies and techniques (eg brainstorming, Venn diagrams, KWL)
- methods and techniques for creating plans (eg flow charts)
- factors to be considered when generating solutions (eg availability and suitability of materials and tools, personal skills, abilities of intended users)

Communicating and managing

EARLY CHILDHOOD

- methods of sharing and communicating ideas (eg orally, drawings, modelling)
- ways to organise personal work (eg using a task folder)

MIDDLE CHILDHOOD

- ways of presenting and communicating ideas that take into account audience (eg multimedia slideshow)
- criteria and frameworks for using self-management skills (eg personal time plan)

Evaluating outputs

EARLY CHILDHOOD

- ways to describe thoughts about things designed and made (eg using a journal)
- how to identify functions and labels in products
- strategies for modifying products and methods in response to discussion

MIDDLE CHILDHOOD

- ways to set criteria based on design requirements to assess personal products
- methods of considering the functional, social and environmental costs and benefits of products created
- strategies for modifying and adapting personal work in response to new ideas and problems identified

EARLY ADOLESCENCE	LATE ADOLESCENCE
The focus for learning in this phase is on: • logical problem-solving and consideration of factors, options and alternatives for risk-management and decision-making • evaluation of products and processes in the light of detailed criteria • audience and purpose when communicating • techniques for implementing and managing workflow • creative, original thinking	**The focus for learning in this phase is on:** • formal problem-solving and industry-standard criteria for developing solutions • communication and management using recognised strategies and techniques • evaluation of products and processes using qualitative and quantitative methods • risk-management, flexibility, creativity and originality
Maximising opportunities • a range of strategies to solve problems methodically and creatively (eg lateral thinking exercises) • factors and options that should be considered when developing solutions to meet needs and wants (eg energy costs, use of time) • methods of determining market suitability and opportunities (eg market research surveys) • ways to use resources efficiently, considering sustainability, wastage and alternative approaches • the implications and practicalities of copyright and patents (eg acknowledgement of sources and ideas)	**Maximising opportunities** • how and when to apply formal problem-solving techniques • industry and market-standard criteria for use when developing creative solutions (eg social, economic and environmental costs and benefits) • strategic approaches to evaluating market suitability and opportunities (eg campaign planning) • commercial and industry-standard practices for making optimum use of time, facilities, resources and equipment (eg market research, project management principles) • intellectual property laws (eg patents, copyright and trademarks)
Generating ideas • thinking strategies and techniques incorporating consideration of alternatives (eg criteria filtering, best of three) • formal techniques for documenting and designing plans and strategies (eg diagramming software, concept mapping) • a range of criteria for evaluating solutions (eg availability and suitability of materials and tools, personal skills, values, attitudes and beliefs, functionality, aesthetics, environmental effects)	**Generating ideas** • how to use creative, lateral and scientific thinking to predict, pre-empt and overcome potential constraints, problems and limitations of options considered • a strategic approach to personal work (eg identifying, assessing and acting on opportunities) • techniques for preparing design proposals that take into account functional, technical, social, economic, environmental and aesthetic factors
Communicating and managing • communication techniques appropriate to audience and purpose (eg video) • techniques and strategies for implementing and organising work, ensuring risk identification and management (eg collaborative work practices such as committee procedure)	**Communicating and managing** • recognised communication strategies that take into account form, style, structure, presentation and audience (eg prospectus) • techniques and strategies for managing and evaluating risks and implementing courses of action, incorporating industry standard approaches (eg research, collaboration, negotiation)
Evaluating outputs • predetermined, detailed specifications and standards that can be used to evaluate personal work • specific factors which determine success in meeting a technology challenge (eg environmental costs and benefits, energy usage, the needs and wants of users)	**Evaluating outputs** • commercial specifications and standards of quality, presentation and performance for evaluating technology products • qualitative and quantitative methods of analysing success in meeting technology challenges, taking into account the interrelationship of functional, technical, social, economic, environmental and aesthetic criteria

Enterprising attitudes

Enterprising capabilities and skills

Enterprising capabilities and skills

Students should be taught:

EARLY CHILDHOOD	MIDDLE CHILDHOOD
Evaluating methods • ways to compare products with personal intentions (eg charts, tables) • ways to consider success in sharing and cooperation (eg spokesperson reporting on group work)	Evaluating methods • methods of reviewing and modifying plans, techniques and processes used in creating personal products • strategies for considering and discussing organisation of time, resources and cooperative roles in the production process (eg written report, web log)

EARLY ADOLESCENCE	LATE ADOLESCENCE
Evaluating methods • a variety of methods to critically evaluate and modify plans, techniques, processes and results (eg testing, reflection and comparison) • methods of recording, assessing and reflecting on personal effectiveness when using a technology process, taking into account a range of factors (eg management of time and resources, cooperative and independent behaviours, and safety practices)	Evaluating methods • strategies for evaluating, modifying and adapting plans, techniques, processes and products using commercial and industry-standard practices (eg market research, performance management) • a range of methods to evaluate and report on personal effectiveness in using and adapting a technology process according to specified criteria (eg individual and collaborative productivity, hazard minimisation, resource management)

Technology and Enterprise >
Technology Skills

Technology Skills

Students apply organisational, operational and manipulative skills appropriate to using, developing and adapting technologies.

In achieving this outcome, students:

Organisational skills
- Monitor and manage capital, consumable and human resources and processes in using, developing and adapting technologies.

Operational skills
- Understand and safely apply operational procedures to equipment in using, developing and adapting technologies.

Manipulative skills
- Physically manipulate tools and resources in using, developing and adapting technologies.

	The student:
LEVEL 8	Manages and organises resources and processes; understands, selects and applies industry-recognised operational procedures and manipulative techniques; and considers the specifications of intended user or client, when creating and modifying technologies.
LEVEL 7	Manages and organises resources, techniques and processes achieving defined industry standards of quality and safety when creating and modifying technologies.
LEVEL 6	Selects techniques, operational procedures and resources and organises and uses tools and equipment efficiently, considering the requirements of own design, and achieves defined standards of quality and safety when creating and modifying technologies.
LEVEL 5	Selects techniques, operational procedures and resources; manages the environment, organises and uses tools and equipment (considering personal limitations) when creating and modifying technologies.
LEVEL 4	Understands and applies skills and operational procedures, organises resources and recognises hazards to use tools and equipment efficiently and safely (to the requirements of own design) when creating and modifying technologies.
LEVEL 3	Selects the skills and standard operational procedures and organises and uses the relevant tools and equipment efficiently and safely when creating and modifying technologies.
LEVEL 2	Identifies, understands and applies the necessary skills and simple operational procedures, organises and uses the tools, equipment, materials and information needed for routine tasks with care and safety, when creating and modifying technologies.
LEVEL 1	Uses familiar tools and simple procedures to operate equipment with care and safety when creating and modifying technologies.
FOUNDATION	Uses familiar tools and procedures safely when using technologies.

EARLY CHILDHOOD	MIDDLE CHILDHOOD
The focus for learning in this phase is on: • identifying, classifying and describing technologies in the immediate environment • methods of examining relationships between components and established ways of making things from everyday materials and equipment • safe, cooperative use of equipment and resources	**The focus for learning in this phase is on:** • a process for solving technology challenges • specifications in plans to make things that meet functional and aesthetic requirements • methods of organising, selecting, manipulating, processing, transforming and controlling technologies • precision, safety and resource management

Students should be taught:

Organisational skills

Materials

- how to distinguish between natural and processed materials
- how materials can be affected by changes in conditions (eg heat, light, moisture)
- criteria for selecting materials for particular purposes (eg texture, strength, flexibility, shape, durability)
- how to identify equipment according to use (eg cutting, joining, polishing, sewing)
- when and how to care for and share resources and equipment

Materials

- how to identify natural, synthetic and composite materials used to manufacture familiar products (eg furniture, clothing, food, toys, soils)
- common factors that determine the use of materials (eg time, cost, availability)
- ways of matching and/or relating the properties of materials to their uses (eg heat absorption, texture, conductivity)
- methods of selecting materials according to their characteristics (eg rigidity, taste, durability)
- ways to maintain and care for tools, materials and equipment

Information

- how to identify different information technologies (eg televisions, telephones, computers, video games)
- ways to specify, gather, sort and analyse information (eg heights, news, distances, opinions, issues)
- techniques for combining information from several sources (eg cartoons, books, videos, radio programs)
- methods of collecting, recording and displaying visual information (eg graphics such as graphs and diagrams)
- methods of storing information (eg tape recorders, videos, computers, drawings)

Information

- ways of locating information sources and undertaking information searches to support personal work (eg libraries, electronic databases, videos, files, internet)
- methods of examining how particular information technologies function (eg computers, DVDs, cameras)
- ways of presenting and interpreting data, taking into account factors affecting the meaning made (eg bias, selection, emphasis)

EARLY ADOLESCENCE	LATE ADOLESCENCE
The focus for learning in this phase is on: • technological knowledge and skills in design and production tasks, and proven ways of doing things • using equipment to specific degrees of accuracy and precision • skills in manipulating, transforming, creating, processing, modifying and operating technologies to specified standards of accuracy and hazard management	**The focus for learning in this phase is on:** • skills relevant to specialised technologies • acquiring and applying skills and techniques applicable to recognised production processes • techniques for creating, transmitting, transforming, selecting, using, operating and modifying technologies to market and industry standards • recognised occupational health and safety requirements and strategic management of resources
Materials • how to identify and select various types of materials that can be used to meet design specifications (eg ceramics, foods, metals, alloys, fibres, composites, timbers, synthetics, monomers, polymers) • factors that may be considered when attempting to produce particular results (eg performance, aesthetics, cost, sustainability) • ways to test materials according to specific design requirements (eg durability, concentration, moisture) • methods and criteria for evaluating techniques for working with materials (eg performance, fault-finding, PMI charts) • methods of organising and maintaining a variety of tools and resources	**Materials** • criteria for relating the characteristics of materials to their use (eg performance, aesthetics, functionality, degradability) • criteria and methods for analysing the characteristics of materials in order to meet specific requirements (eg structure, adhesion, fire retardance, acoustic resonance, thermal stability) • methods and criteria for performing qualitative tests on materials (eg impact, tensile strength, hardness, durability, absorbency) • criteria used to assess quality control processes used in working with materials (eg accuracy, efficiency, reliability, consistency) • how to monitor and maintain the work environment, taking into account issues of waste and energy use and according to recognised industry and commercial practices
Information • ways of using and adapting interactive information sources (eg databases, internet search engines, electronic catalogues) • criteria to justify choice of information processes for different intended users (eg access, compatibility, user capabilities, social effects) • criteria for analysing information collected (eg patterns, trends, reliability, authenticity, sample size, points of view) • criteria to interpret specifications for collecting and organising data (eg scope, size, tabulations, graphical representation)	**Information** • criteria to guide the selection of information equipment and processes (eg construction, measurement, accuracy, efficiency, safety) • alternative ways to use information technologies for particular purposes (eg image processing, remote sensing) • management techniques for data sampling and information analysis (eg community surveys, book systems, inventories) • technical terms to describe the capacities and compatibility of information equipment (eg protocols, bits and bytes, baud) • criteria to examine the efficiency and effectiveness of information equipment (eg accuracy, aesthetics, speed, scope)

	EARLY CHILDHOOD	MIDDLE CHILDHOOD
	Students should be taught:	
Organisational skills	**Systems** • how to identify systems in the immediate environment (eg energy, cooking, entertainment) • ways to select resources for making a system (eg glues, papers, energy sources, people) • criteria for examining the basic relationships between components in systems (eg working parts, human relationships) • ways of describing the basic parts of systems and their functions (eg computers, household appliances, bicycles, telephones, storage systems) • methods of illustrating how systems work (eg sketches, diagrams, drawings, models)	**Systems** • ways to identify and classify systems outside the immediate environment (eg transport, communication) • the ways systems work and are controlled (eg remote control, instructions, gears, sensors) • the ways energy and information are used in the operation of systems (eg solar, wind, combustion, digital, analogue) • methods for identifying patterns and relationships in systems (eg control points, interactions, circuits, mechanisms) • criteria for examining why particular systems (eg irrigation, organisational, entertainment) may apply in certain situations
Operational and manipulative skills	**Materials** • how to safely manipulate materials in ways to suit a challenge (eg shape, mould, colour, join) • ways to build models from simple materials to perform specific functions (eg moving, lifting, conserving, pressing, watering) • different ways to join materials (eg gluing, fastening, stitching) • how to follow instructions when assembling materials (eg recipes, construction kits) • methods of performing simple maintenance on equipment (eg clean, refill, oil)	**Materials** • how to safely process and transform materials to achieve specified outcomes (eg food, ceramics, composites, fabrics) • techniques for modifying materials to improve quality and presentation (eg assembling, processing, shaping, preserving) • ways of producing models and products safely and accurately (eg toys, clothes, machines, model houses, landscapes, food dishes) • suitable methods of joining materials (eg sewing, jointing, fastening, fixing) • how to operate equipment properly and safely (eg mixers, scissors, sewing machines, punches, staplers) • methods of maintaining equipment used (eg schedules, protocols, storage)
	Information • how to operate common information equipment (eg telephones, calculators, compact discs, cameras, amplifiers) • ways of sending, receiving and storing information (eg telephones, signs, books) • simple procedures for using information systems • ways to publish information in text and simple images	**Information** • how to present information in a variety of forms (eg books, brochures, videos, graphics, role-plays, newsletters) • ways to record, sort, transfer and transform information (eg files, spreadsheets, graphics, tables, reports, images) • methods of combining images, sound and text to create media products (eg audio and slide presentations, animations, videos) • techniques for operating information equipment (eg computers, video equipment) • methods of monitoring and maintaining information equipment (eg printers, catalogues, cameras)

EARLY ADOLESCENCE	LATE ADOLESCENCE
Organisational skills	
Systems • ways to choose resources to make systems for particular environments (eg structures, processes, mechanisms) • techniques for examining the control of systems in particular environments (eg health, performing arts, farming) • ways to consider and illustrate the interactions between various system components (eg sensors, levers, circuits, pathways) • ways to use different energy sources to make systems work (eg steam, sound, electricity, wind, human) • criteria for examining how systems affect management and production processes at local and global levels (eg decision-making, lifestyles, social groupings, business operation)	**Systems** • strategies for the use of systems to suit particular uses and environments (eg energy-efficient buildings, wind generators, recycling) • the benefits and costs of different energy sources (eg fossil fuels, solar, renewable, human) • criteria for the performance of working parts in systems (eg compatibility, fit, tolerance, wear, efficiency) • criteria for calculating the overall performance of systems (eg velocity, precision, reliability, social impact)
Operational and manipulative skills	
Materials • techniques for using equipment to manipulate materials with the precision required by design specifications (eg accuracy, purpose, efficiency, safety) • how to apply a variety of methods of manipulating materials to achieve specific results (eg mixing, welding, fabricating, stitching, moulding, spraying, shaping, gluing, casting, fastening) • ways to devise equipment for working with materials (eg patterns, stencils, jigs, templates) • how to operate a range of portable power instruments and equipment safely (eg sewing machines, mixers, lathes, drills, sprays, hoes, editing suites, modems and routers) • health and safety procedures and considerations for handling, storing and disposing of materials (eg combustibility, corrosion, toxicity)	**Materials** • ways to experiment with and apply a range of new materials (eg carbon fibre, Mylar, Kevlar, Velcro, polyunsaturated oils) to meet industry and market standards • ways to combine different materials for production tasks and up-to-date methods for assembling materials (eg fabrication, welding, adhesives) to meet industry and market standards • techniques for devising and using specialised equipment to achieve specific effects with materials (eg moulding, clamping, cooling, cleaning) • how to use modern design and processing equipment (eg CAD, programmable appliances and machinery) • safety codes and regulations for storing and processing materials (eg protocols and procedures for handling hazardous chemicals, protective clothing)
Information • specialised methods of handling information (eg spreadsheets, online news sources, multimedia software) • ways to plan and create information products using combinations of images, sound and text (eg radio programs, Web pages, video, animations) • methods of transferring information using electronic systems (eg email, video conferencing, instant messaging) • strategies for selecting hardware and software for particular purposes (eg storage, analysis, publication, cataloguing) • techniques for dealing with 2D and 3D images by everyday and electronic means (eg drawings, flow charts, digital photographs)	**Information** • techniques and strategies for planning, producing and editing websites and multimedia to industry and/or market standards • how to apply the principles of data collection, analysis, interpretation and synthesis (eg range, validity, samples, reliability, patterns, trends) • ways to control access to information (eg passwords, encryption, bar codes) • methods of manipulating visual images to create special effects (eg animation, digital processing, lighting, juxtaposing) • ways of transferring and processing information using remote and networked systems for specific purposes (eg webcam controls, satellite imaging, wireless communications) • how to use a range of information equipment for specialised tasks (eg GPS's, weather stations, CAD plotters)

Operational and manipulative skills

Students should be taught:

EARLY CHILDHOOD

Systems

- how to construct simple systems from everyday materials (eg batteries, globes, switches, rubber bands, balloons, foil, cardboard, rosters)
- ways of using energy sources to drive simple systems (eg batteries, wind, mechanical, human)
- how to follow a sequence of instructions to operate simple systems (eg graphics, cue cards)
- methods of controlling simple systems (eg gears, timing devices, instructions)
- techniques for ensuring systems are operated safely (eg identifying dangerous components)
- ways to identify causes of system failure (eg broken parts, human error, power failure)

MIDDLE CHILDHOOD

Systems

- ways to construct systems for specific purposes (eg measuring, monitoring, signalling, storing, communicating)
- how to use a range of energy sources to make systems work (eg springs, sails, water, wind)
- ways to construct, modify and dismantle systems (eg toys, appliances, robots)
- methods of programming, managing and operating systems (eg simulations, sound and light, heating and cooking, rosters)
- ways to program devices to perform functions (eg calculators, recorders, robotic devices)
- a variety of means to control systems (eg switches, levers, gears, sequences, electronic impulses, magnetics)
- techniques for ensuring systems are operated and developed safely (eg predicting potential dangers)
- techniques and criteria for measuring the performance of systems (eg speed, strength, rigidity, efficiency)

EARLY ADOLESCENCE	LATE ADOLESCENCE
Systems • ways to assemble systems to perform specific functions (eg irrigation, crowd control, transport, display images) • ways to devise programs to manage data and information, and control systems (eg Logo, Lego robotics, PDAs, macros) • how to construct and modify a variety of specialised systems (eg digital, electronic, hydraulic, chemical) • ways to control systems (eg micro-switches, sensors, protocols, sequences of programmed instructions) • how to use systems to sense, send, receive, interpret and amplify • methods of varying the outputs of systems (eg amplifiers, gears, digital instruction) • safe operation of specialised systems (eg electronic, mechanical, computing, organisational, physical) • ways to modify systems based on measurements of performance (eg speed, power, durability, reliability, growth rate)	**Systems** • how to use suitable components in systems (eg sensors, connectors, resistors, people, controls) • methods of devising software to meet particular needs (eg controlling systems, creating special effects, managing inventories) • ways of storing and converting energy into usable forms (eg batteries, flywheels, solar panels, hydraulics) • techniques for simulating causes and effects in systems (eg computer simulation, wind-tunnel testing) • safety factors relevant to the design and development of systems (eg protocols, standards, risks) • ways to adapt and modify systems based on industry and market specifications • how to apply control methods to systems (eg switching, remote sensing) • methods and criteria for quantitative tests on the components of systems (eg stress, strain, shear, flexibility, moisture level) • how to use equipment necessary to measure functions in systems (eg oscilloscopes, multimeters, tachometers, logic testers)

Technology and Enterprise >
Technology in Society

Technology in Society

Students understand how cultural beliefs, values and ethical position are interconnected in the development and use of technology and enterprise.

In achieving this outcome, students:

Influencing factors

- Understand that technological developments are influenced by the interplay of cultural beliefs, values and ethical positions.

Consequences

- Consider the interplay of cultural beliefs, values and ethical positions and act on this understanding.

	The student:
LEVEL 8	Understands that social, environmental, ethical, economic and political values underpin the development and application of technology and that decisions based on beliefs and values affect the costs and benefits of technologies.
LEVEL 7	Understands that needs, availability of resources and existing circumstances influence decisions related to the development and production of appropriate technologies.
LEVEL 6	Understands that the needs of individuals, communities and environments affect the development and application of technologies.
LEVEL 5	Recognises that beliefs and values of individuals and communities influence the development and use of appropriate technologies.
LEVEL 4	Understands how cultural beliefs and values affect the development and use of technologies.
LEVEL 3	Understands that people value differently features related to aesthetics and the impact of different technologies on the environment.
LEVEL 2	Understands that people use technologies for different reasons and that this use has an impact on their lives.
LEVEL 1	Understands that people use technologies in different ways and have different attitudes toward technologies.
FOUNDATION	Uses technologies in different ways to suit their needs.

EARLY CHILDHOOD	MIDDLE CHILDHOOD
The focus for learning in this phase is on: • the concept of meeting needs and wants • the role technology plays in everyday life • environmental impacts of particular technologies • safety issues	**The focus for learning in this phase is on:** • how technologies apply in certain circumstances • the factors that affect the development of technologies • the various impacts and effects of technology on people, including specific groups in society, and on the environment • ethical and legal issues, and safe use of technologies

Students should be taught:

Influencing factors

Process – investigating

EARLY CHILDHOOD

- particular needs that may be met by technologies (eg ways to cross a river)
- technology has been developed over time to meet human needs and wants
- particular technologies are very important in the way humans live
- individuals make different choices about technology based on what they think is important (according to their values, attitudes and beliefs)

MIDDLE CHILDHOOD

- certain technologies might apply in particular circumstances (eg how people keep warm in cold climates)
- ways to examine and evaluate technologies in the light of how needs and wants are met
- factors affecting technology development (eg availability of materials and tools, and personal skills, as well as the values, attitudes and beliefs of creators and users)

Materials

EARLY CHILDHOOD

- different materials have different uses
- some materials are more appropriate for particular uses than others
- some materials have limited availability
- some materials can be reused and recycled

MIDDLE CHILDHOOD

- use of particular materials has evolved through history (eg the use of gold has evolved from mostly decorative to a high degree of functionality in electronics)
- product design is partially determined by availability and suitability of materials
- people use and select materials according to availability, needs and wants
- the appropriateness of materials for specific uses can be evaluated from various perspectives (eg energy consumption, environmental effects, cultural traditions)

Information

EARLY CHILDHOOD

- people use information for a range and variety of purposes (eg recreation, shopping, learning)
- people react to information in many ways (eg some people don't read the newspaper because it is too depressing, people often ignore advertisements on television)
- information can be owned and traded (eg books, cable television)

MIDDLE CHILDHOOD

- audience and context affect the construction of particular information products (eg the different ways news would be presented to a small group or a whole school assembly, the age of intended readers of a book)
- information is not the same as truth (eg music can change emotional reaction to a documentary, facts can be selected when reporting)

Systems

EARLY CHILDHOOD

- systems play an important role in everyday life (eg people would not receive letters without a postal system)
- systems surround us and we constantly interact with systems (eg viewing television is interacting with a system)

MIDDLE CHILDHOOD

- systems have been developed over time to satisfy human needs and wants
- systems change according to different needs and wants

EARLY ADOLESCENCE	LATE ADOLESCENCE
The focus for learning in this phase is on: • the relationships between context and technologies • technology development through history and how needs and wants can be met in different ways • the appropriateness of particular technologies to different communities and environments • social, cultural, environmental and ethical impacts and issues	**The focus for learning in this phase is on:** • how technological development is a function of the complex interrelationships between the values, attitudes and beliefs of users and developers • the costs, benefits and impacts of technology on individuals, communities and societies • economic, social, cultural, ethical, legal, political and environmental issues
Process – investigating • how to examine and evaluate technologies with an understanding that needs and wants can be met in different ways • features of technologies are developed, adapted and used according to a range of interrelated factors (eg technical and economic criteria, the values, attitudes and beliefs of creators and users, environment, energy efficiency, and cultural, ethical and gender implications)	**Process – investigating** • how to examine and evaluate technologies with an understanding that needs and wants are related to the values, attitudes and beliefs of developers and users
Materials • material availability is dependent on various factors (eg distribution channels, geographic location, economic viability) • changes in the production and use of particular materials through history have often been in response to prevailing needs, wants, resources and circumstances (eg certain metals and alloys such as steel for sword making were developed in response to military needs and historical events)	**Materials** • governments may seek to exert control over the availability, use and production of certain materials for a range of reasons (eg Japan has limited the importation and regulated the production of rice to protect cultural traditions and maintain self-sufficiency) • individuals, households and communities have certain values, attitudes and beliefs which impact in complex ways on the processing and use of particular materials (eg the use of hemp in fabrics has been limited by its association with cannabis)
Information • information forms are tailored according to context, and forms evolve as contexts change • the control of information may represent economic and political power (eg governments control and sell broadcasting licences, censorship in times of war) • information can be biased to achieve a purpose (eg selective choice of detail, translation)	**Information** • information forms, styles and presentations are influenced by the values, attitudes, beliefs, experiences and environment of the audience • the role of information in society can be monitored and influenced by governments and market forces (eg legislators may seek to control the scope and use of Internet technologies)
Systems • particular systems have changed over time, and such change occurs as adaptation to short and long-term needs and wants • there are historical gender links to particular systems (eg women were typically associated with systems connected with domestic roles and men associated with mechanical systems)	**Systems** • the principles, structure, logic, organisation and control of systems influence their impact on people, communities and the environment • adoption and use of a system are determined by the degree to which the benefits to individuals, communities and societies will outweigh costs

Consequences

EARLY CHILDHOOD	MIDDLE CHILDHOOD
Students should be taught:	
Process – investigating	Process – investigating • social and environmental effects of technologies (eg energy usage)
Materials • environmental and safety issues accompany the use of particular materials • the type of materials impacts on how and when they may be used	Materials • particular materials may pose safety hazards in processing and working • needs and wants may impact on the development of new materials and processes (eg the fashion in timber flooring promoted the development of synthetic laminates) • new materials impact on needs and wants (eg tobacco products created their own market)
Information • information impacts on people's daily lives in many ways (eg paying bills, receiving letters, writing) • information might not always be useful (eg junk mail)	Information • the impact of information on particular groups in society (eg the benefits to scientists through exchange of ideas on the internet, shoppers getting the best prices through newspaper advertisements) • ethical and legal issues relevant to information (eg privacy, copyright, censorship)
Systems • some systems have issues of safety such as an electrical system • some systems result in unforeseen consequences, such as being hard for people to use (eg public transport systems having complex, culturally specific timetables)	Systems • systems can impact on society (eg the invention of traffic lights impacted on transport in cities) • systems can impact on the environment (eg power generation systems produce varying amounts of greenhouse gases)

EARLY ADOLESCENCE	LATE ADOLESCENCE
Process – investigating • the appropriateness of particular technologies to different communities and environments (eg literacy level of intended users)	**Process – investigating** • ways to identify and use specific criteria when examining the economic, environmental and cultural appropriateness of technologies, keeping in mind personal, local and global impacts • the direct and indirect costs and benefits of technologies
Materials • the use of certain materials may have social impacts (eg the use of certain fertilisers in rice growing has increased productivity and thus reduced child mortality) • the use of certain materials may have environmental impacts (eg the use of CFCs as refrigerants has climatic consequences) • needs and wants may develop in response to the production and use of certain materials (eg the development of nylon, as an alternative to parachute silk, led to a substantial market for nylon fashion goods)	**Materials** • complex market forces can influence the use and production of materials (eg companies may seek to control and limit the availability of certain materials to increase price through scarcity such as when the diamond market has been subject to manipulation) • interested parties (eg designers, makers, consumers) have competing needs and wants which may impact on the selection and use of materials and related products, processes, services and environments (eg a car maker may seek to minimise costs, whereas consumers may demand expensive safety devices)
Information • broad social impacts associated with information (eg the invention of the printing press affected literacy levels) • issues of social justice associated with information (eg equity of access to online technology) • implications, ethics and practicalities associated with copyright and patent law • potential consequences of the development of specific information technologies (eg threats to privacy)	**Information** • the influence and impact on society of information as a global commodity (eg the rise of internet commerce) • information's role in society can be positive or negative (eg the boundary between news and propaganda) • specific controls and practices associated with information to address practical, social and ethical issues (eg identity theft, metadata) • information products are subject to extensive laws and regulations (eg intellectual property, libel)
Systems • there are ethical and social issues associated with systems (eg genetic modification of foods) • there are environmental issues associated with the operation and maintenance of systems, particularly in regard to choices of energy source and waste disposal • systems interact with people and the environment in a variety of complex and often conflicting ways (eg the construction of a freeway system might improve road congestion problems but reduce the economic viability of public transport)	**Systems** • the costs of systems to individuals, communities and societies include economic costs, particularly of energy, and environmental costs such as pollution • there are cultural implications for individuals, communities and societies when systems are developed and adopted, including changes to the nature of work, gender roles, and political systems. (eg the introduction of mechanised agricultural systems contributed to the demise of feudalism)