TECHNOLOGY

Years 1 to 10 Sourcebook

Guidelines

These sourcebook guidelines should be read in conjunction with the following Queensland Studies Authority materials:

Years 1 to 10 Technology Syllabus

Initial In-service Materials

Years 1 to 10 Technology Sourcebook Modules

Years 1 to 10 Technology CD-ROM

Inquiries should be addressed to:

Queensland Studies Authority, PO Box 307, Spring Hill, Queensland 4004 Australia
Phone: (07) 3864 0299. Fax: (07) 3221 2553
Website: www.qsa.qld.edu.au
Email: office@qsa.qld.edu.au

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Introduction

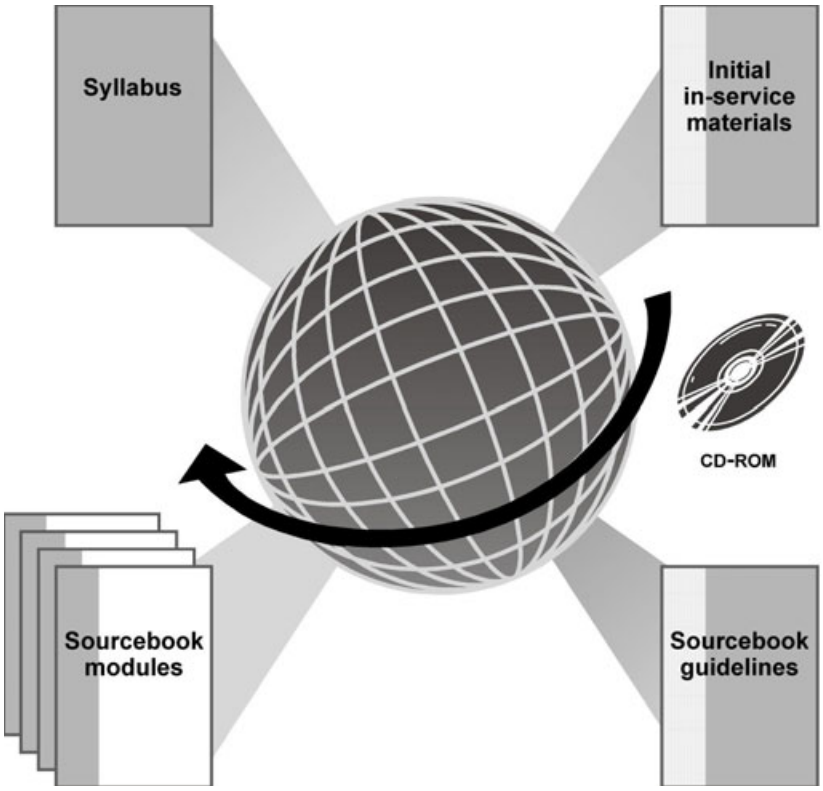
Purpose of the sourcebook guidelines

The *Years 1 to 10 Technology Sourcebook Guidelines* have been developed to assist teachers to implement the Queensland *Years 1 to 10 Technology Syllabus*.

The sourcebook guidelines provide information about:

- the nature of the Technology key learning area
- learners and learning in Technology
- the scope and sequence of learning outcomes
- planning for learning and assessment
- curriculum evaluation.

The sourcebook guidelines are part of a multimedia resource that includes the syllabus, sourcebook modules and initial in-service materials. These materials are published in printed and electronic formats and are supported by the Technology CD-ROM and website (www.qsa.qld.edu.au).



Suite of Technology curriculum materials

Syllabus

The syllabus outlines the rationale of the key learning area and its contribution to the Years 1 to 10 curriculum. It describes key learning area outcomes, core learning outcomes and examples of foundation learning outcomes for the Technology key learning area. The syllabus also provides a framework for planning and assessment.

Sourcebook modules

The sourcebook modules provide teachers with a range of planning, learning, teaching and assessment ideas to assist students to demonstrate core learning outcomes. Modules focus on activities that provide opportunities for students to demonstrate core learning outcomes from the four strands of the Technology key learning area, as well as develop important knowledge, practices and dispositions related to the Technology key learning area.

A number of case studies have been included to provide insights into ways teachers could implement the Technology key learning area. These case studies focus on curriculum decisions that teachers made as they planned for, and assessed, learning outcomes in their own classrooms. They provide valuable insights into how teachers developed their own understandings about technology.

While the full set of Technology modules addresses core learning outcomes from the *Years 1 to 10 Technology Syllabus*, the modules do not cover all situations and contexts through which students could learn about technology. Each module demonstrates one way of planning and assessing learning outcomes in a given context. Teachers may use or modify these modules, or develop their own, to meet the specific needs and interests of individual students or groups of students.

Initial in-service materials

The initial in-service materials assist teachers to develop an understanding of the 1 to 10 curriculum and the Technology key learning area, as well as to develop curriculum programs consistent with the syllabus and effective teaching practice. The initial in-service materials support teachers to develop understandings of the Technology key learning area by:

- allowing teachers to investigate areas of interest in relation to the syllabus and associated curriculum materials
- providing templates, resources and strategies for planning and assessment at individual, class and school levels
- exemplifying planning for learning and assessment in Technology
- providing examples of learning experiences that will assist teachers to understand the syllabus and associated curriculum materials and ways of adapting them to local needs and resources
- providing opportunities for teachers to consider their ideas and understandings about Technology.

Contemporary national and international models of technology education inform the Technology key learning area curriculum materials. The curriculum materials are also informed by advice gathered from teachers, school administrators and school authorities during the trial and pilot of the draft *Years 1 to 10 Technology Syllabus*. In addition, the following references were drawn on during the Technology Curriculum Development Project:

Approaches to Enterprise Education 1995, Curriculum Corporation, Carlton, Vic.
P–10 Curriculum Framework 1999, unpublished, Queensland School Curriculum Council, Brisbane.
A Statement on Technology for Australian Schools 1994, Curriculum Corporation, Carlton, Vic.
Taking on Technology: A Resource Kit for Teachers 1996, EQ, Brisbane.
Teaching Technology: A Resource Kit for Teachers 1997, EQ, Brisbane.
Technology: A Curriculum Profile for Australian Schools 1994, Curriculum Corporation, Carlton, Vic.
Technology Education for Early Learners 1997, Department for Education and Children's Services, Adelaide.
Using the Technology Profile 1995, Curriculum Corporation, Carlton, Vic.

Nature of the Technology key learning area

The purposes of the Technology key learning area

The Technology key learning area has a strong foundation in primary school education. It draws on traditions in early childhood education and builds on programs and approaches that emphasise thinking skills and problem solving. Learning in the Technology key learning area is valued for its practical approach.

The Years 1 to 10 Technology key learning area embraces some learnings that traditionally have been included in lower secondary subjects such as Agricultural Science, Business Studies, Home Economics, Information Technology and Design. It also includes learnings in other subjects such as Environmental Studies, Graphics, and Marine Studies. Courses of study in these subjects may include Technology core learning outcomes. Different sets of learning outcomes can be selected depending on the connection of the subject to particular strands of the Technology syllabus. It is possible that some lower secondary students will choose different combinations of subjects.

Active nature of learning in technology education

Technology education makes important links between student learning and the many ways in which people, as part of their daily lives, design and develop, access and use technology. Students are actively engaged in learning in real-life and lifelike contexts in technology when they take on roles as designers, decision makers, managers, producers and consumers.

As designers, students can generate and critique design ideas and processes and communicate their thinking by using language, notational and symbol systems appropriate to technology. They may source and synthesise knowledge, ideas and data in order to meet design challenges and reflect upon the impacts of past, current and future products of technology. The examination of diverse solutions to design challenges provides opportunities for students to consider the use of materials, information and systems used to meet needs and wants or to capitalise on opportunities.

As decision makers, students collaborate with others to select preferred options towards appropriate technological futures. The importance of considering different viewpoints is reinforced as students make decisions by balancing possible alternatives against potential impacts and consequences of technology. Students consider impacts and consequences in terms of their aesthetic, cultural, economic, environmental, ethical, functional or social appropriateness.

As managers, students plan for the responsible and efficient use of technology. Through cooperation and communication, they learn different approaches to meeting design challenges. Students are required to meet design challenges, plan and undertake production processes within set budgets and time constraints, and use equipment safely.

As producers and consumers, students become well informed about past, contemporary and emerging technology. They develop critical understandings about the processes used to design and develop products by responding to needs, wants and opportunities. As producers and consumers students recognise the limitations of technological solutions to some situations, problems or tasks. They develop their own understandings about the effectiveness and

efficiency of products and processes and consider the roles of technology in enhancing the likelihood of socially just and ecologically sustainable futures.

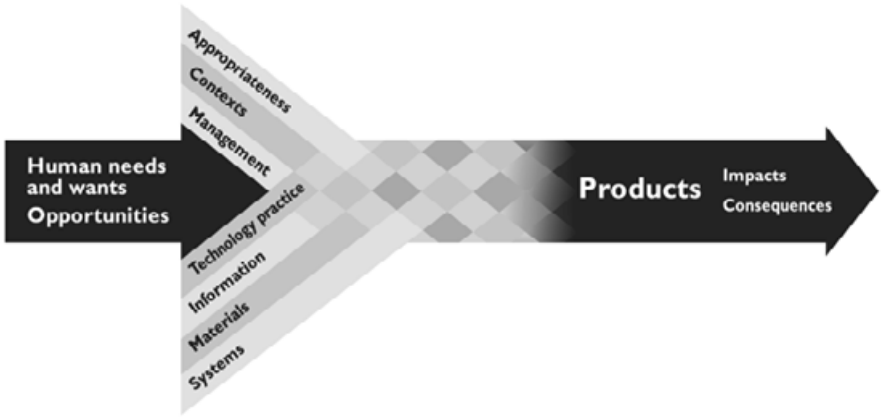
The practical and multi-dimensional nature of technology education caters for a range of interests and learning styles. The key learning area encourages students to become actively involved in initiating, designing, creating and using technology. It provides a framework for the development of students' decision-making abilities by allowing them to take reasonable risks in the search for ideas and solutions to design challenges. It provides opportunities for students to develop technology-related knowledge, practices and dispositions as they build, create and contribute to the world around them in tangible ways.

'Working technologically'

The *Years 1 to 10 Technology Syllabus* describes what students do to develop products[1] in response to needs, wants or opportunities as 'working technologically'. 'Working technologically' is the term used in the syllabus, and related curriculum materials, to describe a way of working that interweaves technology practice, information, materials and systems with considerations of appropriateness, contexts and management. When 'working technologically' students have the opportunities to learn in authentic contexts as they consider issues related to real-life and lifelike situations.

By 'working technologically' students develop knowledge, practices and dispositions that enable them to identify and capitalise on opportunities in innovative, creative or practical ways. They create products in response to needs, wants or opportunities, and evaluate their products and those of others. They also consider the impacts or consequences of such products on individuals, communities and environments.

The diagram below has been used in the *Years 1 to 10 Technology Syllabus* to illustrate the process of 'working technologically'. It shows how a human need, want or opportunity may have a technology demand to which students can respond. They do this by drawing on their technology-related knowledge, practices and dispositions. The diagram indicates that the process of 'working technologically' may be ongoing and that the design and development of products have consequences or impacts that may, in turn, lead to new needs, wants or opportunities.



Model of 'working technologically'

[1] Products may include artefacts, processes, systems, services and environments.

Strategies that teachers can use to promote 'working technologically' include encouraging students to:

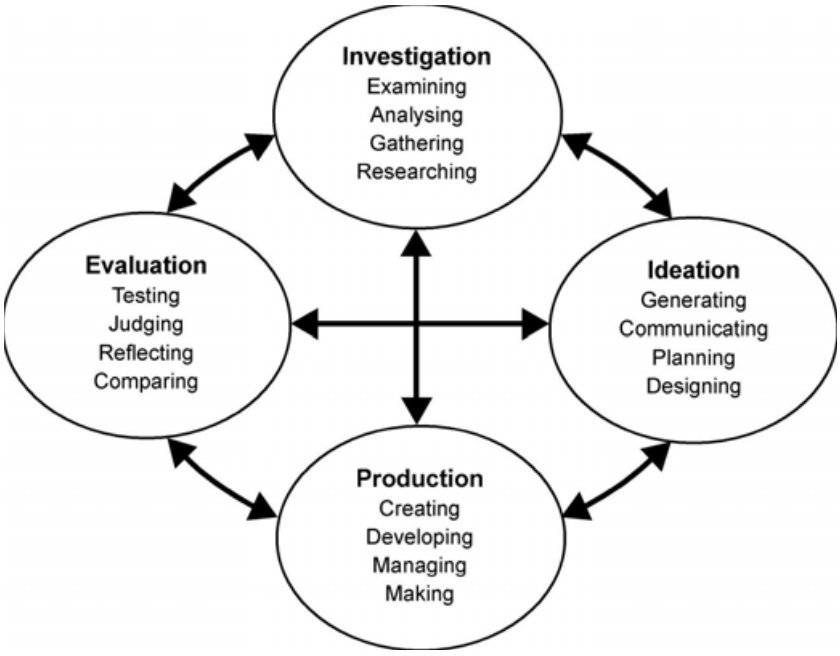
- consider different aspects of design challenges in terms of appropriateness, contexts and management
- make decisions about the use of technology practice, information, materials and systems in meeting a need, want or opportunity
- make choices and value judgments about the impacts and consequences of the processes and products of technology.

When 'working technologically' students need to consider the interrelationships that exist between technology practice, information, materials and systems.

Technology Practice

Technology Practice can be seen as the design element of 'working technologically'. It refers to the actions and interactions of investigation, ideation, production and evaluation that people engage in when they design and develop products. These actions and interactions may be undertaken in iterative, cyclical and recursive ways which means that any one action may be visited any number of times and in any order. It also means that the order of the interactions between investigation, ideation, production and evaluation may be different every time an individual or group is involved in 'working technologically'.

The diagram that follows has been used in the syllabus to explain the dynamic relationships between investigation, ideation, production and evaluation. It shows that a pathway can be followed from any one action to any other action or series of actions.



Technology Practice: Actions and interactions

Information

Information is the purposeful organisation and communication of data. It can be stored, retrieved and communicated in printed, pictorial, numerical, graphical and electronic forms. There are many different sources from which information originates and is gathered.

Materials

Materials are the resources used to create products. They have a range of characteristics that determine their suitability for certain purposes. Students require understandings about the nature of materials and ways they can be manipulated.

Systems

A system is a combination of components that work together to achieve a specific purpose or goal. Systems consist of inputs, processes and outputs. System components may function in simple or complex ways. Systems have structures, or purposeful organisation and functions that can be described and represented by such things as flowcharts, models and schematic diagrams. Systems and subsystems are products of technology, as well as being important in the development and modification of technologies.

Students consider *appropriateness*, *contexts* and *management* when 'working technologically'.

Appropriateness

The development of products to meet needs, wants or opportunities is a human activity and as such is influenced by the values of people and societies. These values may lead to the development and uses of products that have favourable, neutral or adverse effects on different individuals, communities and environments. When developing or using technology, students need to be aware of the possible effects that their ideas, actions and products may have and should use this awareness to inform their decision making.

When 'working technologically' students are provided with opportunities to consider the aesthetic, cultural, economic, environmental, ethical, functional and social appropriateness of products. As a result of considering appropriateness over time, students develop knowledge, practices and dispositions about technology and the impacts it can have on individuals, societies and environments.

Strategies that teachers can use to promote considerations of appropriateness include encouraging students to:

- question the influences technology has on societies and question the values that underpin the development of technological solutions
- make decisions based on consultative and collaborative processes aimed at gathering relevant information
- recognise the influences technology has on change by reflecting on the history of technology in different societies, and envisioning and evaluating preferred futures when 'working technologically'
- identify advantages and disadvantages that technology can bring to individuals, societies and environments
- balance impacts and consequences to make decisions about processes and products when 'working technologically'.

When students design and develop products, or critique the impacts and consequences of technology on individuals, societies or environments, they make use of the seven aspects of appropriateness as identified in the *Years 1 to 10 Technology Syllabus*.

Aspect of appropriateness	Description
Aesthetic	An understanding of aesthetic appropriateness allows students to make judgments about products and their uses in terms of touch, taste, sound, sight, smell and use of space. Such an understanding assists students to develop an appreciation of the needs and wants of others.
Cultural	An understanding of cultural appropriateness allows students to make judgments about the dynamic relationships between beliefs, nuances and practices of different cultural and ethnic groups, and the effects that a product or a process may have on those groups.
Economic	An understanding of economic appropriateness allows students to make judgments about immediate and long-term costs to individuals and environments resulting from the application of technology and the impacts of those costs over time. Students can evaluate the financial and resource implications that the process of developing products may have on people and places.
Environmental	An understanding of environmental appropriateness allows students to make judgments about the beneficial and non-beneficial environmental consequences resulting from the development of products. They develop responsible attitudes towards sustainable ecological development within a futures perspective.
Ethical	An understanding of ethical appropriateness allows students to make judgments about how personal and shared beliefs affect the application of technology. Such an understanding allows students to develop and use ethically appropriate processes and products.
Functional	An understanding of functional appropriateness allows students to make judgments about how well products fulfil their intended purposes. An understanding of functional appropriateness over time may also involve students in making decisions about the safety and efficiency of technology.
Social	An understanding of social appropriateness allows students to make judgments about the needs and conventions of societies, and their sub-groups, and the effects that the application of technology has on these groups. Students come to understand the mutual relationships that exist between technology and communities and they explore issues related to community, heritage, intellectual property, security, privacy, personal ability and gender.

Contexts

Products of technology are designed, created, modified or used in all aspects of human endeavour. Students should be given opportunities to identify and respond to real-life or lifelike design challenges in a variety of broad, overlapping contexts. This provides an authentic background in which students can construct understandings about technology and the effects that contexts may have on their decisions.

Some students may work in several contexts simultaneously. These may include personal and global contexts, as well as contexts of agriculture, business, community, home and family, industry, leisure and recreation, and school. The activities students are involved in as they ‘work technologically’ are often derived from different topics, which in turn are framed by a context or number of contexts. The following table highlights units that could relate to one or more contexts. However, certain activities and units could be grouped differently as they may relate to more than a single context.

Context	Sample unit	Sample activities
Personal	health and wellbeing	diet, clothing, personal appearance
	family occasions	food preparation, celebrations
Global	environments	online communities, global warming, alternative energy, Landcare
	development	stock market, Young Achievers Australia, CREST (Creativity in Science and Technology — CSIRO initiative)
	partnerships	global economies, space exploration, future studies
	systems	communication, Internet and web development, resource management
	design	architecture, web design, interior design, energy use and solar design, clothing
Agriculture	hydroponics	growing lettuce
	horticulture	market garden, tomatoes for school fete, orchids, home gardening
	animal management	school cattle stud, holding yards, beekeeping, domestic animal care
	farming	equipment and maintenance, irrigation, crop production
	native plant production	rainforest garden, riverbank regeneration
Business	marketing	multimedia presentations, advertising, personal résumés
	money management	budgeting, financial planning
	management	financial reports, business plans, human resource management
	information management	filing and storage, databases, programming, communication systems
Community	community	fundraising, newsletter, radio station, small business ventures, school partnerships, school canteen
	town planning	waste management, transport and traffic control, parks and gardens, skate parks
	management	budgeting, community systems and services, youth issues
	services	clubs and societies, childcare, online communities
Home and family	safety	home maintenance, home security
Industry	manufacturing and engineering	furnishings, production lines
	production and fabrication	fabrics and textiles, woodworking, plastics, metal work, production-line planning, catering
	biotechnology	plant propagation, yoghurt making, ginger-beer making
Leisure and recreation	sports and games	water sports such as sailing, rules for ball games, playground planning, board games, design theme parks
	recreation activities	kite construction, model cars, interior design, hobbies, electronic games, film making, gardening
School	occasions and celebrations	graduation ceremonies, drama productions, special days, rock eisteddfod, open days
	environments	school litter, landscaping, class restaurant, camps, classroom layout and design
	publishing/desktop publishing	school newspaper, magazines, books, multimedia resources

Management

In Technology, students manage the drawing together of ideas, resources, knowledge and skills. As students progress from Level 1 to Beyond Level 6, they take on increasing responsibility for the management of projects. Technology education offers students unique opportunities to explore and develop their organisational skills as they manage people, resources, opportunities and constraints.

Managing people involves:	
Managing oneself and others	Technology often requires people to work in collaboration and cooperative partnerships and teams. Students work individually or as a team member to extend their capabilities to design and develop products. Interpersonal management skills are developed in a practical manner as students manage their own projects to completion.
Working collaboratively in teams to design products	To work effectively as members of teams, students must be able to: • work collaboratively • share equipment and working space • manage the work area safely • take responsibility for themselves and others • negotiate steps for the completion of tasks that establish systems to facilitate desired outcomes and measure success.
Managing risk, health and safety	The practical nature of Technology requires that students use a wide variety of equipment and resources. Technology projects and activities may require simple equipment or materials such as scissors, tape or paint, through to hand and power equipment including saws, sewing machines and computers, and large machinery such as tractors. *Student responsibilities* The requirement for students to work safely and develop an awareness of health and safety issues should be inherent in all design challenges. Students need to identify and minimise potential hazards for themselves, their peers and end users. Students need to consider these issues, and adopt safe procedures as a matter of course when designing products. While undertaking Technology activities, students should be able to explain how they have considered and addressed health and safety issues related to design challenges. *Teacher responsibilities* Teachers have obligations under workplace health and safety regulations to ensure that, with all activities undertaken, potential hazards are identified and strategies are implemented to minimise risk to students and others. Risk analysis should be done in reference to relevant school authority policies.

Managing resources involves:	
Managing materials, information and systems	Students identify and use a range of resources to develop products. The planned and informed use of resources results in minimisation of waste, efficiency of processes and effectiveness of products. As students progress from Foundation Level to Beyond Level 6 they should take responsibility for selecting resources and evaluating their use in meeting needs, wants or opportunities.
Assuring quality products	Students evaluate their own and others' design ideas and products based on criteria defined by themselves or others. As students progress from Foundation Level to Beyond Level 6, they become more aware of industry standards and how these assist in maintaining standards and protecting consumers. This information may be derived from professional associations and trade bodies.

Managing opportunities involves:	
Enterprise	Enterprise is regarded as a set of qualities and competencies that enable individuals, organisations, communities and cultures to be flexible, creative and adaptable to change. Enterprise in technology involves the following in a wide range of living and working contexts: • using imagination • identifying ideas and putting them into practice • using initiative and drive • being creative and innovative • taking a risk and learning from the experience • taking responsibilities • being positive and flexible • making decisions and solving problems • planning, managing and organising action • communicating and negotiating with others • managing resources, people and time • working cooperatively • reviewing and assessing.
Marketing	Students develop ideas and strategies for gaining maximum impact of their design ideas and products. Opportunities should be provided for ideas and products to be tested in the marketplace. This may involve investigating a business opportunity, devising a business plan, producing a product or service, devising a marketing plan, participating in product or service delivery, recording and reporting on profit and loss, and reflecting on and evaluating achievements and successes.

Managing constraints involves:	
Time	Students need to be aware of the time implications that may be involved in completing a project. Timelines, sequencing of stages and setting goals should be considered an important part of project management. Students and teachers need to recognise the creative opportunities and limitations that may exist in schools.
Budget	Students should develop a growing awareness of financial implications involved in completing projects, and be encouraged to develop knowledge, practices and dispositions related to budgeting. These understandings should be used to make decisions about appropriate courses of action that could include selection of resources, acceptance or rejection of a particular idea or assessing the viability of a project.
Audience needs and requirements	Students need to be aware of the needs and wants that can be met as well as opportunities on which they can capitalise. Students must take into consideration how well they have met audience needs and requirements when evaluating products and processes.

Contribution of the key learning area to lifelong learning

The Technology key learning area contributes to general education by providing students with opportunities to learn in, through and about technology. Students engage in activities through which they may develop the valued attributes of a lifelong learner identified in the syllabus.

A lifelong learner is described as:

- a knowledgeable person with deep understanding
- a complex thinker
- an active investigator
- a responsible creator
- an effective communicator
- a participant in an interdependent world
- a reflective and self-directed learner.

The sourcebook modules support students' development of the valued attributes of a lifelong learner by actively engaging them in problem-solving and decision-making strategies. The activities in the modules assist students to develop technology-related knowledge, practices and dispositions as they work in a range of contexts that have technology demands.

Cross-curricular priorities

The Technology key learning area incorporates the cross-curricular priorities of literacy, numeracy, lifeskills and a futures perspective.

Literacy

Learning in the Technology key learning area provides opportunities for students to develop literacy practices in practical situations. These practices involve speaking and listening, viewing and shaping, writing and reading, and are developed when students are 'working technologically'.

Students will develop literacy practices by:

- negotiating tasks, ideas and individual and team roles by offering and responding to written and spoken advice
- reporting on the development and evaluation of ideas, plans, processes and products informally or formally using strategies such as design proposals, Technology project folios, journals, brochures of multimedia presentations
- persuading audiences by targeting information to particular groups
- shaping information to affect how people view themselves and others
- representing and communicating design ideas using models, drawings, flowcharts and plans
- responding critically to the generation, presentation and use of information and suggesting alternative ways of presenting information for different audiences
- communicating their ideas using the language and symbol systems related to appropriate fields of technology
- questioning the cultural and social practices embedded in various kinds of texts.

Teachers provide opportunities for the acquisition of these practices by:

- modelling the language and symbol systems related to different fields of technology
- planning activities for students to express their understanding of literacy in contexts that may not be seen as overtly literacy based
- modelling and teaching aspects of literacy used in technology such as negotiating design challenges, developing production procedures, communicating ideas using appropriate terms and conventions
- assisting students to reflect upon products of technology in relation to the cultural and social contexts in which they are made
- encouraging students to structure ideas and communicate meaning in, through and about technology
- encouraging students to make informed interpretations and judgments about their products and processes.

Numeracy

Engaging in real-life and lifelike experiences enables students to develop numeracy-related knowledge, practices and dispositions in practical situations. The knowledge, practices and dispositions involve the use of number, space, measurement and data.

Students develop and enhance numeracy as they:

- access and analyse information needed to undertake design challenges or to define needs and wants

- accurately collect, record and collate data and statistics to trial, modify or refine products
- use measurements, views, scales, graphs or patterns to present information for themselves and others
- assemble three-dimensional models and draw two- and three-dimensional plans to communicate design ideas
- estimate, measure or calculate quantities to efficiently and accurately manage resources
- compare and combine materials or resources to match particular needs or to enhance desirable characteristics
- communicate ideas using the standards and conventions of numerical language and symbol systems related to fields of technology.

Teachers provide opportunities for the acquisition of these practices by:

- modelling the numerical language and symbol systems related to different fields of technology
- helping students to recognise when numeracy practices can be applied
- planning activities for students to express their understandings of numeracy in contexts that may not be seen as overtly numeracy based
- modelling and teaching aspects of numeracy used in technology such as techniques for gathering data, calculating amounts including estimation and measurement, and accurately representing ideas including scaling and making models.

Lifeskills

The Technology key learning area provides students with opportunities for the development of lifeskills in real-life and lifelike contexts. Lifeskills describe the knowledge, practices and dispositions considered necessary for people to function adequately in their contemporary and changing life roles and situations. Knowledge, practices and dispositions involve personal development skills, social skills, self-management skills and citizenship skills.

- Students develop and enhance their *personal development skills* as they reflect on, and critically evaluate and respond to, the relationships between themselves, societies and new products.
- They develop and enhance their *social skills* through teamwork, which encourages cooperative learning, effective communication and conflict resolution strategies to solve problems.
- They develop and enhance their *self-management skills* when they recognise that time and budgetary constraints affect how and which resources are selected and used.
- They develop and enhance their *citizenship skills* when they:
  - make decisions about the impacts and appropriateness of technology on individuals, societies and environments
  - build partnerships through consultation with peers, community members and interest groups.

Teachers provide opportunities for the acquisition of lifeskills by:

- encouraging students to make decisions about the products of technology by promoting identification of and reflection on alternative viewpoints
- creating stimulating environments for students to meet needs, wants or opportunities across a range of contexts
- planning real-life and lifelike activities that require students to communicate ideas, manage resources and interact with others
- modelling strategies that promote risk taking, creativity, flexibility, negotiation and effective decision making about the impacts of technology
- planning activities that develop students' capabilities in the use of tools and equipment.

Futures perspective

The Technology key learning area provides opportunities for students to develop knowledge, practices and dispositions related to making decisions about their own preferred futures. A futures perspective involves using knowledge, practices and dispositions for the identification of possible, probable and preferred individual and shared futures. Students are challenged to think ahead about their futures, make decisions about their preferred futures, and put into action strategies that help them work towards these futures.

Students have opportunities to develop a futures perspective as they:

- examine the values underlying decisions made about technology and the roles they have in making these decisions
- develop products and accept responsibilities for consequences arising from technological change that may arise from these products
- analyse interrelationships between technology and societies and consider how past products of technology have impacted on and influenced societies
- reflect on their own use of processes and resources to develop products and describe how these products impact on their own futures
- discuss short-term and long-term effects of contemporary technological solutions and how they relate to the major dilemmas of our present period of history.

Teachers provide opportunities for the development of a futures perspective by:

- planning activities that encourage students to consider values which underpin the development of products
- assisting students to make connections between their design ideas and past and present futures
- providing students with a variety of contexts in which to make decisions about their own preferred futures
- modelling decision-making processes and planning strategies that consider short-term and long-term impacts and consequences of products and processes.

Learners and learning in Technology

The Technology key learning area promotes learning in, through and about technology through the process of 'working technologically'. This process involves learners in the construction of meaning as they develop products to meet needs, wants or opportunities. The engagement of learners in this process will differ depending on their individual and group circumstances.

Characteristics of learners

The physical, emotional, intellectual and social characteristics described below are included to assist teachers to enhance their understanding of learners during different bands of schooling. These general characteristics provide the framework for the developmental sequence of the learning outcomes in the Technology key learning area.

Teachers should be aware that generalised characteristics are not sufficient to communicate the complex nature of learners and learning. When planning learning experiences and assessment opportunities, teachers' understandings about general characteristics should be supported by:

- information about prior and current learning and life experiences
- understandings about interacting cultural, social, geographic, ethnic and linguistic backgrounds of individual learners
- understandings that learners will communicate their knowledge, practices and dispositions about technology in various ways.

Early primary learners

Young learners are typically interested in the interactions and environments that surround them. They use a variety of strategies that involve them actively in the social construction of meaning and exploration of their surroundings. At school, young learners build on prior knowledge to find out about themselves and the designed world they live in. They are active and competent learners and make meaning in environments where they can work individually as well as with others. Resources such as time and equipment are used flexibly to encourage learners to make choices and develop a sense of control over their learning. They engage in spontaneous and planned activities in open-ended situations or guided approaches to meet particular purposes. Learners in the early primary years have an intense interest in self-chosen tasks where they can explore ideas in purposeful contexts. They are developing fine- and gross-motor control and enjoy the independence they gain as they master various skills and processes.

As learners in early primary participate in Technology activities, they may:

- begin to develop understandings about interactions that take place between technologies and societies and the effects that technology has on people's lives
- identify and reflect on needs and wants important to them based on personal experience and interests
- develop products that are meaningful to them and evaluate how other products may meet their own needs and wants
- consider the functions and characteristics of equipment and resources in structured and unstructured activities
- experiment with a range of ways to communicate ideas and intentions and explore ways in which other people present ideas.

Middle primary learners

These learners are taking tentative steps towards operating in a world of adults, often with less scaffolding than has been previously provided during their earlier years. They are developing deeper understandings about appropriateness, contexts and management as they work cooperatively with peers to make simple, responsible decisions about meeting needs and wants. They can respond to several variables, but may be unable to perceive a relationship between them. Learning may occur as part of direct experience, with thinking processes supported by involvement in real-life and lifelike activities. Learners investigate and discover ideas that may stem from experiences outside their own personal experience. Interest is shown in the perspectives of others and they can express empathy in situations to which they relate. Their physical abilities are continuing to develop and they may be able to accurately and safely use some equipment and tools.

As learners in middle primary participate in Technology activities, they may:

- explore needs and wants beyond their personal experiences and look at the consequences that arise out of meeting design challenges
- judge the feasibility of their ideas and communicate them in various forms — for example, oral, written, graphical or material forms
- use simple plans to convey ideas, intentions and procedures related to meeting needs and wants
- work individually and with others in undertaking design and production tasks and to evaluate and reflect upon technology.

Upper primary learners

These students may be encountering physical and emotional challenges brought on by puberty. Growth rates start to differ between boys and girls. Students may be engaging in, and solving, complex and challenging tasks, which may be theoretical or practical. A willingness to increase independence may become more prominent in social and learning environments and can be nurtured through involvement in decision-making processes. They can evaluate their own and other people's perspectives with the view of identifying possible consequences or impacts. Students use self-reflection to make judgments about practices and processes of technology and the influences it has on diverse communities.

As learners in upper primary participate in Technology activities, they may:

- consult with others to explore needs, wants and opportunities and to judge consequences that may arise from feasible solutions
- develop views about appropriate applications of products and processes of technology and therefore become more discerning when evaluating their own or others' work
- work cooperatively to translate needs, wants or opportunities into achievable goals and develop proposals to carry them out
- decide on the most appropriate techniques to manipulate and process different resources and use these to realise design ideas.

Lower secondary learners

These students are becoming aware of their developing sexuality and growth as they move into adolescence. They enjoy increasing abilities to deal with abstract concepts and challenges and can reason hypothetically. They can recognise the rights and opinions of others and may use their sense of moral awareness and beliefs about social justice to question the role of technology in society. They begin to develop a detailed knowledge of the form and function of a wide range of specialised products and processes of technology. Learners are aware of a wider range of strategies for learning and they are able to reflect

upon their own learning with less guidance. Their insights into their own and others' learning, combined with understandings about their own interpersonal skills, may enable them to work independently or as effective members of teams.

As learners in lower secondary participate in Technology activities, they may:

- broaden their abilities as they seek out knowledge and skills of others with expertise and apply this to their tasks
- draw upon knowledge, practices and dispositions of technology in order to refine products against original intentions
- use the language and symbol systems of technology to apply commercial and industrial standards
- develop their own criteria for judging the appropriateness of their products and use these to evaluate the suitability of products.

Using a learner-centred approach

A learner-centred approach to learning and teaching views learning as the active construction of meaning, and teaching as the act of guiding and facilitating learning. This approach sees knowledge as being ever-changing and deepening, built on prior experience and emerging perspectives and evidence. A learner-centred approach is underpinned by understandings about learners' development, interests, needs, talents and diverse cultural and social backgrounds.

Teachers make learning meaningful to students by:

- encouraging students to be active constructors of meaning
- emphasising the process of metacognition
- involving students in cooperative learning
- adopting inclusive curriculum practices.

Active construction of meaning

Learners have prior knowledge, practices and dispositions that have been influenced by their individual social and cultural backgrounds. When teachers acknowledge, value and accommodate a student's prior knowledge, practices and dispositions, it becomes possible for the student to actively construct meaning in Technology.

Some strategies that teachers can use to scaffold the active construction of meaning in Technology include:

- providing opportunities for learners to collaborate in order to meet design challenges
- scaffolding learning through interactions with more experienced peers or adults
- developing shared understandings about what it is students need to know and do with what they know
- developing a learning environment that is responsive to learners' needs by involving them in real-life or lifelike contexts
- structuring learning so that the technology demand is appropriately challenging
- encouraging learners to develop their own design ideas by adjusting the amount of teacher intervention as appropriate
- encouraging learners to participate as independently as possible in meeting design challenges by considering aspects related to appropriateness, contexts and management.

Metacognition

Metacognition is the process of thinking about thinking. Engaging in metacognition assists learners to develop deep and lasting understandings by internalising concepts that become the basis for further learning.

Metacognition is an ongoing process that can occur at any time — before, during or after learning experiences. This process of internalisation may be assisted through the refinement of ideas and practices through trial or testing; interactions with others using dialogue or group work; reflection on learning and life experiences; and transfer of knowledge from familiar to unfamiliar contexts.

Metacognition can be promoted by teacher modelling of metacognitive strategies — for example, framing questions that lead to self-reflection and self-knowledge.

In Technology, learners may:

- be assisted to reflect on practices and dispositions — for example, their role in teamwork
- identify the processes they are using when 'working technologically' and the effectiveness of their actions in terms of reaching their final goal
- plan and monitor their learning
- explore the consequences of different options
- identify links between choices, actions and results
- reflect on what has been done and learned.

Cooperative learning

Cooperative learning has long been recognised as a powerful learning and teaching strategy in Technology. Cooperative learning in Technology is both a strategy for maximising learning and a means of developing products to meet human needs and wants, capitalise on opportunities and extend human capabilities.

Cooperative learning supports the notion that each member of a group can succeed and that each member has something to offer. When students work cooperatively with peers, they can help each other understand information, support each other in achieving their goals, and give each other ideas and encouragement. When students work cooperatively with parents/carers, teachers, more experienced peers and school and community members, they access the diverse knowledge, skills and expertise, including direct and vicarious experiences, of a range of social and cultural groups.

Some strategies that promote cooperative learning include:

- cultivating a learning environment that supports cooperative attitudes and collaborative practices
- providing opportunities for group problem solving, investigating and decision making
- providing scaffolding for students to work in groups of different sizes and membership characteristics
- promoting self-reflection on cooperative attitudes and practices
- challenging learners to meet design challenges beyond their own personal experiences by providing opportunities for learners to consult with others
- involving people from the broader community in the learning environment
- encouraging peer assessment.

Inclusive curriculum practices

An inclusive curriculum ensures that the learning process is accessible and meaningful to all students. This involves identifying and overcoming barriers that limit participation in, and the benefits from, learning in Technology. These

include, for example, difference in learning styles, understandings, capability or skill levels.

Some students will require flexible pathways of learning and assessment as they demonstrate progress through the continua of learning in the Technology key learning area. Students with special needs or disabilities may need flexibility in the ways they demonstrate learning outcomes. This means that some students may demonstrate learning outcomes from different levels in the same or different strands.

The level statements at Foundation Level and some sample learning outcomes have been developed for learners with disabilities who are not yet demonstrating the core learning outcomes at Level 1. Teachers are encouraged to develop personalised learning outcomes for Foundation Level to suit the needs, interests and abilities of individual students.

Some strategies that promote inclusive curriculum practices include:

- acknowledging and respecting diversity by valuing the perspectives, contributions and experiences of all students and the communities in which they live
- providing learning environments that are supportive of students' involvement by accepting that learning in technology may occur in different ways
- catering for a range of abilities by planning across levels and by developing suitable Foundation Level outcomes that link to individualised curriculum programs
- providing learning experiences that develop students' acceptance of, and respect for, the diversity of people's achievements
- providing opportunities for students to demonstrate learning outcomes in a variety of contexts and through a variety of methods, and by using assessment techniques that take account of students' differences.

Equity in curriculum

The Technology key learning area supports and promotes the principles of equity. The Technology curriculum acknowledges the cumulative and interrelated impact of the social, cultural, geographic and economic circumstances on students' schooling experiences.

Learning experiences in the Technology key learning area can promote students' knowledge, practices and dispositions regarding equity. A focus for learning in the Technology key learning area is the rich and diverse development of technology across cultures and societies. An understanding of this diversity enables students to critically consider and analyse the aesthetic, cultural, economic, environmental, ethical, functional and social impacts and consequences of the processes and products of technology.

Learning about equity issues through Technology involves developing the knowledge, practices and dispositions necessary to:

- critique imbalances in power that arise in societies as a result of the products and processes of technology
- encourage tolerance of, and sensitivity to, individual differences
- encourage a climate of respect, valuing and understanding both within and beyond the school community
- encourage the development of positive self-esteem and gain greater understandings of students' life experiences
- recognise contributions made to technology by a range of cultures throughout history, including the diversity within and across cultures
- explore and critique the historical, social and cultural constructions of knowledge
- explore the impact differing values, morals, ethics and views have on

personal roles and relationships

- question social structures that may implicitly or explicitly disadvantage individuals or groups
- challenge, rather than accept or simply know about, social injustice
- explore contemporary social issues, and critique and challenge stereotypical constructions
- critique and challenge representations of Aboriginal and Torres Strait Islander peoples, including an analysis of misconceptions and stereotypes
- examine and challenge representations of women and men, masculinities and femininities, including the analysis of gender constructions, misconceptions and stereotypes
- challenge injustices of social and economic poverty and understand the power of social and cultural capital
- understand how valued knowledge and power relations affect individuals, groups, communities and societies
- analyse and challenge unequal power relations and knowledge that are valued within and across various groups of people
- question and challenge social contexts that inhibit full participation of particular groups or individuals with disabilities and learning difficulties.

Scope and sequence of learning outcomes

Outcomes approach

An outcomes approach to education defines the end product of education in terms of what it is that students know and are able to do with what they know. It is based on a belief that there are certain things that all students should learn and that these things, expressed as learning outcomes, should be made explicit to all concerned. This approach accepts that learning is progressive and that stages along a continuum leading to the desired learning outcomes can be identified. It emphasises the provision of activities that give students opportunities to learn and to demonstrate this learning. This approach places a high importance on relevant, real-life student-centred contexts, as well as on how and what students learn. These contexts are used to develop the knowledge, practices and dispositions they need now, and in the future, as lifelong learners.

In an outcomes approach to education, the emphasis is on what students learn, rather than on what they have been taught. Progressive monitoring of students' demonstrations of learning outcomes is vital to ensure that curriculum programs can be individualised to meet the particular needs of students.

An outcomes approach places high importance on learning in context as well as how learners make meaning and what they should learn. These contexts should be student-centred and reflect real-life and lifelike situations. They are used to link the knowledge, practices and dispositions that learners need in order to prepare for future learning and life beyond school.

Principles of an outcomes approach

The principles of an outcomes approach include:

- a clear focus on learning outcomes
- high expectations for all students
- a focus on development
- planning curriculum with students and outcomes in mind
- expanded opportunities to learn.

Clear focus on learning outcomes

This involves:

- focusing on demonstrations of learning outcomes rather than on the content being used in an activity
- students, teachers, parents/carers and members of the community knowing the outcomes that students are working towards
- students understanding the reasons for learning what they are learning.

High expectations for all students

This involves:

- recognising that all students can succeed
- challenging students to achieve high standards by providing experiences that promote learning
- giving students time to produce work of a high standard
- establishing clear expectations of student performance, including criteria, and referring to these when monitoring the progress of student learning.

Focus on development

This involves:

- a knowledge of students' progression along the outcomes continuum
- providing opportunities for self-assessment so that students can monitor their own progress
- a knowledge of the preferred learning styles of students
- the use of a wide range of strategies to cater for developmental differences and the prior knowledge and skills of students
- building comprehensive and cumulative developmental assessment using the techniques of observation, consultation, focused analysis and peer- or self-assessment to monitor student progress and to facilitate further learning.

Planning curriculum with students and outcomes in mind

This involves:

- planning assessment at the same time as planning experiences that promote learning
- using assessment to inform future planning and to provide opportunities to learn
- planning activities for students that provide them with opportunities to progress and be assessed in their demonstrations of learning outcomes
- valuing students' backgrounds, interests, prior understandings, experiences and learning styles and considering these when planning programs, units and activities
- recognising the different ways and settings in which learning and assessment take place
- identifying and overcoming barriers that might limit students or groups of students in their demonstrations of outcomes
- maintaining a learner-centred approach to learning and teaching.

Expanded opportunities to learn

This involves:

- giving students opportunities to progress and demonstrate core learning outcomes in more than one context
- developing programs, units and activities that are sufficiently flexible to cater for the different characteristics and learning needs of students
- involving students in planning, assessment and evaluation processes.

Learning outcomes

The *Years 1 to 10 Technology Syllabus* describes four different types of outcomes:

- key learning area outcomes
- core learning outcomes
- discretionary learning outcomes at Beyond Level 6
- example learning outcomes for Foundation Level.

The learning outcomes use terms such as 'communicate', 'consult', 'describe', 'discuss', 'explain' and 'express'. These should be understood to mean all forms of verbal or nonverbal communication including the use of signed communication or devices such as communication boards. Teachers should plan to allow for all students to demonstrate their understandings when contexualising outcomes. For example, a student who is not able to read or write may be able to 'communicate' or 'compare' by using pictures or diagrams, pointing to various objects, or using gestures or body movements.

Strands

The core learning outcomes are organised into four strands, which define the scope of the key learning area. Key concepts underpin each strand. Each of the strands makes an equivalent contribution to the Technology key learning area.

The four strands are:

- Technology Practice — this strand is about the investigation, ideation, production and evaluation in the design and development of products.
- Information — this strand is about the nature of information and the techniques with which to manipulate it.
- Materials — this strand is about the nature of materials and the techniques with which to manipulate them.
- Systems — this strand is about the nature of systems and the techniques with which to manipulate them.

Levels

The sequence of the key learning area is defined in levels, which sequence the learning outcomes from Foundation Level to Beyond Level 6. Example learning outcomes are identified for the Foundation Level, core learning outcomes are described in Levels 1 to 6 inclusive and discretionary learning outcomes are described for Beyond Level 6.

The different levels are described in *level statements*. These level statements provide the conceptual framework for, and summary of, the learning outcomes at each level in each strand. For example, each level in the Systems strand has a statement that describes both the major concepts and summarises the core learning outcomes.

Within the scope of the core learning outcomes there is a sense of progression from:

- novice to expert
- familiar cultural contexts to less familiar cultural contexts
- self to community
- concrete to abstract consideration of a single aspect to consideration of multiple aspects
- simple to complex concepts
- immediate time to past or future time
- supported to independent.

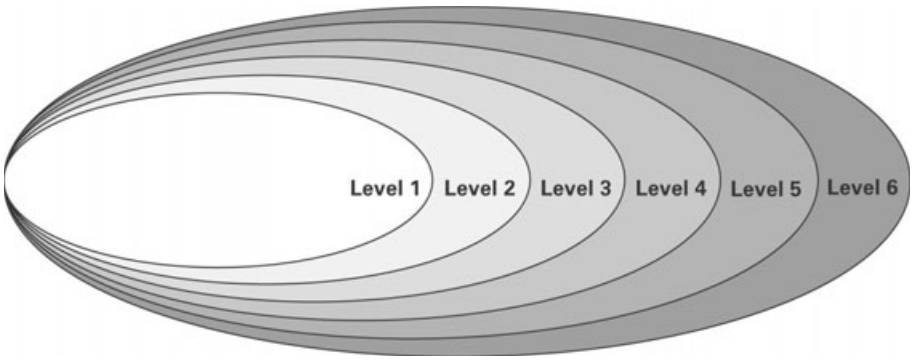
Key learning area outcomes

Key learning area outcomes highlight the uniqueness of the Technology key learning area and its particular contribution to lifelong learning. They describe the knowledge, practices and dispositions students develop about Technology during the compulsory years of schooling. (See p. 13 of the *Years 1 to 10 Technology Syllabus*.)

Core learning outcomes

Core learning outcomes describe what students know and can do with what they know on a continuum of increasing complexity from Level 1 to Level 6. In an outcomes approach, core learning outcomes provide a framework for developing rich and diverse activities that meet the learning needs of students. They are also a means by which teachers can develop shared understandings about what students know and can do with what they know at the different levels. It is expected that most students will have demonstrated all of the core learning outcomes in all four strands over the compulsory years of schooling. (See pp. 20–35 of the *Years 1 to 10 Technology Syllabus*.)

The conceptual progression of the core learning outcomes is described by using the term ‘nestedness’. This refers to the ways in which a core learning outcome at one level relates to the corresponding core learning outcome in the same strand at the next level. Learning outcomes in successive levels are conceptually linked to each other, forming a continuum, rather than a number of discrete entities. This continuum is represented in the following illustration.



Progression of conceptual development of outcomes

Key concepts

Each of the four strands has its own set of key concepts and these are the basis for the progression of the learning outcomes. Each core learning outcome relates to a key concept. The key concepts are informed by knowledge about learners and learning and the knowledge base of technology education.

There are four key concepts in the Technology Practice strand and two key concepts in each of the Information, Materials, and Systems strands. The strands, their key concepts and some of the knowledge, practices and dispositions that may be developed are summarised in the following table.

Strand	Key concept	Students develop Technology-related knowledge, practices and dispositions when they:
Technology Practice	• Investigation is carried out to gather and use knowledge, ideas and data to meet design challenges. • Ideation is undertaken to generate and communicate ideas that meet design challenges and to justify the selection of these ideas. Production procedures can be identified, described and managed to make products that meet design challenges. • Evaluation is undertaken to make judgments about the appropriateness of processes and products when meeting design challenges.	• investigate and explore how products meet human needs and wants, capitalise on opportunities and extend human capabilities • express thoughts and opinions about their own and others' products • communicate and modify design ideas and develop and follow production plans to realise products • evaluate design features and functions of products and reflect on how design ideas may become products • consult with others to explore needs and wants beyond their own experience and communicate ideas for meeting these using detailed plans • develop procedures using processes and equipment with growing understandings of industrial and commercial standards.
Information	• Information originates from different sources, exists in various forms and can be used for different purposes. • Information can be manipulated, presented and managed in different ways for different purposes.	• find and use different forms of information to communicate with a wide range of audiences across many contexts • analyse ways in which information processing and transmitting is continually changing and how this may affect people's lives • access, store, record or generate information • process and transmit information using specialised equipment and techniques • evaluate reliability, accessibility, standards and conventions related to the use of information and how these may impact on the ways information is presented and interpreted.
Materials	• Materials have characteristics that determine their selection and use in products. • Equipment and techniques can be used to manipulate and process materials.	• identify and investigate how materials can be used and the ways in which they can be manipulated to meet design challenges • test materials to analyse what characteristics they have in order to use them for particular design purposes • develop a range of techniques to manipulate materials and evaluate some of the impacts of using these techniques and materials over time • combine, modify and work materials to specified standards of safety, accuracy and presentation.
Systems	• Systems consist of interactive components and have inputs, processes and outputs that can be controlled in logical ways based on certain principles. • Systems can be developed, refined and optimised by organising their components.	• make links between routines and systems using steps to carry out familiar tasks • identify how components of systems operate together, assemble and trial systems, and describe impacts these systems may have in meeting design challenges • explain relationships between inputs, components and outputs in systems they make and modify • analyse the logic of systems and their subsystems and refine these to optimise beneficial impacts • control systems and their outputs by identifying and correcting faults.

Discretionary learning outcomes

The *Years 1 to 10 Technology Syllabus* does not have discretionary learning outcomes at each level, only those outcomes described at Beyond Level 6 are considered discretionary. It is suggested that to broaden a student's experience at any particular level, teachers should plan using the outcomes in different contexts. Discretionary learning outcomes are of a different order to core learning outcomes. It is not expected that all students will demonstrate them.

Foundation Level example learning outcomes

The syllabus provides level statements at Foundation Level, which have been developed for students who are yet to demonstrate learning outcomes at Level 1 because of a disability. These statements provide a framework for teachers to develop outcomes that meet the individual needs of these students.

Example learning outcomes for Foundation Level are provided at the beginning of each strand. These are examples only and provide a model that teachers may use as they develop learning outcomes for students working in the Foundation Level. Learning outcomes selected or developed at Foundation Level should relate to the students' individualised curriculum programs.

Sequence of core learning outcomes with elaborations for Foundation Level and Levels 1 to 6

The tables on pages 30 to 64 contain elaborations to help teachers understand the intent of core learning outcomes for Levels 1 to 6 and the level statements for Foundation Level. The elaborations indicate possible contexts through which students might demonstrate learning outcomes, and can be used to inform the development of activities.

Elaborations for Foundation Level

To assist teachers in understanding the intent of the level statements for Foundation Level, and to develop learning outcomes for students' individual education programs, example learning outcomes and elaborations have been included.

These elaborations for Foundation Level were developed from the level statements and key concepts for each of the Technology strands. Teachers can use these elaborations to assist in the development of individualised learning outcomes. At class program level, teachers are encouraged to develop purposeful and authentic learning activities that incorporate a number of learning outcomes from various key learning areas.

The tables of elaborations that follow are not exhaustive and are not checklists. They provide examples only and teachers may select specific contexts and contents according to the needs, abilities and interests of their students. It is not intended that all elaborations will be addressed. The elaborations are not meant to be goals for students' Individual Education Plans (IEPs). However, there should be links between the school and class curriculum programs and students' IEP goals.

The following communication statement is included to draw attention to the breadth and variety of modes and ways in which students may demonstrate the learning outcomes.

Communication statement

Students with disabilities may communicate their understandings in a variety of ways and modes (both aided and unaided), for example:

- *Gestural* — pointing, touching, manipulating, hand squeezing, giving eye contact, eye blinking, moving towards/away from, miming, signing, using body language or facial expressions
- *Vocal* — vocalising, communicative vocalisations, speaking
- *Visual/written* — cutting and pasting, using books, drawing pictures or diagrams, matching, sorting, Braille, software programs, multilevel communication book, using spell and phrase board
- *Aided* — using a manufactured aid which is either low-tech — for example, object symbol, daily schedule, multilevel communication book, topic pages, spell and phrase board; or high-tech — for example, voice output communication devices (VOCAs), computers.

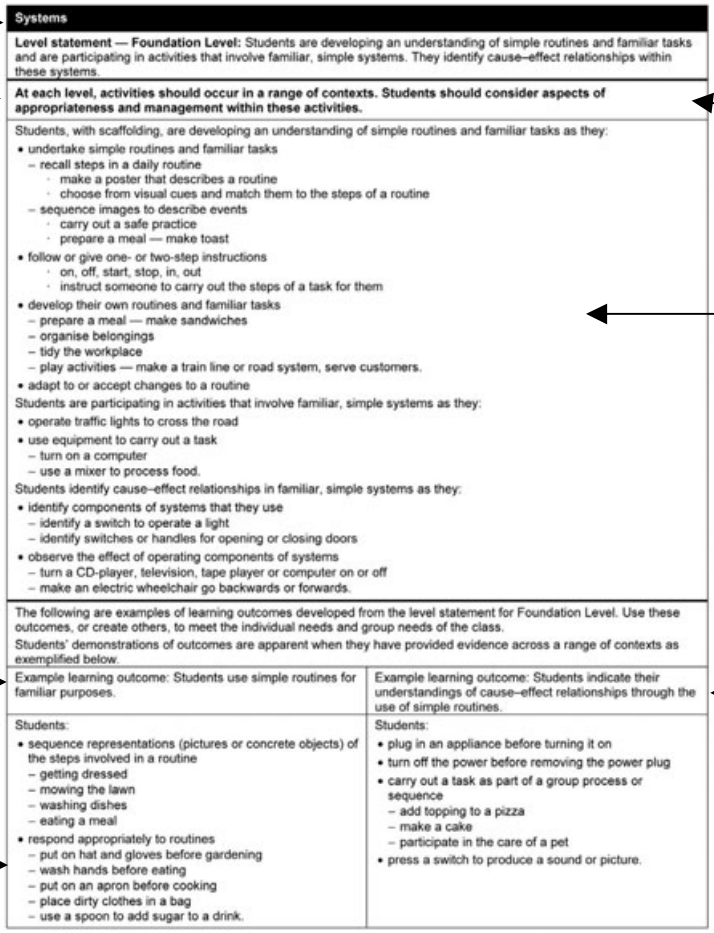
Context statement

Learning opportunities should be provided through a variety of contexts, routines and activities to assist students develop their knowledge, practices and dispositions. Opportunities for demonstrations of the learning outcomes should be in these same contexts, routines and activities.

Some of these contexts replicate real-life situations and so provide practical opportunities for students to engage with learning outcomes from a number of key learning areas. Cooking activities, for example, might include learning outcomes from Health and Physical Education, English, Mathematics, Science, and Technology.

When monitoring and reporting on students' demonstrations of learning outcomes, the contexts, routines, activities and personnel involved in the learning opportunities and demonstrations should be indicated. Students may demonstrate their learning in one context, routine or activity but not another; with one person but not another. Therefore, it is important to engage students in purposeful activities in a range of contexts and with a variety of personnel.

The following diagram illustrates the layout of the elaborations for Foundation Level for the Information, Materials and Systems strands. The layout of the Technology Practice strand is similar.



Systems

Level statement — Foundation Level: Students are developing an understanding of simple routines and familiar tasks and are participating in activities that involve familiar, simple systems. They identify cause–effect relationships within these systems.

At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.

Students, with scaffolding, are developing an understanding of simple routines and familiar tasks as they:

- undertake simple routines and familiar tasks
  - recall steps in a daily routine
    - make a poster that describes a routine
    - choose from visual cues and match them to the steps of a routine
  - sequence images to describe events
    - carry out a safe practice
    - prepare a meal — make toast
- follow or give one- or two-step instructions
    - on, off, start, stop, in, out
    - instruct someone to carry out the steps of a task for them
- develop their own routines and familiar tasks
  - prepare a meal — make sandwiches
  - organise belongings
  - tidy the workplace
  - play activities — make a train line or road system, serve customers.
- adapt to or accept changes to a routine

Students are participating in activities that involve familiar, simple systems as they:

- operate traffic lights to cross the road
- use equipment to carry out a task
  - turn on a computer
  - use a mixer to process food.

Students identify cause–effect relationships in familiar, simple systems as they:

- identify components of systems that they use
  - identify a switch to operate a light
  - identify switches or handles for opening or closing doors
- observe the effect of operating components of systems
  - turn a CD-player, television, tape player or computer on or off
  - make an electric wheelchair go backwards or forwards.

The following are examples of learning outcomes developed from the level statement for Foundation Level. Use these outcomes, or create others, to meet the individual needs and group needs of the class.

Students' demonstrations of outcomes are apparent when they have provided evidence across a range of contexts as exemplified below.

Example learning outcome: Students use simple routines for familiar purposes.	Example learning outcome: Students indicate their understandings of cause–effect relationships through the use of simple routines.
Students: • sequence representations (pictures or concrete objects) of the steps involved in a routine – getting dressed – mowing the lawn – washing dishes – eating a meal • respond appropriately to routines – put on hat and gloves before gardening – wash hands before eating – put on an apron before cooking – place dirty clothes in a bag – use a spoon to add sugar to a drink.	Students: • plug in an appliance before turning it on • turn off the power before removing the power plug • carry out a task as part of a group process or sequence – add topping to a pizza – make a cake – participate in the care of a pet • press a switch to produce a sound or picture.

Strand from Technology syllabus

Level statement describes what students know and are able to do

Advice about contexts, appropriateness and management

Elaboration of the level statement identifying possible contexts and content for learning from the level statement

Sample learning outcomes that teachers can use as examples when developing learning outcomes for individual students

Example learning activities identify possible contexts and content for learning from the learning outcome

Sample learning outcomes that teachers can use as examples when developing learning outcomes for individual students

Elaborations for Levels 1 to 6

Purpose of the elaborations

The core learning outcomes for Levels 1 to 6 have been elaborated to assist teachers in understanding what students are expected to know and do with what they know in relation to the key learning area. The elaborations contexualise the learning outcomes and provide examples of ways to incorporate content into learning activities.

Elaborations are provided as examples only and are interchangeable with other elaborations developed by teachers. They also provide ideas for teachers when planning for learning or assessment. When considering the application of elaborations for their own planning and assessment, teachers should consider a range of factors including:

- students' prior knowledge
- students' interests
- the context in which learning will take place
- the various socioeconomic and cultural backgrounds of students
- available equipment and resources
- school programs
- school authority policies.

Organisation of the elaborations

The tables that follow present elaborations of each core learning outcome. The organisation of these elaborations is by strand and key concept, progressing from Foundation Level to Beyond Level 6.

The purpose of the elaborations is to:

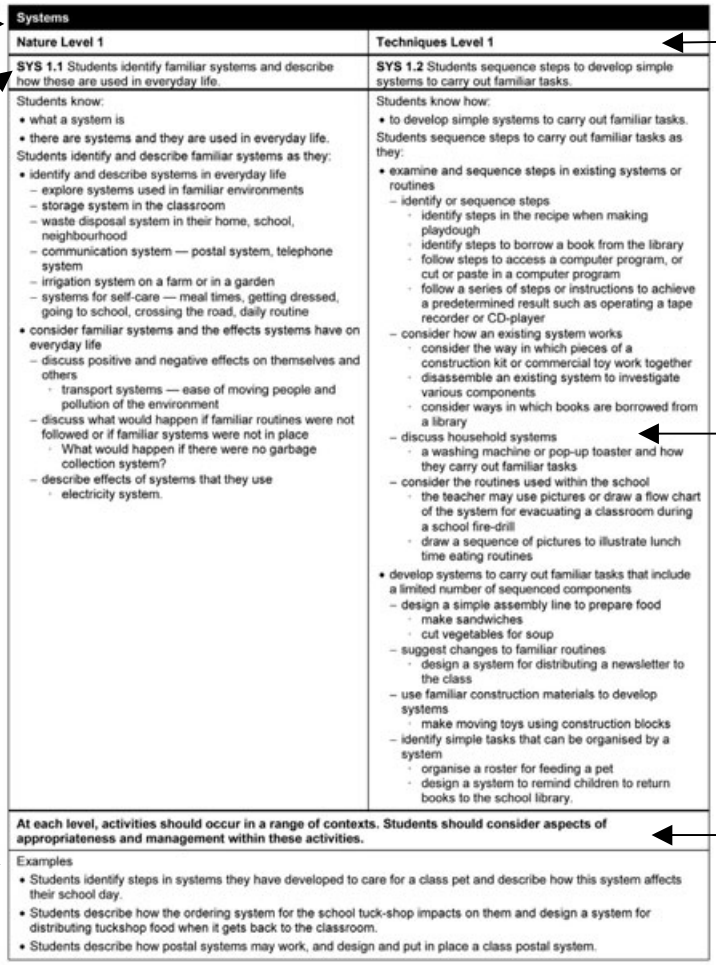
- make clear what students need to know and do with what they know to demonstrate the core learning outcomes
- contextualise the core learning outcomes by providing examples of how they may be demonstrated
- explain specific terms in a core learning outcome
- show how contexts can be used to make learning real-life or lifelike
- provide examples of how content can be incorporated into activities.

Each core learning outcome has been given a unique code. This code is made up of letters (which identify the strand) and numbers (which identify the level and key concept to which the core learning outcome relates). For example, **SYS 1.1** refers to the System strand, Level 1 outcome, which is related to the first key concept in that strand.

The diagram below identifies the layout of the elaborations by levels in key concepts.

Strand from Technology syllabus

Core learning outcome



Systems

Nature Level 1	**Techniques Level 1**
SYS 1.1 Students identify familiar systems and describe how these are used in everyday life.	**SYS 1.2** Students sequence steps to develop simple systems to carry out familiar tasks.
Students know: • what a system is • there are systems and they are used in everyday life. Students identify and describe familiar systems as they: • identify and describe systems in everyday life – explore systems used in familiar environments – storage system in the classroom – waste disposal system in their home, school, neighbourhood – communication system — postal system, telephone system – irrigation system on a farm or in a garden – systems for self-care — meal times, getting dressed, going to school, crossing the road, daily routine • consider familiar systems and the effects systems have on everyday life – discuss positive and negative effects on themselves and others · transport systems — ease of moving people and pollution of the environment – discuss what would happen if familiar routines were not followed or if familiar systems were not in place · What would happen if there were no garbage collection system? – describe effects of systems that they use · electricity system.	Students know how: • to develop simple systems to carry out familiar tasks. Students sequence steps to carry out familiar tasks as they: • examine and sequence steps in existing systems or routines – identify or sequence steps · identify steps in the recipe when making playdough · identify steps to borrow a book from the library · follow steps to access a computer program, or cut or paste in a computer program · follow a series of steps or instructions to achieve a predetermined result such as operating a tape recorder or CD-player – consider how an existing system works · consider the way in which pieces of a construction kit or commercial toy work together · disassemble an existing system to investigate various components · consider ways in which books are borrowed from a library – discuss household systems · a washing machine or pop-up toaster and how they carry out familiar tasks – consider the routines used within the school · the teacher may use pictures or draw a flow chart of the system for evacuating a classroom during a school fire-drill · draw a sequence of pictures to illustrate lunch time eating routines • develop systems to carry out familiar tasks that include a limited number of sequenced components – design a simple assembly line to prepare food · make sandwiches · cut vegetables for soup – suggest changes to familiar routines · design a system for distributing a newsletter to the class – use familiar construction materials to develop systems · make moving toys using construction blocks – identify simple tasks that can be organised by a system · organise a roster for feeding a pet · design a system to remind children to return books to the school library.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students identify steps in systems they have developed to care for a class pet and describe how this system affects their school day. • Students describe how the ordering system for the school tuck-shop impacts on them and design a system for distributing tuckshop food when it gets back to the classroom. • Students describe how postal systems may work, and design and put in place a class postal system.	

Identifies the level

Elaboration of the level statement identifying possible contexts and content for learning from the level statement

Example learning activities identify possible contexts and content for learning from the learning outcome

Advice about contexts, appropriateness and management

Technology Practice

Level statement — Foundation Level: Students are developing an awareness of the products of technology they use in familiar situations to meet their own needs and wants. They are beginning to generate and communicate ideas for products that can be used for real-life and lifelike purposes. They are developing an understanding of some safety procedures and practices related to the development of products and the use of technological devices. They express their views about various aspects of familiar products and their purposes.

Investigation Foundation Level	Ideation Foundation Level
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Students develop an awareness of the products of technology when they: • observe and identify some features of products – express feelings about features of products – match or sort products based on similarities and differences • ask questions about products of technology and some of their purposes • feel, handle and use products of technology to become familiar with how they work • investigate ways products can be used • determine when there is a need to seek help for a technological problem or challenge. Students explore the products of technology used in familiar situations: • tools and equipment that manipulate materials — saw, stapler, scissors, beaters, fork, shovel, playdough tools • technological devices that assist communication and mobility — communication board or devices, wheelchairs, prosthetics, spectacles, computers, hearing aids, battery-operated toys, switches • objects used for self-care — combs, toothbrushes, shavers, manicure set • domestic products for convenience and comfort — chairs, shoes, clothing, buttons, zippers, hats, utensils • multimedia equipment — computers, cameras, CDs, televisions, video recorders, sensory equipment • built environments or systems — playgrounds, traffic lights, swimming pools, shopping centres.	Students begin to generate and communicate ideas for products that can be used for real-life and lifelike purposes when they: • show a preference for, or communicate, an idea that meets a need or want – point to a design, from a range of pictures, of a building they can make from blocks – use visual cues to indicate the product they would like to make or use – prepare lunch by selecting food, from a range of options – choose from a range of presented options • communicate their ideas about products that may meet needs or wants – select types of vegetables to grow in a garden – use photographs or pictures from magazines or books to identify products that they would like to make or use • recall ideas and experiences with products to help them develop ideas for their own products – explain how a product helped them to meet a need or want – recall ideas about products with which they have had experience through discussions • link products to purposes – identify different ways of meeting the same need or want – match more than one product to a particular purpose • identify potential sources of help for a particular problem or challenge – parent/carer to open a container – adults to help with operating a device.
The following are examples of leaning outcomes developed from the level statement for Foundation Level. Use these outcomes, or create others, to meet the individual needs and group needs of the class. Students' demonstrations of outcomes are apparent when they have provided evidence across a range of contexts as exemplified below.	
Example learning outcome: Students observe and identify the purpose of a specific product or device.	Example learning outcome: Students indicate a preference from a range of options to meet a need or want.
Students: • operate utensils in order to observe how they work, e.g. use electric beaters to make a cake, use sand play toys, use a spade for gardening, eat with a spoon • examine a familiar product by handling, matching or demonstrating the use of it in daily situations, e.g. wheelchair, communication device, a hose to wash a car • observe and identify the purpose of a specific technological device such as traffic signals, ATMs, vending machines, bicycles, playground equipment • investigate the workings of a specific technological device by asking questions, gesturing or interacting with the object, such as how to operate a moving toy.	Students: • select a picture or recipe card of the type of cake they want to make • select where they would like to put plants in a garden by placing markers on the soil before planting • choose shapes to attach to some string in order to make a mobile • identify pictures of clothes to wear for specific purposes such as swimming or school • indicate a preference by, for example, gesturing, smiling, or making eye contact • use communication devices to indicate choices.

Technology Practice

Level statement — Foundation Level: Students are developing an awareness of the products of technology they use in familiar situations to meet their own needs and wants. They are beginning to generate and communicate ideas for products that can be used for real-life and lifelike purposes. They are developing an understanding of some safety procedures and practices related to the development of products and the use of technological devices. They express their views about various aspects of familiar products and their purposes.

Production Foundation Level	Evaluation Foundation Level
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Students develop an awareness of safety procedures and practices for the development of products and the use of technological devices when they: • follow directions, with guidance if necessary, to allow safe practices to occur when developing products – join materials with guidance using glue – hammer nails or pegs – use a knife when preparing food – use scissors to cut paper – use garden tools to make a garden and store gardening equipment in a safe place – press a switch to operate equipment when instructed to mix batter for pancakes • use technological devices safely with or without guidance, as necessary – operate controls such as brakes or a toggle on a wheelchair – operate switches on communication devices, stoves, microwaves or washing machines – wear seat belts in the car or bus – wear a bicycle helmet when riding – place the camera strap around the neck when using the camera • indicate that they think their work is complete – say/sign/symbol when finished – put their work down – put their work on display • seek help to use technological devices safely – indicate need for assistance to turn on hot taps – ask for protective clothing such as goggles or gloves.	Students express their views about various aspects of familiar products and their purposes when they: • express ownership of products they make – indicate ownership — mine, me, my – seek out their own work – recognise their own work • express pride in products they make – display their own work – seek approval from others • express opinions about products – convey positive views about products · aesthetics · functionality · social – identify particular features of a product that they may like or dislike – indicate preferences for their own or others' work.
The following are examples of learning outcomes developed from the level statement for Foundation Level. Use these outcomes, or create others, to meet the individual needs and group needs of the class. Students' demonstrations of outcomes are apparent when they have provided evidence across a range of contexts as exemplified below.	
Example learning outcome: Students follow directions safely for specific purposes.	Example learning outcome: Students express their likes or dislikes about products they have helped to make.
Students: • follow a recipe card to participate safely in the making of a cake for a special occasion • follow directions to cut and glue safely to create a card for a special occasion • follow directions to use traffic signals in order to safely cross the road • follow safety procedures such as wearing protective clothing when using a lawn mower.	Students: • express views about the taste and appearance of a cake that they have helped to make • display a card they have made and identify it from other cards on display • describe likes and dislikes about a garden they have looked after • repeat requests for a product or activity • show, give or tell others about the product.

Technology Practice	
Investigation Level 1	**Ideation Level 1**
TP 1.1 Students gather knowledge, ideas and data from familiar environments and consider how they will use this information to meet design challenges.	**TP 1.2** Students generate design ideas and communicate these through experimentation, play and pictures.
Students know that knowledge, ideas and data are: • gathered from familiar environments • used in meeting design challenges. Students gather knowledge, ideas and data as they: • discuss and question – how and why family and friends use products – the function or design of products · toys with which to play · clothes to wear — consider why we have clothes of various designs such as rain coats, jumpers, sun hats · play equipment including the use of safety features – how various products are produced • explore – features and functions of products and clarify how they are used – characteristics of various materials and products by using senses · taste — food; touch — textiles • interact with products in meaningful ways – participate in structured socio-dramatic and/or exploratory play – examine handling collections – manipulate materials used to create products. Students consider how knowledge, ideas and data are used to meet design challenges as they: • describe, discuss and record how products meet needs and wants – categorise products and the needs and wants they meet by listing products from magazines and books – record needs and wants that may exist in some contexts and discuss ideas they gather about different products that could be used in these contexts • draw or illustrate, and label, information gathered – pictures of the designs of products they have observed • make charts that record existing ways of meeting a design challenge.	Students know that: • design ideas can be generated in different ways • design ideas can be communicated in different ways. Students generate and communicate design ideas as they: • use strategies that may meet needs and wants – work in small groups to brainstorm various design ideas for a product – come up with new or novel products – draw what the product may look like • experiment with ways of recording and communicating their own design ideas – make models using blocks, clay or playdough – create pictures or pictorial representations of a finished product – present oral descriptions of what a product may do or how it works – roleplay how a product may work or may be used – make approximations of design ideas by arranging objects, materials or props • look at ways other people communicate design ideas – 2D representations including pictures, drawings, illustrations, photographs or plans · plans of buildings · pictures or photographs of products · diagrams of how to assemble a toy – 3D representations including dioramas or models · museum exhibits · prototypes — working models of products – written or verbal descriptions including reports, recounts or labels · recipes for preparing food · story books · Technology project folios – combinations of these · pictorial and written directions to make a toy · annotations/labels on drawings.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students examine and compare the features of different lunch boxes to inform their design ideas when designing a lunch box for an excursion. • Students explore different environments when gathering ideas for a class garden. • Students disassemble old toys to determine how they move and operate. • Students observe different ways to keep food fresh when storing sweets made for the school fete.	Examples • Students set up socio-dramatic play areas such as a restaurant, train station, home area to stimulate discussion about design ideas and design challenges and record their ideas. • Students visualise, draw or make models of design ideas, e.g. block building, bridge and spacecraft. • Students visualise and draw the layout for a garden. • Students make models or use pictures and photographs to share ideas for an invention to help around the house.

Technology Practice	
Production Level 1	**Evaluation Level 1**
TP 1.3 Students make products that are meaningful to them, and describe their production procedures.	**TP 1.4** Students express thoughts and opinions to evaluate their own and others' design ideas and products.
Students know that: • products can be made • production procedures can be described. Students make products meaningful to them as they: • create – products that meet a need or want · invent something and explain how it can be used – products to be used in a real or imaginary sense · make a platform in the block area so they can view the tigers in the jungle – products to serve a particular purpose · prepare food designed for a class morning tea • develop their ideas into products – process materials – manipulate information – develop systems – make artefacts – construct an environment – provide a service. Students describe their production procedure as they: • examine, consider and identify – the use of different production procedures for different effects · cut paper, join paper, strengthen paper – the selection of production procedures · appropriate production procedures for joining different materials such as using glue to join paper and wood instead of nails – management issues related to · materials · people · environments • record in Technology project folios – design ideas for different products – processes or actions used to develop a product – issues of safety they considered.	Students know that: • design ideas and products can be evaluated • evaluation about design ideas and products can be expressed as thoughts and opinions. Students evaluate design ideas and products by expressing thoughts and opinions as they: • answer questions about design ideas and products – What is it and what does it do? – Why was it made and who might use it? – Does it do what it is meant to do? – How does it sound/taste/smell/feel/look? – What is it made from? – Does it meet a need or want? – What do I think about it? • consider some issues related to appropriateness – aesthetic — Do I like the way it looks? – cultural — Would other groups of people like this? – economic — How much does it cost to make? – environmental — How does it affect the environment? – ethical — What questions can we ask about the effects of this product? Why do people need this? – functional — Does this product do what I want it to do? – social — Would people other than me use this? • make judgments about their own or others' ideas or products – record thoughts and opinions about design ideas and products in their Technology project folios – share views about different products · artefacts — how well a hat keeps the sun off · systems — the routine for keeping the classroom tidy · processes — borrowing books from the class library · services — transport services in the community · environments — how well the plants grow in a fish tank.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students prepare products for a class art show. Activities may include: – making displays and recording safety issues about their placement – preparing food for visitors and describing the process involved in its preparation – producing advertising posters and identifying the types of techniques they would need to use to develop the posters. • Students describe the steps involved in producing a booklet to inform visitors about their classroom.	Examples • Students share views about features of playground equipment that they encountered on an excursion. • Students discuss appropriateness of design ideas and products they developed during a unit of work about space. • Students reflect on project folio entries and express their thoughts and feelings about 'working technologically'. • Students record their reactions to different products by using charts.

Technology Practice	
Investigation Level 2	**Ideation Level 2**
TP 2.1 Students organise knowledge, ideas and data about how needs and wants might be met and use this information when meeting design challenges.	**TP 2.2** Students generate design ideas, acknowledge the design ideas of others and communicate their design ideas using annotated drawings that identify basic design features.
Students know that knowledge, ideas and data can be: • organised • used to meed design challenges. Students organise knowledge, ideas and use data to meet design challenges as they: • record investigations using – written or pictorial records · in a Technology project folio · storing it to disk · making a chart, table · photographs, pictures, drawings, video – samples of products or processes investigated – samples of different materials • categorise products, processes, techniques and ideas – make charts that classify different processes for joining – sequence pictures or diagrams of how techniques could be carried out – sort materials in a handling collection according to selected characteristics – list features of products that make them useful for a specific purpose – list needs or wants and how they may be met – compare different products that meet the same need or want and give reasons for similarities and differences • use information – drawing on ideas to develop concept maps or flowcharts – referring to procedures or processes – discussing alternatives and ideas.	Students know that: • basic features of design ideas need to be identified and described • other people may have similar or different design ideas from their own. Students communicate and acknowledge design ideas as they: • draw 2D representations of their design ideas, usually using one view – a top view of their ideas for cake decorations – front or back view of clothing – a side view of what their boat would look like • annotate the drawings to identify basic features and their purposes – label a view of a cake to indicate colour of icing, decorations, candles – label a front or back view of a T-shirt to identify the collar, colour, logo – label a view of a boat to identify the mast, rudder, engine • acknowledge the design ideas of others – view demonstrations of design ideas by peers – listen to peers explaining their design ideas about a model boat for the class boat race – examine drawings or series of plans prepared by professionals – share and compare their own design ideas with others in a group • generate and record design ideas – use concept maps or bubble charts to record ideas – make lists/tables – use creative thinking skills such as de Bono's Six Thinking Hats and CoRT thinking skills – predict how some products may change in the future.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students visit a local restaurant to observe and record some of the systems and products used in food preparation to inform their designs in setting up a class restaurant. • Students compare the features of different buildings to determine how they meet peoples' needs and wants and use this data to inform the design of a tree house. • Students compare samples of different materials in a handling collection to determine the most appropriate materials when designing a backpack for an excursion.	Examples • Teachers model the drawing of a plan of a room using design ideas generated by students. • Students use blocks to generate the layout of a bus for the play area, and draw the layout with chalk in the playground. • Students draw or sketch the main features of an insect trap. • Students present an illustration of the main features of a cubby house they have designed and seek others' ideas to add to it. • Students use 3D embossed drawings to communicate ideas for blind students.

Technology Practice	
Production Level 2	**Evaluation Level 2**
TP 2.3 Students identify, sequence and follow production procedures to make products of their own design.	**TP 2.4** Students consider initial design ideas with final products and give reasons for similarities and differences.
Students know that: • production procedures can be identified and sequenced • production procedures can be followed. Students identify and sequence production procedures as they: • ask questions of an adult, or more experienced peer, about what production methods to use • watch someone modelling a production process and try to incorporate it into their own production procedures • select a sequence of steps to develop a product of their own design • explain why a production process has been selected – suitability to the task – prior experience with a material or process – trial and error – limitations of available equipment and materials • document production procedures in their Technology project folios. Students follow production procedures to make products of their own design as they: • follow a simple step-by-step production process – join materials · when making a mask for a play using collage materials · when making a pot-plant holder using wood – cut and past images in a drawing program · when making a card in a computer program · when making an advertisement for the class play – follow written, oral and diagrammatical instructions · to prepare a growing area for the class garden · to prepare food for morning tea.	Students know that: • initial ideas and final products can be compared • reasons can be given to explain similarities and differences. Students consider design ideas and products as they: • compare design ideas and products – identify similarities and differences between features of a design idea and the resulting product – try out or test a product to assess how well it meets the intended purpose · Does the fruit drink taste sweet enough? · Does the storage system keep the room tidier? · Does the poster communicate the message clearly? – describe the process of developing a design idea into a product – match the features of a design idea with features of a product. Students give reasons for similarities and differences as they: • explain why changes to initial design concepts may have taken place – analyse the function or appropriateness of a product and describe how or why it may have been changed · identify some of the strengths and weaknesses of a design idea, product or process · identify constraints in resources, processes, techniques or skills – identify the benefits of making changes to ideas or maintaining original proposals – exchange views with peers about products they have generated or design ideas they have had · write a short report or make a photo story.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students identify and follow a production process for making a mask that could be used in a cultural story or tale. • Students follow their design plan to make a card for a friend using a publishing program on a computer. • Students identify, describe and carry out cutting and joining procedures to make costumes for a fancy dress ball.	Examples • Students report on tests of materials selected for an unsinkable boat and describe how these tests led to changes in their initial design ideas. • Students keep Technology project folios about the development of a frog pond and use it to compare similarities and differences between initial design ideas and products, including changes they make along the way.

<table>
<tr><th colspan="2">Technology Practice</th></tr>
<tr><th>Investigation Level 3</th><th>Ideation Level 3</th></tr>
<tr><td>TP 3.1 Students examine knowledge, ideas and data from a range of sources and establish the relevance of this information when meeting design challenges.</td><td>TP 3.2 Students collaboratively generate design ideas and communicate these using presentations, models and technical terms.</td></tr>
<tr><td>Students know that knowledge, ideas and data:
can be drawn from a range of sources
should be relevant to design challenges.
Students examine knowledge, ideas and data from a range of sources as they:
research and draw information from various sources
– library, the Internet
– people — parents/carers, teachers, community
– brochures, magazines
– environments — excursions to specific places
– products.
Students establish the relevance of information to the design challenge:
identify what they need to know in order to undertake or meet the design challenge
identify user requirements and list existing products that meet similar needs
explain how the information gathered is related to the design challenge
annotate the design ideas they have collected with suggestions for using them to meet the design challenge.</td><td>Students know that:
design ideas can be collaboratively generated
design ideas can be communicated using presentations, models and technical terms.
Students generate design ideas in response to a design challenge as they:
work in groups
– brainstorm designs for a classroom of the future
– sketch possible designs for a birdfeeder
– use CoRT Thinking Skills to evaluate ideas for revegetating a riverbank.
Students communicate design ideas as they:
select from top view, front view and side view in 2D presentations to represent their design ideas and describe major features
– in a top-view of a classroom of the future, include symbols for doors, walls and windows
– in a side view of a birdfeeder, include measurements in millimetres
– draw enlarged sections of key features
make 3D models or prototypes of their design ideas to approximate proportions
– use various materials to make a 3D model of their bedroom of the future
– use clay and other materials to make a 3D model of how a revegetated riverbank will look, and label or describe special features
use technical terms to describe their intentions and the major features of their designs
– describe how their multimedia presentations will work using terms such as animation, transition, effects, font style
– use correct terms and symbols to identify measurements, features, processes, tools or equipment
· use a symbol for a door in a top-view of a room
· identify measurements in millimetres, or appropriate scale.</td></tr>
<tr><td colspan="2">At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.</td></tr>
<tr><td>Examples
Students visit a pet shop or research online sources of information to determine appropriate environments for fish when developing an aquarium.
Students answer focus questions to investigate a handling collection of hats to identify and discuss appropriate features for a sun-smart hat.
Students use a survey to gather information about the school grounds to assist them to design a system for keeping the school litter free.
Students collaborate with Elders from the local Aboriginal community to prepare a bush tucker menu for a multicultural day.</td><td>Examples
Students work in groups to generate and record designs for an enclosure for the class pet and use the designs to communicate size and major features.
Students collaborate with the local landcare group to develop a model for communicating their perceptions of how to revegetate a riverbank.
Students sketch more than one view of a compost system and identify measurements, material and features.</td></tr>
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Technology Practice	
Production Level 3	**Evaluation Level 3**
TP 3.3 Students cooperatively develop and follow production procedures to make products that reflect their design ideas.	**TP 3.4** Students test and judge how effectively their own and others' processes and products meet the design challenge.
Students know that: • production procedures can be developed cooperatively • production procedures can be followed to make products. Students cooperatively develop production procedures as they: • work together to describe and sequence steps they can follow to carry out production – discuss and select ways to work with materials · cut, past, join, save, melt, heat, screw, dig, chop – consider appropriate use of resources · availability, cost, suitability, environmental impacts – consider advice they receive from others about · tools and equipment (how to use a saw or sew with a needle and thread) · the nature of materials, information or systems they are working with – manage safety · use insulated gloves to remove hot things from a stove · finish a product so as to make it safe to use – work efficiently · set timelines and work to them · assign tasks · share resources · recycle waste. Students follow production procedures in order to develop products as they: • ensure that the quality of products are of a standard to meet their needs or the needs of others – follow identified production procedures – modify procedures to suit changing circumstances – monitor the quality of their work or the work of their team • adhere to safety procedures – seek assistance where needed – carry out safety checks.	Students know that: • products and processes can be tested • judgments can be made about the effectiveness of processes and products. Students test processes and products and make judgments as they: • conduct tests and trials on products and processes in real-life and lifelike situations to determine – effectiveness – efficiency – durability – suitability • compare different products that meet the same need or want to determine the most appropriate product • identify requirements or constraints of design challenges and gauge opinions of others to judge how well products meet design challenges – judgments can be made · aesthetic appeal of colour, texture, sound, taste · cost · efficiency · cultural suitability · environmental and social impacts.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students work together to identify the steps, resources and assistance they will need to make a torch for a camping trip. • Students prepare a meal that can be taken to the beach and follow procedures they have developed to make it. • Students design and develop a system to help them keep track of their belongings on a school camp.	Examples • Students record results from taste tests conducted on pizzas to inform judgments about the appropriateness of toppings used. • Students gather opinions about different designs they have developed to advertise a local event and use this information to evaluate the most appropriate design. • Students trial different processes for decorating fabric to select the most appropriate process for applying a T-shirt design. • Students test various pizza boxes to determine which is most effective in keeping a pizza warm.

<table>
<tr><th colspan="2">Technology Practice</th></tr>
<tr><th>Investigation Level 4</th><th>Ideation Level 4</th></tr>
<tr><td>TP 4.1 Students use consultative methods to gather knowledge, ideas and data when researching alternatives within design challenges.</td><td>TP 4.2 Students generate design ideas through consultation and communicate these in detailed design proposals.</td></tr>
<tr><td>Students know that knowledge, ideas and data are:
gathered through various methods of consultation
used to research alternative solutions within a design challenge.
Students use consultation to gather knowledge, ideas and data as they:
use a variety of methods to gather information from potential users
interview people with specialised knowledge
architect to seek advice on drawing
chef to seek advice on cooking techniques
Aboriginal Elder regarding cultural issues
nursery worker to seek advice on gardening
more experienced peers about hobbies
school staff with specialised knowledge
community representatives about local issues
potential users to identify constraints
use, for example, interviews, surveys, questionnaires and environmental scans to identify needs and verify information
use resources that specialists have developed to gather opinions or ideas from other communities
use email or online communities to seek information
gather information from brochures, pamphlets or advertisements
examine existing products to determine how others have met a similar challenge
discuss options and design ideas with interested people
gather opinions about the best designs to meet a design challenge.
Students research alternatives within design challenges as they:
compare ideas gathered through consultation
identify options provided by different people
investigate specialised knowledge or techniques
use library facilities to gather ideas from books
search the Internet
identify advantages and/or disadvantages of particular ideas or options.</td><td>Students know that:
consultation may be used to generate design ideas
communication of design ideas can be done using detailed design proposals.
Students generate ideas through consultation and communicate them as they:
consult with others to generate design ideas
discuss the requirements of a design
discuss sketches of different designs with others
gather opinions about a design proposal
question others about features of design ideas
discuss problems that arise during the design process with a person with specialised knowledge
develop detailed design proposals that may include
background information about the design challenge, the purpose of their product and its intended users or audience
considerations of appropriateness, contexts and management
a record of consultation processes — sketches and annotated drawings from different views
communicate design ideas using a range of strategies
envisage and sketch possible solutions and alternatives to communicate them
use simple scales in plans and drawings
draw designs from a number of views
represent ideas using techniques or advice that has been gathered through consultation
construct prototypes or large-scale models using, for example, blocks, clay or other construction materials.</td></tr>
<tr><td colspan="2">At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.</td></tr>
<tr><td>Examples
Students interview a wildlife ranger to research different designs for a feeder for birds living in the local area.
Students visit websites and discussion lists about hydroponics to research information that will inform the development of a hydroponic garden.
Students analyse advice provided from peers about preferred features for a class web page and identify skills needed to develop these features.
Students collect home improvement pamphlets to identify ways of representing house plans and house design features that are appropriate to particular climates.</td><td>Examples
Students generate ideas for festive decorations by showing sketches of different designs and discussing opinions about proposals.
Students consult with a landscape gardener to assist in developing plans that show appropriate detail when communicating ideas for a rainforest garden.
Students generate ideas about the organisation and activities for the class camp by consulting on a draft program.
Students generate a detailed design proposal for advertising ideas for a school disco.</td></tr>
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<table>
<tr><th colspan="2">Technology Practice</th></tr>
<tr><th>Production Level 4</th><th>Evaluation Level 4</th></tr>
<tr><td>TP 4.3 Students identify and make use of the practical expertise of others when following production procedures to make products for specific users.</td><td>TP 4.4 Students gather feedback to gauge how well their design ideas and processes meet design challenges and how effectively products meet the needs of specific users.</td></tr>
<tr><td>Students know that:
practical expertise of others can be identified and used when following production procedures
products can be made for specific users.
Students identify and make use of the practical expertise of others when following production procedures as they:
consult people with practical expertise to personally develop skills and techniques
– ask for guidance in the operation of specialised equipment
· seek assistance to use a digital camera
– learn a particular skill or technique
· learn how to sew a seam when joining fabric
seek assistance from others to extend their ability to complete a task
– engage people who work with specialised equipment to safely carry out a particular task
· organise a printer to colour print tickets for a school event
– engage people with specialised skills to carry out techniques which are beyond their own capability
· identify a person in the community who is qualified to safely weld metal for them.
Students make products for specific users as they:
negotiate with specific users to enable their requirements to be met
– work to clearly defined specifications
· refer to production proposals
· identify any special features of the product
· document and record decisions
– provide advice on progress to users
· use samples, prototypes or models
– seek feedback on progress of production from users
· negotiate timelines
· check quality
– safely manage materials and production processes.</td><td>Students know that:
feedback can be gathered
feedback can be used to gauge how well design ideas and processes meet design challenges.
Students gather feedback from specific users as they:
conduct surveys
examine questionnaires
use suggestion boxes
conduct interviews
compare products.
Students gauge how well processes and products meet design challenges as they:
compare feedback to judge the effectiveness of designs prior to production
consider the opinions of others to assess the effectiveness of designs and products
consider criteria provided by specific users to enable the selection of one design from a range of alternatives based on feedback
survey target groups on the appropriateness of the product
reflect on products and processes by comparing finished products with their original ideas
demonstrate how their ideas evolved into products by pointing out special features and explaining why these features were included
gather feedback by using a product in a real-life situation.</td></tr>
<tr><td colspan="2">At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.</td></tr>
<tr><td>Examples
Students seek advice to learn how to authentically decorate kites when making Asian kites for a school fete.
Students organise for a person with a kiln to safely fire clay pots they have designed as a gift for a family member.
Students seek assistance to join components of a stand for a birdfeeder to be placed in the school gardens.
Students organise for colour printing of brochures and posters to inform visitors about fauna in a local area.</td><td>Examples
Students analyse feedback gathered about the effectiveness of a recipe card they have made to evaluate the appropriateness of its content and layout.
Students evaluate the quality of the finish on a wooden toy designed for a young child by comparing their own products with other products produced for similar purposes.
Students distribute a questionnaire about the school camp to see how well the event met the needs of the children who attended.</td></tr>
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Technology Practice	
Investigation Level 5	**Ideation Level 5**
TP 5.1 Students analyse links between the knowledge, ideas and data gathered to meet design challenges and the design and development of new and improved products.	**TP 5.2** Students generate design ideas and communicate these in design proposals that indicate an understanding of factors influencing the development of option(s) they have selected.
Students know: • that the development of new or improved products is linked to knowledge, ideas and data • how to analyse knowledge, ideas and data and link it to the development of new or improved products. Students link knowledge, ideas and data to the development of new and improved products within a design challenge as they: • capitalise on new materials, products or techniques to enhance products by, for example, using Velcro instead of buttons or zips or invent new products • envision ways of developing products to meet new or emerging needs, wants or opportunities • determine how and why products evolve to meet changing needs and wants by, for example, developing a handling collection that shows the evolution of the telephone • explain why existing products no longer meet needs or wants. Students analyse links as they: • consider criteria developed for the design challenge and match materials/techniques to the design requirements • examine changes in products over time and evaluate alternative ways to meet needs and wants • compare existing products by evaluating how well they meet needs and wants • interpret information from different sources to identify ways to use alternative materials • question reasons for product development and consider how needs and wants have changed and continue to change.	Students know that: • a number of design ideas can be generated and a viable idea can be selected from these • design proposals should indicate a range of factors influencing the selection and realisation of designs. Students generate and select design ideas as they: • devise a range of options and select viable design ideas – work in groups to identify various design ideas to meet needs, wants or opportunities and from these select their preferred option – work individually to generate designs and select the most appropriate for their purposes. Students communicate design proposals that indicate influences on selection and realisation of ideas as they: • outline factors that influence design choices – include records of consultation with specialists/users/clients/design team members in their Technology project folios • describe how issues related to context, appropriateness and management affect the design and realisation of a product – identify the impacts and consequences arising from its design or development – identify design constraints and opportunities related, for example, to materials and costs by including detailed specifications or annotating plans and drawings – include, for example, a comparison table that illustrates reasons for selecting or rejecting ideas – use software to generate 2D and 3D images to enhance their design proposals.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students ascertain a shop's advertising requirements and use this information to create a new window display. • Students review advertising materials developed for letterbox drops, and analyse ways to improve them including use of materials, special techniques and layout of information. • Students identity safety issues in a workshop, analyse existing practices and design safety signs that help to improve the safety procedures. • Students investigate the design of new and improved hamburgers that meet prescribed standards.	Examples • Students generate options for an orchard irrigation system, and describe factors influencing the selection of their preferred idea in their design proposals. • Students show in their design proposals how they used specifications to guide the selection of an idea, and the identification of relevant processes and equipment needed to realise the idea. • Students consider different design options when creating a coordinated suite of business stationery — for example, business cards and letterhead for a local company.

Technology Practice	
Production Level 5	**Evaluation Level 5**
TP 5.3 Students meet predetermined standards as they follow production procedures to make quality products.	**TP 5.4** Students use predetermined criteria to judge how well processes and products meet the needs of specific users, and recommend modifications or improvements.
Students know that: • production procedures are affected by predetermined standards • quality of products is dependent on how well production procedures are followed to meet predetermined standards Students follow production procedures to meet predetermined standards as they: • meet standards of quality that reflect clients' needs – use quality materials to achieve desired effects • manage resources within constraints – share limited equipment and/or resources – substitute alternative resources if necessary – work within budget constraints – allocate tasks to make effective use of time • modify their proposed production procedures to, for example – ensure safety – minimise waste · use recycled material and recycle waste – respond to changes that occur during production · adjust components to fine-tune systems. Students make quality products to meet predetermined standards as they: • identify the predetermined standards related to – workplace health and safety requirements – clients' needs and/or product specifications – design constraints • follow correct procedures for using tools and equipment safely • use techniques that will provide the necessary level of accuracy or flexibility – select procedures that match resources · optimise images for the Internet · measure ingredients accurately using electronic scales • consider how procedures and decisions about production may impact on appropriateness of the final product – identify economical methods of production – minimise negative impacts of production processes · minimise noise levels generated by equipment.	Students know that: • predetermined criteria can be used to make judgments about products and processes • judgments can be used to inform recommendations about modifications or improvements to products or processes. Students use predetermined criteria to judge how well products and processes meet the needs of specific users as they: • identify issues of appropriateness, context and management – consider needs of specific users – recognise that a range of appropriateness can be used to evaluate a process or product • describe how particular criteria were met or were intended to be met • make judgments about the effectiveness of particular processes – compare different processes – identify efficient or economical processes • make judgments about how a product meets predetermined criteria – carry out a range of product tests – identify how special features meet predetermined criteria. Students use judgments to inform recommendations about improvements to products or processes as they: • provide reflections about the effectiveness of their own or others' work • report to users about modifications that could be considered about processes and the ways they were carried out • make recommendations about changes to products that may enhance the ways they meet specific needs or wants.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students identify safety issues related to the operation of equipment needed to make a barbeque. • Students working in groups have regular, documented team meetings to manage aspects of a project including financial planning and budgeting, and consider modifications they will need to make in order to deal with resource constraints when planning a school play. • Students follow appropriate procedures and work with selected resources to produce a container for carrying an item of sports equipment on a pushbike.	Examples • Students use criteria provided by others to evaluate products, such as barbeques, and make recommendations about ways to improve their functionality for specific users. • Students consider a range of ways to compare hamburger production for a school fete against predetermined criteria and use these comparisons to recommend changes in features or processes.

Technology Practice	
Investigation Level 6	**Ideation Level 6**
TP 6.1 Students formulate detailed plans for gathering knowledge, ideas and data and validate choices of information, sources and methods.	**TP 6.2** Students generate design ideas and communicate these in design proposals that indicate various options and incorporate management strategies.
Students know that: • a detailed plan can be developed to gather knowledge, ideas and data • information comes from a range of sources and choices of information and methods of data collection can be validated. Students formulate detailed plans for gathering knowledge, ideas and data as they: • develop an action plan describing: – range of sources · target groups, clients, stakeholders, libraries, Internet, books, products – range of collection methods · surveying — field survey, target groups to collate data and inform decision making · researching — existing ways of solving problems with the view to developing new and innovative ideas to solve these problems · questioning — peers, stakeholders, specialists, users · scanning — environmental scan of identified communities and groups such as a soccer club, school, community group · interviewing — focusing on clients' needs · handling collections · testing — beta testing, bench testing, taste testing, field testing · disassembling/reassembling · sampling – record their detailed plan including timelines in their Technology project folios. Students validate choices of information, sources and methods used to gather it as they: • consider questions about the validity of the information – What are the sources and what relevance do they have to the design challenge? – How relevant is the data gathered in reflecting the clients' needs? – Is the information source reliable and without bias? • consider the practicality of the plan within the constraints • provide evidence (e.g. author, organisation) that the information is accurate and factual.	Students know that: • design ideas can be generated and then communicated in design proposals that indicate various options • design proposals record and communicate management strategies. Students generate design ideas and indicate various options as they: • identify a range of resources that could be used to make a product • describe appropriate techniques that they could employ • indicate what makes an option appropriate • record, communicate and generate various options – written notes and specifications resulting from consultation with potential clients – detailed sketches, diagrams or plans developed using CAD or 3D software that help to communicate options – prototypes or models that indicate features – presentations to clients/potential users. Students record and communicate management strategies as they: • identify strategies for managing people – consult with team members to establish workable timelines and to allocate tasks – collaborate with other teams to share ideas or resources – coordinate compatibility between projects • develop plans for managing resources – share resources – minimise waste – recycle materials – purchase materials • manage opportunities – identify opportunities that exist for innovation – consider enterprise aspects of options • plan for managing constraints – lists of materials and sources – consider budgets – production schedules/timelines.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students develop a detailed plan to undertake pre-market and post-market research within the school, or a specific community, leading to the development and evaluation of a product. • Students formulate a detailed plan to gather information from a visiting dietician or food technologist when designing food packs for athletes. • Students validate information they have gathered about the development of web pages for a club or society by cross-referencing their data with other sources.	Examples • Students prepare Technology project folios identifying a range of designs for clothing, including concept sketches or patterns, and strategies for managing the production of a particular option. • Students communicate options for products that support the school musical including posters, programs, lighting and stage settings, and work in groups to develop production plans for developing various aspects. • Students use a 3D model to communicate options for a skate park and detail management issues related to its location and system of operating.

Technology Practice	
Production Level 6	**Evaluation Level 6**
TP 6.3 Students negotiate and refine production procedures in making quality products that meet detailed specifications.	**TP 6.4** Students identify methods for evaluating commercial or industrial products and processes and use these to judge the appropriateness of their own processes and products.
Students know that: • production procedures can be negotiated and refined • quality products meet detailed specifications. Students negotiate and refine production procedures as they: • share ideas about production procedures and reflect on ways to modify or refine them • consider the management of production processes – systemise production by breaking it into stages – set time lines for production – identify how to make efficient use of resources within constraints • demonstrate understandings of commercial and industrial standards – consider industrial processes used to streamline production processes – examine issues associated with quality production methods of different organisations. Students make quality products that meet detailed specifications as they: • apply, where appropriate, commercial and industrial standards in meeting specifications – labelling standards when making a food product • follow identified procedures and specifications to achieve accuracy and quality – use quality control and quality assurance processes in their production • use resources that are appropriate to the product and its intended use – optimise images and save them in suitable format for use on a web page.	Students know that: • there are methods for evaluating industrial or commercial products and processes • methods used to judge industrial or commercial products and processes can be applied to judge appropriateness of their own products and processes. Students identify methods used to evaluate industrial and commercial products and processes as they: • describe different methods used to evaluate industrial and commercial products – explain methods of evaluation based on information gathered from, for example, government or commercial websites – compare purposes and key features of methods and gather feedback to evaluate their efficiency – investigate how industrial or commercial methods may be transferred or adapted to the requirements of their design challenge. Students evaluate the appropriateness of their own products and processes by applying methods similar to those used in commercial or industrial contexts as they: • devise their own methods based on those used in industrial or commercial contexts to: – gather and use feedback – design a quality assurance process – assess the quality of a product of process · seek advice from external evaluators about social or cultural appropriateness · field test a product to establish environmental appropriateness · use destructive or non-destructive testing methods to establish functionality – assess the economic viability of their product or process.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students work in teams as they test and select appropriate production procedures to work with the fabric they have selected for a beachwear range and complete stages of production while monitoring quality. • Students identify production procedures for developing commercially produced fishing lures and refine their production processes to approximate these in order to develop a quality product. • Students use specialised software to produce a website that incorporates animation and digital images, and meets specifications related to download time and accessibility.	Examples • Students identify methods used to evaluate educational resources and use the information to devise ways to evaluate talking books they produce for young children. • Students gather information about food preparation processes and use this information to monitor the safety and freshness of food prepared for a school function. • Students evaluate the success of a hydroponic vegetable venture by using criteria based on similar commercial ventures to judge the cost effectiveness of their project. • Students use destructive and non-destructive tests to evaluate the strength of their bridge models.

Information

Level statement — Foundation Level: Students are developing an understanding of information by exploring familiar sources and forms of information and different ways of accessing it. They frequently make meaning of the information they receive. They experiment with a variety of ways of communicating information.

At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.

Students explore familiar sources and forms of information as they:

- identify some sources of information
  - people who help them with tasks
  - books that they use
  - programs on television
  - signs in their communities
  - logos, symbols or pictures
- respond to or use different forms of information
  - visual information such as signs or signals
  - oral information such as speech or vocal sounds
  - using smell, touch or taste
  - aural information such as hearing, clapping, ringing a bell.

Students access information in different ways as they:

- watch a person model an action
- identify directions given orally, visually or aurally
- ask questions by signing, gesturing or speaking
- use their senses
- use communication devices
- look at pictures in books or magazines
- use, with structured assistance, the Internet, information touch screens, talking CDs.

Students make meaning of information they receive as they:

- understand some technical terms
  - name/use tools, equipment
- follow directions or instructions
- react to the stimulations of their senses
- interpret information in meaningful ways
  - telephone ringing, walk only when signal is green.

Students experiment with a variety of ways of communicating as they:

- use information for their own purposes
  - express an idea using signs, gestures or symbols
  - communicate feelings visually by pointing to pictures
  - show ownership using a sign.

The following are examples of learning outcomes developed from the level statement for Foundation Level. Use these outcomes, or create others, to meet the individual needs and group needs of the class.

Students' demonstrations of outcomes are apparent when they have provided evidence across a range of contexts as exemplified below.

Example learning outcome: Students react to stimuli in their environment in various ways.	Example learning outcome: Students use sound, visual or concrete representations to present information.
Students: • indicate awareness of environmental changes through posture, eye gaze, startle reflex – sound of an approaching train – school bell – smell of food • indicate signs in their community – 'walk' signs at pedestrian crossings – logos or symbols for cafes, restaurants or shops – for community services such as police or ambulance – within the school such as toilet or office – for bus stops.	Students: • display photographs of specific family members • create drawings or models of family members in domestic situations • manipulate digital images of family members for a communication board • label their possessions using an icon.

Information	
Nature Level 1	**Techniques Level 1**
INF 1.1 Students identify and describe different forms of information.	**INF 1.2** Students use simple techniques for presenting information for their own purposes.
Students know that: • information exists • forms of information can be identified and described. Students understand how information exists as they: • realise there are different sources of information – people – television/radio/print – libraries – Internet • realise there are different forms of information – aural — spoken, sound · telephone conversation, school bell – visual — text, graphical · recipe, email letter, drawings of ideas, advertising brochure – multimedia — combinations of different media · program on the television, interactive story book on CD-ROM, website. Students identify and describe different forms of information as they: • consider and discuss forms in which information is conveyed – signs, symbols and logos used in public places – explanatory photographs and videos – information posters – labels in classrooms – television advertisements – non-fiction books – sound recordings such as music CDs or story tapes – telephone book • locate forms of information in the community – identify some forms of information in the local area · street name, road signs, billboards – use libraries or the Internet · electronic · text · graphical · pictorial.	Students know how: • simple techniques are used to present information. Students prepare and present information for their own purposes as they: • use simple techniques to prepare information – draw · pictures for posters · pictures to illustrate a product – lay out information · cut/paste items to create charts · layout of information using a computer · write lists to use for different purposes · write simple sentences (with assistance) to explain their ideas – use certain design techniques they have observed · colour · change text · change font size. • use simple techniques to present information – oral presentations – display posters – print information using a computer – electronic slide shows – pictures, using a digital camera or video – audio recordings.

At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.

Examples

- Students describe how road signs are used in their surroundings and use simple techniques to make their own signs for the classroom.
- Students examine the layouts of storybooks and apply them to make new storybooks.
- Students look at recipes and present a drawing of a sequence of steps to explain how they wish to make sandwiches.
- Students observe posters in the library and select ways to organise a display board of photos from an excursion.
- Students use computers, with assistance, to access sources of information and print the information they find.
- Students watch information programs on television and video their own roleplays of these programs.

Information	
Nature Level 2`	**Techniques Level 2**
INF 2.1 Students explain the purposes of different forms of information and describe how these are used in everyday life.	**INF 2.2** Students use simple techniques for accessing and presenting information for themselves and others.
Students know that: • different forms of information have different purposes • different forms of information are used in everyday life. Students explain the purposes of information as they: • consider the role of different forms of information – to instruct · a recipe for making playdough · symbols such as road symbols – to persuade · advertising on TV and billboards – to inform · news on TV, newspapers, magazines – to report · non-fiction books, weather reports – to help different people understand the same message · sign language, symbols – to entertain · a joke or a film. Students consider how forms of information are used in everyday life as they: • record which forms of information students, their families and friends access – newspapers for information – television programs for entertainment – instructions for assembling an item – recipes when cooking – signs when locating a shop or street – diagrams or maps to find a location – instructions to enter competitions – advertisements to persuade themselves or others to buy things or do things.	Students know how: • simple techniques are used to access and present information. Students access and present information for themselves and others as they: • access information – use the library to gather data – question classmates about opinions, feelings or ideas – use the computer to access information from a CD-ROM – use books to find information – watch television or video to gather information about a selected topic • present information – identify purposes for presentation · to instruct · to persuade · to inform · to report · to help different people understand the same message · to entertain – identify the intended audience – select forms that are appropriate for the purpose · present this information in a simple graph · present it using a computer program · make a simple chart of instructions for others to follow.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students identify the role of colour in packaging and use bright colours to make advertisements. • Students examine features used in a newspaper layout, such as print size and font style, and adopt these ideas as they design their own newspapers. • Students examine how television interviews report on people's ideas and use a video camera to record a report on the environmental views of their classmates. • Students explain why they use a simple graph to present information from a class survey about how children get to school. • Students explain how their poster, created with the computer, informs people about the school fete and encourages them to attend.	

Information	
Nature Level 3	**Techniques Level 3**
INF 3.1 Students describe advantages and disadvantages of different sources and forms of information.	**INF 3.2** Students select and use techniques for generating, modifying and presenting information for different purposes.
Students know that: • information comes from different sources and can be presented in different forms • different sources and forms have advantages and disadvantages. Students describe the different sources and forms of information as they: • identify different sources of information appropriate to their needs – list and choose sources of information — for example, Internet, books, television, signs, environment, people – classify information according to its source • gather and compare information in various forms – collect and compare a newspaper feature article, editorial and letters to the editor on a particular topic. Students describe advantages and disadvantages of different forms and sources of information as they: • compare information to determine its appropriateness in meeting a design challenge • establish reliability and relevance of forms and sources of information – compare newspaper articles with television coverage about the same news story – compare forms and sources of information accessed electronically with library resources – compare information from people and consider its reliability • consider the effects of different forms of information – compare the visual appeal of black-and-white and colour photographs – compare the use of sound in radio and television advertisements – evaluate different combinations of media in multimedia products such as websites or multimedia presentations.	Students know how: • techniques can be selected and used to generate, modify and present information. Students generate, present and modify information for different purposes as they: • generate information – organise information so it can be used for different purposes · use a computer to organise information in different ways · record data using tables they have designed • present information – display information in forms that are meaningful to the purpose · adopt ideas about presentation from an existing form · present data in a simple table or spreadsheet – consider appropriateness when laying out information · aesthetic appeal, social relevance – use equipment such as digital cameras, video and audio devices to present information · record and develop a video about a class camp • modify information – consider feedback about presentations and use this to change them · trial a multimedia presentation to gather reactions to the use of different background colours · show samples of pictures to be used on a poster – use computers to cut, paste and print information from one source and modify it in order to create a new information product · a brochure, school project or assignment.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students describe the advantages and disadvantages of different ways of circulating information about their school camp and select ways to present the information. • Students select techniques to create and modify a web page about the school and describe some of the advantages and disadvantages of presenting the information in this form. • Students describe advantages and disadvantages of different forms of advertising and generate advertisements for the same product using different forms and appropriate techniques. • Students input data that they have gathered about Australian animals into a database, and discuss advantages and disadvantages of generating, presenting and modifying information in this form.	

Information	
Nature Level 4	**Techniques Level 4**
INF 4.1 Students analyse sources and forms of information and match these to the requirements of design challenges.	**INF 4.2** Students apply techniques for transforming and transmitting information for different audiences.
Students know that: • sources and forms of information can be analysed • sources and forms of information can be matched to the requirements of design challenges. Students analyse sources of information as they: • verify whether the source of information is reliable, comprehensive, current, accurate, unbiased – currency of text in magazines, Internet, books – credibility of information from the Internet – bias of television programs. Students analyse forms of information as they: • compare similar information stored, presented and/or transmitted in different ways • evaluate the effectiveness of methods of presenting and transmitting information such as print and electronic forms • identify the purposes of the features — for example, text type, layout, use of graphics and sound — in different forms of information. Students match sources of information to requirements of design challenges as they: • identify specifications and constraints in a design brief – timelines, management or other requirements • seek specialised information from reliable sources to inform the development of their design ideas • seek clarification of user requirements or feedback on design ideas or products from potential users – interview potential users – involve potential users in test runs or trials. Students match forms of information to requirements of design challenges as they: • identify effective forms of information for particular purposes • identify suitable forms of information for specific audiences – cultural significance of using specific colours – inclusivity of a selection of pictures – acceptable use of terminology.	Students know how: • techniques are applied to transform and transmit information. Students transform and transmit information for different audiences as they: • transform information using a variety of techniques – use special effects in a computer program · slide transitions and sound effects · insert animated graphics – use specialised equipment to manipulate information in different ways · scan or take digital images to include in a brochure · convert data to a pictorial or graphical presentation – use freehand techniques to layout a product, manipulate and present information · a brochure for tourists about local wildlife – edit wording to make it appropriate for a specific audience – redesign the information products of others to make them more effective for specific users • transmit information in appropriate forms – send information to communities in a remote location via the Internet or email – select appropriate forms to communicate information to a large audience · design a poster to advertise an event · present an advertisement in audio form as well as visual form • report on changes to the media – the Internet — the ease of access to a wide range of current information • research contemporary sources of information and compare them with those of the past • describe the effects that changes to sources of information have on occupations and leisure • access different sources • present the same information in a range of ways targeting the needs of particular audiences.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students verify the currency of information by including references to publication dates and explain how the information can be used to meet the design challenge. • Students access reliable sources of information to inform their development of local area maps for the school website. • Students analyse information from a parents/carers' survey about their preferences for school lunches and compare the effectiveness of emailing the survey findings to parent/carers or reporting them in the school newsletter. • Students examine bias in television interviews and make a video recording to present an unbiased view of an event or issue.	

Information	
Nature Level 5	**Techniques Level 5**
INF 5.1 Students explain how changes to sources, forms and management of information affect design and production decisions.	**INF 5.2** Students compare and select techniques for processing, managing and presenting information for specific users.
Students know that: • changes in sources, forms and management of information are ongoing • changes in sources, forms and management of information affect production decisions. Students consider reasons for changes to sources, forms and management of information as they: • identify reasons for ongoing change – technical advances · invention of computers and the Internet · invention of analogue and digital mobile phones – changes in society · changes in government and public perceptions · uptake of procedures related to new technology – changes to public policy · privacy legislation · regulations for food labelling – financial changes resulting in accessibility to equipment • describe some impacts of changes to sources, forms and management of information on, for example, health, study, occupations and leisure – accessibility of information – volume of information · sources vary in reliability · multiple forms of information exist – data management · privacy issues · data integrity · data security. Students explain how ongoing changes to sources, forms and management of information affect design and production decisions as they: • examine impacts of technological advances to sources and forms of information – CAD programs — rendering – programmable devices — robots – encryption of information — online banking • compare past and present information management systems and identify impacts of changes to these • predict implications of emerging technologies.	Students know how: • techniques are compared and selected to process, manage and present information. Students process, manage and present information for specific users as they: • compare and select techniques – select tools such as computers and use computer programs to manipulate and present information in specialised ways · use charts and graphs to present financial information – use equipment such as scanners, computers, VCRs, cameras and tape recorders · select appropriate equipment for the type of information product that is most suitable for the task and audience — a photograph may require transfer to a digital image for electronic transmission – organise and store information · create suitable filing systems · back up file and store to disk – retrieve information · compare the retrieving of information from traditional paper storage and electronic storage – transform and transmit information • make decisions about design and production – consider the requirements of the audience · children compared with adults – decide on the format for a presentation · a brochure format compared with an electronic format – consider the implications of choosing a particular medium for their product · printed format compared with non-printed format • present information for specific users – consider the needs of individual users when designing information · special needs, remoteness or access to and availability of equipment – consider the cultural background of potential audiences and how this affects interpretation and use of information.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students consider the design and production features of multimedia software when creating a presentation to inform other students about vacation activities. • Students consider the implications of privacy related to recording people's personal details when developing a database. • Students consider impacts of changes in the ways information is presented on specific groups of people, and select techniques to present information in forms that are meaningful to them. • Students explain how perceptions of health have led to changes in labelling and use this information to create packaging for genetically modified products or 'low fat' products.	

Information	
Nature Level 6	**Techniques Level 6**
INF 6.1 Students analyse issues related to the ownership and control of information in societies.	**INF 6.2** Students use specialised techniques for managing and organising the presentation of information to meet detailed specifications.
Students know that: • there are issues related to ownership of information • the control of the presentation and transmission of information by individuals and groups impacts on societies. Students analyse issues related to ownership of information as they: • observe intellectual property rights – seek permission for use – acknowledge sources of information – recognise the need for patents • discuss issues related to ownership of information – plagiarism – controlling access to information – censorship – privacy. Students analyse issues related to the control of the presentation and transmission of information as they: • identify influences of different groups on how information is presented and transmitted – compare presentation and transmission of information in different media – identify legislated requirements for presentation and transmission of information – identify impacts of restricting bandwidth for data communication • identify issues that may impact on the accessibility of information – ownership of media companies · software development by a limited number of companies · ownership of television and print media • availability of technology for accessing information – accessibility to computers and the Internet • consider issues that may impact on the way information is presented – provision of information in different forms to increase access – availability of technology for presenting information in accessible forms.	Students know how: • specialised techniques are used to manage, organise and present information. Students manage, organise and present information to meet detailed specifications as they: • use specialised techniques to manage information – make use of the Internet and email to access and transmit information – manage the distribution of interrelated pieces of information · coordinate the advertising for a product they have developed · consider management of a school magazine • use specialised techniques to organise information – develop a database for the storage and retrieval of information – use spreadsheets • use specialised techniques to present information – specialised software programs to achieve desired effects · CAD programs, multimedia programs, animation programs, publishing programs, webpage designs · video software to create an online video clip · software to create a virtual fly-through of a public space they have designed – create information products using a range of media sources and equipment · record/edit/produce a short video clip · develop a suite of business stationery including letterhead, web page, email, business card.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students critically investigate and debate ownership and control issues related to a website they are developing that provides music samples of popular bands. • Students use storyboard techniques to manage the shooting of an advertisement and consider issues of control that relate to the presentation of advertisements on television. • Students produce a multimedia information package for a tourist destination on CD-ROM and investigate ethical issues related to selected images, text and music. • Students investigate the control of media in Australia and create a website that provides access to a range of publications controlled by different interests.	

Materials

Level statement — Foundation Level: Students are developing understandings of the basic characteristics of familiar materials through exploration. They choose materials from a range of options. They select materials for simple tasks, and suitable tools and equipment for manipulating and processing the materials.

At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.

Students are developing understandings of basic characteristics of materials as they:

- investigate materials by handling them
  - sort materials by texture
    - rough or smooth
  - describe cooking ingredients by their characteristics
    - wet or dry
- categorise the characteristics of materials
  - light or heavy
  - shiny or dull
- explore materials in their play
  - float or sink
  - dry or damp.

Students choose materials for simple tasks as they:

- select different materials to decorate an object
- select a suitable material to make a card for a special occasion.

Students choose tools, equipment and props for manipulating and for processing the materials as they:

- select a knife to spread butter to make a sandwich
- select a suitable container to carry water
- use a prop, in socio-dramatic play, to manipulate an imaginary material
- select tools required to carry out tasks such as cutting or pasting
- use scissors to cut paper when making a card
- use a spade to dig the earth when preparing a garden
- choose a freezer to make an iceblock
- identify an appliance needed to make toast.

The following are examples of learning outcomes developed from the level statement for Foundation Level. Use these outcomes, or create others, to meet the individual needs and group needs of the class.

Students' demonstrations of outcomes are apparent when they have provided evidence across a range of contexts as exemplified below.

Example learning outcome: Students sort materials according to differences in characteristics.	Example learning outcome: Students choose suitable materials and equipment for a familiar task.
Students: • sort materials into groups, e.g. same or different; or by colour, shape, size, texture, smell, sound • select paper according to colour • sort landscape materials by texture • match fabrics according to pattern • choose between two objects • sort fabrics by feel.	Students show that they understand the need to: • use a jug to add water to a mixture when making gravy • use a spoon to stir ingredients when making a cake • pour detergent into a bucket to make bubble-blowing liquid • use scissors to cut cardboard to make a card • select a tool to dig a hole to plant a tree • select a tool to hammer a nail into a piece of wood • use a brush to brush a dog's coat • use soap to wash hands • select a spoon rather than a fork to eat yoghurt.

Materials	
Nature Level 1	**Techniques Level 1**
MAT 1.1 Students identify characteristics of materials and explain how materials are used in everyday products.	**MAT 1.2** Students explore equipment and techniques when joining and combining materials for meaningful purposes.
Students know that: • materials have characteristics that can be identified • materials are used in everyday products. Students identify characteristics of materials as they: • examine materials – look at characteristics of different materials in a handling collection – sort materials by characteristics · weight, flexibility, strength, texture – compare the characteristics of different materials • describe several characteristics of different materials – wood – plastic – ingredients for cooking. Students explain how materials are used in everyday products as they: • identify materials used in everyday products – name materials used in everyday products · plastic used in a toothbrush, paper used in tissues, wood used in rulers – describe some ways materials could be used • discuss why different materials are used in different products – discuss the selection of a material to make a product · use of a plastic drink bottle in the design of their boat · discuss why a material may have been used to make a particular toy · explain why toppings were selected for a pizza.	Students know how: • to explore and experiment with a range of equipment and techniques for meaningful purposes. Students explore equipment and techniques for working with materials as they: • experiment with a variety of equipment and range of techniques to make products – blend materials · use beaters to combine ingredients – join materials · use glue to join collage materials to create a model house · use a hammer and nails to join pieces of wood · use a screwdriver to assemble and disassemble parts – cut materials · use scissors to cut fabric – process data · use computers to paste pictures in a paint program • explore a range of equipment – make use of equipment · use screwdriver in a play or lifelike scenario to fix a toy car · use home tools or appliances (with adult supervision) to prepare a meal — a microwave to heat soup – make use of materials · use different fabrics as a costume to act out part of a story · make a product from collage materials as a gift.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students investigate materials used to make products brought in for ‘repair’ to play workshop in the classroom and use equipment and techniques to repair them. • Students explore the use of equipment such as hammers, nails and glue and use them with materials they select to make a toy that they have designed. • Students identify characteristics of materials they will use to make placemats and explore appropriate techniques and equipment needed to make them. • Students taste ingredients as they select pizza toppings and experiment with different ways of cooking pizza.	

Materials	
Nature Level 2	**Techniques Level 2**
MAT 2.1 Students match the characteristics of materials to design requirements.	**MAT 2.2** Students select and use suitable equipment and techniques for manipulating and processing materials.
Students know that: • characteristics of materials can be matched to design requirements. Students match the characteristics of materials to design requirements as they: • identify how materials can be used depending on their characteristics – identify design requirements and select materials · talk to preschoolers about their needs when making a toy and select appropriate materials – categorise materials as to how well they meet design requirements · identify materials that meet the design requirements of being waterproof and light weight – describe characteristics needed in materials to support the features and functions of a product · select materials appropriate for making portable chairs · identify ingredients for making a birthday cake – match materials to purposes based on the materials' characteristics · plant a specific tree that attracts birds and butterflies when designing an environmental area.	Students know how: • to select and use suitable equipment and techniques • to manipulate and process materials. Students select and use suitable equipment and techniques as they: • choose appropriate equipment and techniques – identify and use · a suitable size hammer and nail when joining wood · a digital camera to take pictures · a glue gun to join materials · gardening tools to plant vegetables. Students manipulate and process materials as they: • explore appropriate equipment and techniques – identify different methods of processing the same material · fabrics can be joined by sewing or gluing · food can be cooked by steaming, frying or baking · paper can be used by folding, taping, stapling or gluing – consider the characteristics of a material and select and use appropriate ways of processing it · cut wire with pliers · trim fabric with pinking shears to prevent fraying · melt butter in a microwave oven using a non-metal tray.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students select materials that float and process these materials in appropriate ways to make an unsinkable boat. • Students select herbs that will grow in their local area and make a garden using appropriate tools and equipment. • Students select materials with appropriate characteristics in order to make a bag for carrying their belongings on an excursion.	

Materials	
Nature Level 3	**Techniques Level 3**
MAT 3.1 Students choose materials according to various characteristics that best suit the product and user.	**MAT 3.2** Students select and use suitable equipment and techniques to combine materials accurately in order to meet design requirements.
Students know that: • materials have various characteristics that make them more suitable for a specific purpose • materials can be selected based on the needs of the user. Students choose materials according to various characteristics as they: • describe what makes certain materials appropriate for products – identify a number of characteristics that make a material suitable · the purpose of a toy boat is to float, so a lightweight, waterproof material is selected · a kite has to fly and be seen, so it is made out of light, colourful materials. Students consider the characteristics of materials for users as they: • identify purposes of products and describe how some materials support these purposes – identify materials used in products and how these meet the needs of a user · non-toxic, soft materials used in toddlers toys · waterproof materials used in swimming bags for themselves · soft, easily digestible food for an elderly person • analyse the characteristics of different or similar materials – compare the characteristics of materials to determine their suitability for a purpose · compare different cheeses for a pizza · compare the flexibility of different pieces of wood when making a fishing rod.	Students know how: • to combine materials accurately in order to meet design requirements. Students select and use suitable equipment and techniques as they: • consider the need for accuracy when processing materials to meet design requirements – accurately combine ingredients when cooking · accurately measure and combine ingredients using appropriate equipment – accurately combine different materials using suitable techniques and equipment · use screws and wood glue to make a mouse house – use needle and thread to join the seams on a bag · stitch evenly to sew a neat seam – cut accurately around a pattern piece · pin pattern pieces and cut closely around a pattern to make a stuffed toy – combine different types of materials to fit together accurately · measure and cut wood, plastic and fabric when making parts of a kite.
At each level, activities should occur in a range of contexts. Student should consider aspects of appropriateness and management within these activities.	
Examples • Students identify appropriate materials for a compost system and select techniques and equipment that allow them to accurately follow design instructions. • Students explore, compare and specify characteristics needed to join materials with different characteristics and accurately work with the materials to make a pet shelter. • Students identify materials that have characteristics that provide insulation when making a take-away food container and accurately use equipment and techniques to meet design requirements. • Students choose appropriate materials that are flexible, easy to print on and durable, and use appropriate techniques to make a book. • Students choose materials with different characteristics to affect the noise a marble makes as it moves through a marble maze.	

Materials	
Nature Level 4	**Techniques Level 4**
MAT 4.1 Students explain how characteristics of materials affect ways they can be manipulated.	**MAT 4.2** Students employ their own and others' practical knowledge about equipment and techniques for manipulating and processing materials in order to enhance their products.
Students know that: • materials have characteristics that affect the ways they can be manipulated. Students explain how the characteristics of materials affect their manipulation as they: • investigate and describe ways in which materials may be manipulated – describe the properties of a material · strength, flexibility, appearance – list advantages and disadvantages of using materials · glass to make a fish tank – identify materials that keep their shape · clay, playdough – describe how the characteristics of a material will allow it to be manipulated · thickness and strength of a material will affect how it can be cut · characteristics of a fabric will determine ways it can be joined · absorbency of different types of materials will affect the type of glue used · combining ingredients is affected by the characteristics of the different ingredients.	Students know how: • to enhance products by manipulating and processing materials. Students use their own and others' knowledge to enhance products as they: • develop practical knowledge about specific equipment and techniques – build on previous personal experiences · develop familiarity and adeptness with a word-processing program · explore how different equipment and techniques could be used to create a finish on a wooden product – gather information by working with others to process materials · work with specialists to design a watering system for the school garden · prepare a meal with an invited guest who has specialist knowledge about Asian food • incorporate advice about equipment and techniques as they process materials and enhance products – manipulate and process materials to achieve specific effects · use a mitre box and hand saw to cut material for a picture frame · fold paper to achieve special effects on a card for a special occasion · decorate a picture frame using different techniques · use particular cooking techniques to achieve desired effects.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students select materials with suitable characteristics in order to make take-away food warmers for a class restaurant, and seek advice about the most appropriate techniques and equipment needed to develop their product. • Students select materials needed to make scenery for a class play, and seek advice about the most appropriate techniques and equipment needed to make the scenery look realistic. • Students select materials with suitable characteristics for the construction of an indoor or outdoor hydroponic garden, and explore different techniques and equipment that can be used to minimise water loss.	

Materials	
Nature Level 5	**Techniques Level 5**
MAT 5.1 Students compare and contrast materials according to their characteristics to determine how effectively the materials meet predetermined standards.	**MAT 5.2** Students operate equipment and apply techniques for manipulating and processing materials to meet predetermined standards.
Students know that: • materials can be compared and contrasted according to their characteristics • materials can be selected to meet predetermined standards. Students compare and contrast materials according to their characteristics as they: • consult with clients and potential users about the characteristics of a selection of materials – colour schemes and textures • conduct tests on a range of materials to compare their characteristics – the flammability of a range of fabrics – the effects of the sun on a range of materials over a period of time • consider the economic, environmental and functional impacts and consequences of using materials with particular characteristics. Students select materials that meet predetermined standards as they: • identify predetermined standards – standards determined by the context of the design challenge – quality standards set by clients – safety standards predetermined through legislation, regulation and convention • identify the characteristics of materials that make them suitable for meeting a standard – consider size, weight, durability, flexibility, transparency – availability and cost • conduct tests to determine whether particular materials meet particular standards – select fabrics for children's clothing that meet safety standards based on the results of flammability tests • base their selection of materials to meet standards on comparisons of the materials' characteristics – compare the effect of using lightweight cement or timber for construction – select ingredients based on comparisons of fat or sugar content – compare the aesthetic appeal and cultural appropriateness of particular colour combinations.	Students know how: • to meet predetermined standards by manipulating and processing materials. Students safely operate equipment and apply techniques to meet predetermined standards as they: • develop skills to manipulate and process materials – use precision when operating equipment and applying techniques · accurately cut materials to measured lengths · accurately weigh ingredients and combine them in a cooking process · mark out fabric and use a sewing machine to make clothing · optimise digital images to a defined standard • refer to predetermined standards to identify the precision with which materials need to be manipulated – identify the standard required · standards determined in the context of the design challenge · quality standards set by clients · safety standards predetermined through legislation · operating instructions of the manufacturer of equipment in order to meet safety standards.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students identify materials suitable for the construction of a device that can be produced for use by people with disabilities. • Students identify materials with characteristics that are sun safe, and select and use techniques so that the garments are, for example, suitable for the occasion, culturally appropriate, durable, functional and aesthetically pleasing. • Students identify standards for food packaging, and select materials and techniques to make food packaging that meets these predetermined standards.	

Materials	
Nature Level 6	**Techniques Level 6**
MAT 6.1 Students incorporate in their design proposals ideas about the impacts of particular materials used in products.	**MAT 6.2** Students use specialised equipment and refined techniques to make quality products to detailed specifications.
Students know that: • impacts result from the use of particular materials in products. Students incorporate ideas about impacts of materials in their design proposals as they: • record information about the use of materials and the impacts these may have in their design proposals – describe consequences of using materials in particular situations · justify the selection of materials to make a product based on how materials have been used in the past and impacts this may have had on the environment · use various methods to research the use of chemical fertilisers and the impacts these have on crop growth and the environment • make an informed decision about the impacts materials may have – use their understandings of the characteristics of materials to make appropriate decisions about the selection of materials · select materials that will have beneficial impacts on the functionality of products · select materials that allow a product to be produced inexpensively · select materials that meet environmental conditions.	Students know how: • to use detailed specifications to make quality products • to make quality products using specialised equipment and refined techniques. Students determine detailed specifications as they: • identify the specifications required to make quality products – determine standards in the context of the design challenge – consider the quality standards set by clients – examine safety standards determined through legislation, regulation or convention – make checks on quality to ensure detailed specifications are met · use calipers to confirm size of material on a lathe · test soil to determine pH levels for plant growth – consider quality of digital images needed in different situations — web, paper, multimedia presentations. Students use specialised equipment and refined techniques to make quality products as they: • select and use specialised equipment and techniques – match equipment and technique to desired specifications · turn wood on a lathe to make matching table legs · grow plants indoors using hydroponics · use a computer-controlled tool to mill, embroider or engrave a product · cook using specialised equipment and food preparation techniques.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students record considerations about the impacts of materials they have selected to make a solar-powered product and employ the necessary equipment and techniques required to develop a quality product. • Students select fabrics for sports uniforms based on performance tests against specific criteria and use specialised techniques to make a prototype of their design. • Students consider impacts of different fertilisers, trace elements and methods of delivery on local flora and fauna and select the most appropriate method of delivery to promote efficient plant growth.	

Systems

Level statement — Foundation Level: Students are developing an understanding of simple routines and familiar tasks and are participating in activities that involve familiar, simple systems. They identify cause–effect relationships within these systems.

At each level, activities should occur in a range of contexts. Student should consider aspects of appropriateness and management within these activities.

Students, with scaffolding, are developing an understanding of simple routines and familiar tasks as they:

- undertake simple routines and familiar tasks
  - recall steps in a daily routine
    - make a poster that describes a routine
    - choose from visual cues and match them to the steps of a routine
  - sequence images to describe events
  - carry out a safe practice
    - prepare a meal — make toast
- follow or give one- or two-step instructions
  - on, off, start, stop, in, out
  - instruct someone to carry out the steps of a task for them
- develop their own routines and familiar tasks
  - prepare a meal — make sandwiches
  - organise belongings
  - tidy the workplace
  - play activities — make a train line or road system, serve customers
- adapt to or accept changes to a routine.

Students are participating in activities that involve familiar, simple systems as they:

- operate traffic lights to cross the road
- use equipment to carry out a task
  - turn on a computer
  - use a mixer to process food.

Students identify cause–effect relationships in familiar, simple systems as they:

- identify components of systems that they use
  - identify a switch to operate a light
  - identify switches or handles for opening or closing doors
- observe the effect of operating components of systems
  - turn a CD-player, television, tape player or computer on or off
  - make an electric wheelchair go backwards or forwards.

The following are examples of learning outcomes developed from the level statement for Foundation Level. Use these outcomes, or create others, to meet the individual needs and group needs of the class.

Students' demonstrations of outcomes are apparent when they have provided evidence across a range of contexts as exemplified below.

Example learning outcome: Students use simple routines for familiar purposes.	Example learning outcome: Students indicate their understandings of cause–effect relationships through the use of simple routines.
Students: • sequence representations (pictures or concrete objects) of the steps involved in a routine – getting dressed – mowing the lawn – washing dishes – eating a meal • respond appropriately to routines – put on a hat and gloves before gardening – wash hands before eating – put on an apron before cooking – place dirty clothes in a bag – use a spoon to add sugar to a drink.	Students: • plug in an appliance before turning it on • turn off the power before removing the power plug • carry out a task as part of a group process or sequence – add topping to a pizza – make a cake – participate in the care of a pet • press a switch to produce a sound or picture.

Systems	
Nature Level 1	**Techniques Level 1**
SYS 1.1 Students identify familiar systems and describe how these are used in everyday life.	**SYS 1.2** Students sequence steps to develop simple systems to carry out familiar tasks.
Students know: • what a system is • there are systems and they are used in everyday life. Students identify and describe familiar systems as they: • identify and describe systems in everyday life – explore systems used in familiar environments – storage system in the classroom – waste disposal system in their home, school, neighbourhood – communication system — postal system, telephone system – irrigation system on a farm or in a garden – systems for self-care — meal times, getting dressed, going to school, crossing the road, daily routine • consider familiar systems and the effects systems have on everyday life – discuss positive and negative effects on themselves and others · transport systems — ease of moving people and pollution of the environment – discuss what would happen if familiar routines were not followed or if familiar systems were not in place · What would happen if there were no garbage collection system? – describe effects of systems that they use · electricity system.	Students know how: • to develop simple systems to carry out familiar tasks. Students sequence steps to carry out familiar tasks as they: • examine and sequence steps in existing systems or routines – identify or sequence steps · identify steps in the recipe when making playdough · identify steps to borrow a book from the library · follow steps to access a computer program, or cut or paste in a computer program · follow a series of steps or instructions to achieve a predetermined result such as operating a tape recorder or CD-player – consider how an existing system works · consider the way in which pieces of a construction kit or commercial toy work together · disassemble an existing system to investigate various components · consider ways in which books are borrowed from a library – discuss household systems · a washing machine or pop-up toaster and how they carry out familiar tasks – consider the routines used within the school · the teacher may use pictures or draw a flowchart of the system for evacuating a classroom during a school fire-drill · draw a sequence of pictures to illustrate lunch time eating routines • develop systems to carry out familiar tasks that include a limited number of sequenced components – design a simple assembly line to prepare food · make sandwiches · cut vegetables for soup – suggest changes to familiar routines · design a system for distributing a newsletter to the class – use familiar construction materials to develop systems · make moving toys using construction blocks – identify simple tasks that can be organised by a system · organise a roster for feeding a pet · design a system to remind children to return books to the school library.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students identify steps in systems they have developed to care for a class pet and describe how this system affects their school day. • Students describe how the ordering system for the school tuckshop impacts on them and design a system for distributing tuckshop food when it gets back to the classroom. • Students describe how postal systems may work, and design and put in place a class postal system.	

Systems	
Nature Level 2	**Techniques Level 2**
SYS 2.1 Students identify and describe the order of components in familiar systems.	**SYS 2.2** Students combine components to assemble systems in order to meet their needs and the needs of others.
Students know that: • systems are made up of ordered components. Students identify and describe the order of components as they: • investigate different components that make up a system – recognise that components of a system can include people – identify basic components of a system and describe how they function · the ordering system and people involved in making the tuckshop function · the function of a wheel, bucket and handle of a wheelbarrow · the processes of sending and receiving mail • identify the order of different components in a system and describe their purposes – describe how components are linked in a sequence to perform a task · waste disposal system — collect, sort and dispose of rubbish · tuckshop ordering system — accept order and payment, make and pack orders, deliver orders • identify and describe the purpose of various components within a system – identify the purpose of a timer in moving students through a fitness program.	Students know how: • to combine components to assemble systems. Students assemble systems to meet their needs and the needs of others as they: • combine components to make a system – use existing components to make a simple product · make a simple light fitting using a battery, light bulb and aluminium foil – use equipment to assemble and disassemble various systems · use tools to disassemble a clock – create a system to meet their needs · a system for alerting the class that someone is at the classroom door – create an organisational system for an identified class need · design a roster for watering the class garden.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students identify and describe some components needed to make a transport system and combine components to assemble a transport system for a model town. • Students identify and describe components needed to recycle aluminium cans and assemble a recycling system for their home or class. • Students identify components that could be included in a class fitness program and organise and operate a fitness circuit. • Students describe some effects of a pulley system by experimenting with it, and devise and use a system that combines similar components to lift weights in a sandpit.	

Systems	
Nature Level 3	**Techniques Level 3**
SYS 3.1 Students identify and describe relationships between inputs, processes and outputs in systems.	**SYS 3.2** Students assemble and trial systems they design by considering inputs, processes and outputs.
Students know that: • systems have inputs, processes and outputs. Students identify and describe relationships between inputs, processes and outputs as they: • identify inputs, processes and outputs of systems – use simple flowcharts, drawings and diagrams to record how systems operate · draw a flowchart of a water-treatment system that identifies unfiltered water, filtering processes and clean water as inputs, processes and outputs · list inputs, processes and outputs of different systems · label diagrams or models to show names of inputs processes or outputs • identify relationships between components – discuss and record what happens to an input as a result of a process · water becomes cleaner during a treatment process · ingredients change chemically during cooking processes · bread changes to toast during the heating process – describe effects that may arise from changing an input or process · describe the effects if the number of batteries in a lighting circuit is doubled · describe the result of increasing oven temperature when baking a cake · describe the impact of electric vehicles on the transport systems of the future · describe how navigation aids assist blind students to navigate their way around the school.	Students know how: • to assemble and trial systems. Students consider inputs, processes and outputs as they: • design and assemble systems • develop different systems that carry out similar tasks – systems for serving food at a school camp — self-service or table service – systems for storing school books — storing books in desks or storing books in bags • develop a system to achieve specific outputs – design and make a system to help keep school lunches cool – combine components in a simple electronic circuit to make an alarm to identify if a person is at the door • describe the function of components in a system – identify the effect a heating process is meant to have on an input – draw diagrams and explain to others how their systems operate • trial systems they design – test and evaluate their own and others' designs for consistency of outputs · describe how an alarm rings when the switch is activated • consider the appropriateness of inputs, process and outputs – time taken for system to operate – cost of inputs – effectiveness of processes.
At each level, activities should occur in a range on contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students identify the inputs, processes and desired outputs for a system for cooking and distributing food on a school camp and design a system that they can trial at the camp. • Students identify relationships between inputs, processes and outputs in a mail system and assemble and trial a mail system for distributing mail around the classroom and school. • Students describe some relationships that exist between components in electronic circuits and design and trial a simple alarm system for a window or door. • Students disassemble old toys that contain systems and determine how they could use the components in these to create new systems to meet their needs or the needs of others.	

Systems	
Nature Level 4	**Techniques Level 4**
SYS 4.1 Students identify and explain the logic of systems and subsystems.	**SYS 4.2** Students incorporate feedback to refine and modify systems and/or subsystems.
Students know that: • systems and subsystems have logic. Students identify and explain the logic of systems and subsystems as they: • identify logic of systems and subsystems in terms of their organisation – describe the logic of components in systems and subsystems and the links between them · draw a diagram that shows the placement of components in a circuit and links between each component · draw a flowchart that illustrates the operation of subsystems in a hydroponic system · describe the logic involved in a ticketing and seating system at a school cultural evening • explain/examine the cause–effect relationships that exist between systems and subsystems – control relationships · identify and describe subsystems that help to control a system such as an on/off switch or warning mechanism – operational relationships · identify and describe how subsystems for sorting affect the operation of a recycling plant · describe the cause–effect relationship between pedals, chain and wheel on a bicycle.	Students know how: • to gather relevant feedback to refine and modify systems and/or subsystems. Students refine and modify systems and/or subsystems by incorporating feedback as they: • adjust systems/subsystems based on feedback gathered from others – refine and modify the system based on feedback from users · add a dimming device to a torch for night spotting of wildlife on a school camp after gathering information about the specific needs of the user – refine and modify systems/subsystems based on test results · carry out a field test or operational test of a solar cooker to observe the effectiveness of achieving desired outputs · test the effectiveness and accuracy of a device and make adjustments to improve its operation – consider how a system can be changed to lessen its impact on the environment or society – make comparisons between systems that carry out similar tasks to identify features that could be incorporated into a hybrid system · examine two alarm systems and select the best features of each to create new system/subsystem.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students describe the logic of a hydroponic system they have designed and conduct field tests over an extended period in order to modify it. • Students design and refine an organisational system with subcommittees for ticketing, catering and seating to help coordinate a school event. • Students design and refine a system for the election of school leaders with clearly identified steps involved in the casting and counting of votes. • Students describe and refine the logic for a simple electric system for a torch.	

Systems	
Nature Level 5	**Techniques Level 5**
SYS 5.1 Students explain the structures, controls and management of systems and subsystems.	**SYS 5.2** Students incorporate control and management mechanisms in systems that include subsystems.
Students know that: • systems and subsystems have structures and can be controlled and managed. Students explain how systems and subsystems can be structured, controlled and managed as they: • explain the structure in terms of components, logic and relationships between systems and subsystems • analyse the structure of systems and subsystems – compare and explain different types of structures · automated and manual structures — garage door · the structure of management within an office · different configurations for lighting systems where bulbs are in parallel or series circuits – assemble or disassemble systems to investigate their structures · disassemble a simple electrical system and identify its components and structure by drawing a circuit diagram · assemble different systems for feeding animals and describe their alternative structures – use systems with different structures and describe some of the advantages or disadvantages they may have · describe how a computer-controlled system may work differently from a non-computer-controlled system · justify choosing a computerised database for a filing system instead of a manual filing system • analyse controls and management of systems and subsystems – observe and describe the control or management of systems and subsystems · observe the operation of an irrigation system and identify how it is controlled and managed – describe advantages and disadvantages of different ways of controlling and managing systems and subsystems · observe the management and control of food quality in a fast-food outlet – suggest structures for control and management of systems · review and recommend structures to control and manage a school-based enterprise for sponsoring an overseas child.	Students know how: • to control and manage systems. Students incorporate 'control and management mechanisms' as they: • use various control and management mechanisms to meet the needs of different users – design systems that incorporate control and management mechanisms · locks · sensors · alarms · backup systems · ledger balances – modify control or management mechanisms in existing systems · replace an existing handle on a tap so it can be controlled by a person with arthritis · add series numbers to tickets to manage seating at a school concert – add control or management mechanisms to an existing system · handbrake on a go-kart to control speed · timer on a watering system to manage water loss.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • Students develop a structure for a watering system that incorporates timers and allows for the watering of different areas at different times. • Students analyse local waste-management systems to identify structures, management and control mechanisms, and incorporate similar ideas as they develop systems for managing waste at school. • Students analyse the management of food hygiene or workplace health and safety and use this to improve their own food-preparation and hygiene systems. • Students develop a system to control and manage the finances and resources associated with a school-based enterprise.	

Systems	
Nature Level 6	**Techniques Level 6**
SYS 6.1 Students explain principles underlying complex systems in terms of structures, control and management.	**SYS 6.2** Students devise ways to manage and monitor the operation of complex systems.
Students know that: • systems have principles that can be explained in terms of structures, control and management. Students explain principles underlying complex systems as they: • analyse and synthesise how the structure of a system affects its operation – explain relationships existing within structures · between systems and subsystems such as a sorting system within a mail exchange · between inputs, processes and outputs such as gears and brakes on a bike · between components such as the components in an electrical circuit · draw schematic diagrams, flowcharts, concept maps to illustrate the structure of systems • analyse and synthesise how the control and management of a system affects its operation – explain processes used to control and manage a system · monitor and maintain systems such as a computer-network system · modify or refine systems based on tests and feedback such as adding a gear to a motor to increase power · use control and management mechanisms such as creating folders to sort and manage mail · compare the advantages and disadvantages of different control mechanisms — manual, automatic, and computer-controlled systems.	Students know how: • to manage and monitor complex systems. Students devise ways to manage and monitor complex system as they: • design ways to provide for efficient and effective operation of systems – plan quality-control procedures · consider how industry uses systems to monitor the quality of their products and devise similar quality-control procedures – monitor systems · design a fault-finding methodology for faults in an irrigation system · field test or bench test to measure current flow to determine a fault in an electrical system · troubleshoot software to debug a computer program – develop back-up or fail-safe measures · devise and implement systems for backing up computer data – develop ways of gathering feedback to ensure outputs are appropriate · consult users to identify difficulties and preferred modifications.
At each level, activities should occur in a range of contexts. Students should consider aspects of appropriateness and management within these activities.	
Examples • To assist them in developing their own tests of a system they have designed, students observe alternative ways of testing a system's structure, control and management. • Students devise ways to monitor the structure, control or management of an existing system and, based on feedback, recommend how the system could be modified to minimise its impacts on individuals, communities and environments. • Students use understandings about the structures of macros and use these to develop a macro that will make a spreadsheet more efficient by automatically calculating data. • Students use their understandings of the structures of systems to develop programs that control and manage a robot, and monitor its operation in performing desired tasks.	

Planning for learning and assessment

The *Years 1 to 10 Technology Syllabus* provides a framework for planning for learning and assessment that provides opportunities for students to develop and demonstrate what they know and can do with what they know. Programs, units and activities are the structures used to organise curriculum in schools. Experiences that promote learning and strategies for gathering information about the learning are developed within these structures. The nature, extent, purpose and organisation of programs, units and activities differ widely depending on student needs, teacher expertise, the local context and school authority requirements.

This section provides advice to teachers that will support appropriate, effective and efficient planning for learning and assessment practices for:

- the characteristics of worthwhile programs, units and activities
- planning curriculum for demonstrations of learning outcomes
- planning assessment for demonstrations of learning outcomes.

Characteristics of worthwhile programs, units and activities

Programs, units and activities that are consistent with the principles of an outcomes approach should reflect:

- comprehensiveness
- promotion of self-reflection
- appropriateness
- sequencing
- relevance and authenticity
- consideration of equity issues
- promotion of active learner involvement
- efficient and innovative use of resources
- policies.

Comprehensiveness

Programs, units and activities are comprehensive when they offer a variety of learning experiences drawn from multiple contexts that cater for a range of learning styles. Assessment and reporting are comprehensive when students are provided with multiple opportunities in a variety of contexts to demonstrate learning outcomes. Judgments about students' demonstrations of learning outcomes should be gathered and recorded over time using a variety of assessment techniques and recording instruments.

Promotion of self-reflection

Programs, units and activities that promote reflective and self-directed learning provide opportunities that enable students to monitor their own learning. These opportunities should be provided regularly to enable students to reflect on what they have learned, on their strengths and weaknesses as learners, on their progress in demonstrating learning outcomes, and on ways to improve their learning.

Appropriateness

Programs, units and activities are appropriate when they are suited to the developmental needs and learning styles of students. Teachers should provide

students with learning experiences that represent realistic challenges and enable them to develop beyond their present levels of understanding. Appropriateness for all students requires that learning experiences be varied and individualised where necessary.

Sequencing

The sequence of units and activities should allow time for students to investigate ideas, develop skills and understandings, and provide multiple opportunities for students to demonstrate learning outcomes. Students should be made aware of the anticipated evidence for demonstrating learning outcomes and know how they are progressing in relation to this.

Consideration must be given to the balance of units and activities across the span of an overall school Technology program. Students should be provided with opportunities to participate in sequenced units and activities to ensure continuity of development of knowledge, practices and dispositions from year to year.

Relevance and authenticity

Programs, units and activities are relevant and authentic when their concepts, content and contexts link with students' cultural, social, geographic or economic circumstances and prior understandings to allow them to construct new understandings. Students' interests and understandings should be determined prior to beginning activities. Relevant and authentic units and activities should involve students in meaningful contexts and provide opportunities for students to negotiate curriculum. Technology programs, units and activities should encourage discussions on the range of individual and community values and beliefs about technology, the products of technology, and their implications.

Consideration of equity issues

Programs, units and activities are equitable when they facilitate student access and participation. They also include and value the experiences and backgrounds of all students. Equitable programs, units and activities promote knowledge, practices and dispositions regarding equity and provide a means of exploring and challenging equity issues in and through Technology.

Promotion of active learner involvement

Teachers should acknowledge and accommodate the prior experience and knowledge of students when planning. Students' constructions of meaning can be nurtured through providing ongoing opportunities for students to apply the knowledge, practices and dispositions that they bring to new learning. Activities that emphasise the processes of creating, participating, expressing, communicating and reflecting should build on and challenge students' existing understandings. Sharing of ideas and accepting challenges should be encouraged in a respectful and safe environment and should provide opportunities for students to challenge inequitable practices and the assumptions that underpin them.

Efficient and innovative use of resources

Programs, units and activities should make efficient, cost-effective and timely use of resources. It may be necessary to support demonstrations of learning outcomes with particular resources to cater for differences in learning needs. Students will be encouraged to select resources and use them in innovative ways as they work towards demonstrating learning outcomes.

Policies

School authorities and individual schools have policies, procedures and protocols that influence the learning and teaching process. These policies may relate to safety, equity, pedagogy or other curriculum requirements. Teachers are encouraged to become familiar with these policies prior to planning activities and assessment tasks. Programs, units and activities should be consistent with these policies.

Planning curriculum for demonstrations of learning outcomes

Planning curriculum with an outcomes approach involves planning for learning and assessment concurrently. It is recognised that teachers' planning processes and documentation will vary depending on their practices, students' needs, learning contexts, school policies and school authority requirements. However, it is accepted that when using an outcomes approach, teachers should plan for learning and assessment with the learning outcomes and students in mind.

Considerations for planning

When planning curriculum for the demonstration of learning outcomes from the Technology key learning area, consideration should be given to characteristics of learners and learning outcomes, as well as:

- key messages in the Technology syllabus
- learning and assessment
- educational settings
- resources
- safety.

Key messages in the Technology syllabus

Teachers should consider these five key messages from the Technology syllabus as they plan programs, units and activities:

- Technology involves envisioning and developing products to meet human needs and wants, capitalise on opportunities and extend human capabilities.
- 'Working technologically' reflects the ways in which products — that is artefacts, systems, services and environments — are designed and developed within societies.
- Values and beliefs influence, and are influenced by, technology and its impact on individuals, societies and environments.
- When planning programs, units and activities, teachers should focus on learning outcomes from the Technology Practice strand and at least one other strand.
- Design challenges are situations, problems or tasks that enable students to consider appropriateness, contexts and management as they design and develop products.

Learning and assessment

In an outcomes approach, students, teachers, parents/carers and other stakeholders should be clear about what students need to know, and be able to do with what they know, to demonstrate learning outcomes. Students should also be provided with multiple opportunities to demonstrate learning outcomes. This allows students to learn in different contexts, and teachers to gather evidence and assess student demonstrations of learning outcomes over time.

When planning for learning and assessment, with assessment also being a learning experience, teachers should consider how they can:

- provide opportunities for students to be involved in 'working technologically'
- acknowledge and cater for differences in students' interests, abilities and learning styles when planning design challenges
- plan programs, units and activities with learning outcomes in mind
- provide links to the cross-curricular priorities of literacy, numeracy, lifeskills and a futures perspective
- promote knowledge, practices and dispositions related to equity and provide a means of exploring and challenging equity issues in and through Technology
- consider the reporting requirements of the student, school, school authority, parents/carers and community.

Educational settings

Students' experiences in Technology may be influenced by particular settings in different areas. Settings will be impacted on by location, teaching staff, school population and organisation, existing school events, and school authority policies and requirements.

Resources

Resources will differ from school to school and should not be seen as limiting the range of contexts in which students can engage with Technology. Different school settings will provide diverse and rich contexts in which students may learn, including contexts extending beyond the immediate school or classroom environments.

When planning for learning and assessment in Technology, teachers should consider:

- how physical and human resources may assist the development of innovative programs
- ways to use available equipment, facilities and resources to provide quality programs, units and activities in Technology
- additional equipment and physical resources required to enhance existing programs, units and activities
- human resource implications of implementing Technology programs, including professional development and the time for professional dialogue and reflection.

Activities that deal with topics of a sensitive nature, such as those that may include special cultural or social considerations, need to be managed thoughtfully and carefully. School authorities and schools may have policies to advise teachers on how to deal with such issues when they arise within the school setting.

Safety

Teachers should be proactive in providing a safe environment for learning and teaching when planning programs, units and activities for technology education. Guidelines for providing a safe learning and teaching environment may be given in school procedures, school authority guidelines, or government legislation and regulations.

Learning in the Technology key learning area may involve students in using tools and equipment. (For further information on this subject, please refer to Appendix 2: An introduction to the use of tools, equipment and associated items in Technology.)

Program planning

When planning, teachers should have a shared understanding of what learning outcomes their students will demonstrate. To develop shared understandings, teachers may choose to plan in collaboration with one another; such planning may, in turn, lead to consistency of judgments about learning outcomes and the different ways students may demonstrate them.

Collaborative planning may involve teachers in using the same learning outcomes to plan for:

- learning and/or assessment activities
- different activities in different contexts
- activities in different curriculum areas.

It should be stressed that collaborative planning does not limit the many ways in which learning outcomes may be demonstrated or preclude students from demonstrating other learning outcomes related to the activities and contexts in which they are working.

Collaborative planning promotes consistency by assisting in the development of:

- shared understandings about the intention of the core learning outcomes and how they might be demonstrated
- shared understandings about learning experiences and assessment opportunities related to the core learning outcomes
- comparability of teachers' judgments about students' demonstrations of the core learning outcomes
- connections between learnings within and across key learning areas
- access to a range of teachers with different expertise and perspectives.

School programs

The nature of school programs will vary depending on school organisational structures, individual contexts and school authority requirements. Purposes of school programs may also vary — for example, focusing on continuities of learning and assessment for students, or seeking to foster links between different key learning areas.

When teachers develop school programs, they are:

- evaluating existing curriculum programs in the school
- designing organisational structures for curriculum
- describing contexts for learning and teaching
- identifying some of the physical, financial and human resources that may be required.

When developing school programs, consideration may be given to how:

- programs relate to organisational structures such as middle schooling, multi-age classes or timetabling
- teachers may use programs to develop units or courses of study
- core content can be engaged with across developmental levels or year levels
- valued attributes of a lifelong learner, cross-curricular priorities and equity principles are linked to the school program
- specific experiences valued by the school community can be associated with particular contexts
- physical, human and financial resources can be provided to support the implementation of the program
- learning and assessment may link to school authority policy requirements or other external frameworks
- professional development can be provided to support the program.

Unit planning

In an outcomes approach, teachers should plan concurrently for learning, teaching and assessment with students and learning outcomes in mind. Documentation of planning is seen as a separate but complementary process that allows teachers to record the ways that they intend students to engage with learning in the Technology key learning area.

Considerations in planning units include:

- selecting learning outcomes with which students are expected to engage over a period of time
- identifying a series of activities that relate to a particular context
- describing what students are expected to know and do with what they know and the evidence teachers expect to gather about student learning
- identifying an expected timeframe in which students are expected to engage with the learning outcomes from the *Years 1 to 10 Technology Syllabus*.

When planning units, consideration may be given to planning for multiple outcomes. This may involve:

- planning for demonstrations of learning outcomes from more than one strand of the Technology key learning area
- planning for demonstrations of learning outcomes from the Technology key learning area in conjunction with learning outcomes from other key learning areas.

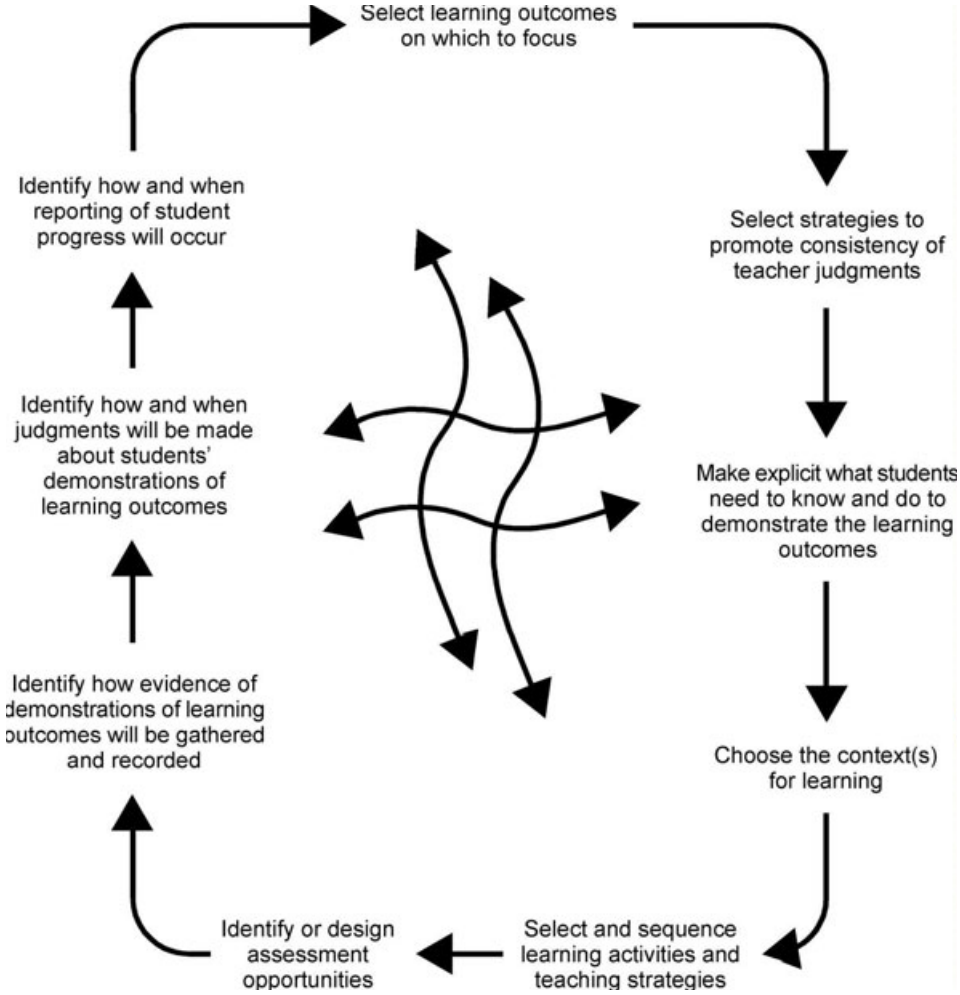
When planning for multiple outcomes in Technology, teachers may involve students in 'working technologically'. This involves students in meeting a design challenge by drawing on their knowledge of technology practice, information, materials and systems. As students do this, they consider appropriateness, contexts and management.

When planning for multiple outcomes from the Technology key learning area and additional key learning areas, teachers may prepare units that draw together learning outcomes by using contexts, integrated topics or common content.

Design challenges may be used by teachers as a focus for unit planning in Technology. These challenges provide real-life or lifelike contexts for learning in Technology because they require students to respond to situations with a Technology demand. Design challenges can be stated as a 'problem' for students to solve, a task for students to complete or a situation requiring the development of a product. Design challenges may be 'open' or 'closed' depending on their purpose. For example, a closed design challenge may be used to focus on particular knowledge or practices. An open design challenge may be used to allow students to apply knowledge to demonstrate learning outcomes. Students may use a Technology project folio to record the ways they meet design challenges. These folios may become a useful tool for assessment.

It is difficult to prescribe a single process for unit planning and documentation. Teachers often have individual approaches or processes to unit planning that suit different learning contexts, students' interests or systemic requirements. In an outcomes approach, unit planning should be done with students and learning outcomes in mind.

While recognising that there may be many approaches to planning and documentation, the following diagram and table seek to illustrate both the cyclic nature and some of the key decisions of planning using an outcomes approach.



Planning for learning, teaching, assessment and reporting

The following table provides a detailed outline of this approach to planning units of work. Although the table presents the process in a linear format, it is acknowledged that individual teachers will sequence planning according to their own priorities and preferences and may use processes not identified here.

Process	Considerations
Select learning outcomes on which to focus	Consider the prior learning, needs and interests of the students. Identify the learning outcome(s) to be the focus of learning and assessment. Identify related learning outcomes from the same strand, other strands or other key learning areas. Look at the outcomes at the levels before and after the selected outcomes to be cognisant of the developmental sequence.
Select strategies to promote consistency of teacher judgments	Consider consistency strategies that could be implemented during the unit of work, e.g. collaborative planning, common assessment tasks, statements of anticipated evidence or criteria sheets, samples of typical responses, moderation processes. Identify which strategies will be used to ensure consistency of teacher judgments.
Make explicit what students need to know and do to demonstrate the learning outcomes	Analyse the learning outcomes to make explicit what students need to know and do with what they know. This information can be used to inform planning of any activity or unit addressing that learning outcome. Use elements from the syllabus (including core content), these sourcebook guidelines (elaborations) and sourcebook modules to support understanding of the learning outcomes.
Choose the context(s) for learning	Consider the specific needs, interests and abilities of the students in the class for which the activities (or units) are planned (learning styles, special needs, target groups, previous experiences and prior learnings). Consider the available school and local resources.
Select and sequence learning activities and teaching strategies	Use the analyses of the learning outcomes to guide the selection of learning activities. Identify core content that is relevant to the core learning outcome(s) and that could provide contexts for activities that meet the needs, interests and abilities of the students. Develop learning activities or use the sourcebook modules from the relevant key learning areas and other resources to identify activities that provide learning opportunities through which students develop the knowledge, practices and dispositions required by the learning outcomes. Identify teaching strategies that meet the needs of the students. Sequence activities according to a preferred teaching approach (e.g. 5Es instructional model; interactive approach; orientating, enhancing, synthesising; inquiry approach).
Identify or design assessment opportunities	Identify learning activities that could provide opportunities for students to demonstrate what they know in terms of the learning outcome(s). Design specific assessment tasks if required. Make explicit the basis for judgments about students' demonstrations of learning outcomes.
Identify how evidence of demonstrations of learning outcomes will be gathered and recorded	Select the assessment techniques that will be used to gather evidence. Decide on the most appropriate way to record evidence so that it can be easily accessed when making judgments about students' demonstrations of learning outcomes.
Identify how and when judgments will be made about students' demonstrations of learning outcomes	Identify how and when the recorded evidence will be used to make judgments about students' demonstrations of outcomes.
Identify how and when reporting of student progress will occur	Identify how and when feedback will be provided to students about their learning and their progress in relation to the learning outcomes. Identify whether (and if so, how and when) other audiences will be provided with information about the learning that has occurred in the unit of work.

Activity planning

Activities are learning experiences that engage students in the teaching and learning process. The sequencing of activities may play an important role in providing opportunities for students to demonstrate learning outcomes and can assist students to develop the knowledge, practices and dispositions associated with the learning outcomes. Activities typically should be developed and implemented by taking into consideration the school programs, units, resources, safety, and school authority and individual school policies.

When teachers plan activities, they may be:

- linking student learning to learning outcomes and core content
- providing opportunities for students to demonstrate learning outcomes
- providing opportunities for students to demonstrate outcomes from within or across strands
- providing opportunities for students to demonstrate outcomes from Technology in conjunction with outcomes from other key learning areas.

When planning activities within units or from modules, it is necessary to consider the following:

- the capacity of the activity to develop students' knowledge, practices and dispositions associated with the learning outcome(s)
- whether the activity allows all students to participate, or how the activity may be modified to allow all students to participate
- the sequence of activities and the role this has in supporting students' learning
- how activities may link to the cross-curricular priorities of literacy, numeracy, lifeskills or a futures perspective
- the availability and management of resources and space
- staff expertise, interest and experience
- time for student reflection
- safety.

When planning activities, teachers need to consider how to cater for students with disabilities or impairments, students with learning difficulties and students with significant behavioural and adjustment difficulties. To facilitate learning for these students, activities may need to be modified or additional assistance may need to be provided. Teachers should consider the safety implications of particular activities when working with particular students or groups of students.

Ways in which Technology activities may be adapted to be inclusive of all students include:

- assistance or support being provided to students when using tools and equipment
- materials being altered or modified to make them more manageable
- more time being allocated
- alternative ways of presenting design challenges
- developing a variety of design challenges across a range of contexts.

Teachers are encouraged to contact local specialist support groups and advisory services for further ideas on adapting activities for students with disabilities.

Appendix 1 includes further information on students with disabilities.

Planning assessment for demonstrations of learning outcomes

The syllabus outlines the principles that underpin effective assessment practices.

There is an integral relationship between the experiences that promote learning and the assessment techniques that facilitate students' demonstrations of learning outcomes. The essential features of effective planning for assessment and reporting include:

- selecting the focus learning outcomes for assessment and reporting
- selecting strategies to develop the consistency of teacher judgments about students' demonstrations of learning outcomes
- making explicit what students are expected to know and do with what they know to demonstrate the learning outcomes
- identifying how and when reporting to students and parents/carers about student progress in relation to learning outcomes will occur
- identifying or designing opportunities for students to demonstrate the learning outcomes (i.e. assessment opportunities)
- identifying how evidence about students' demonstrations of outcomes will be gathered and recorded
- identifying how and when judgments will be made about students' demonstrations of learning outcomes.

These features are an essential part of long-term planning (for example, planning yearly or semester programs) and short-term planning (for example, planning units of work).

The learning experiences provided for students also provide opportunities for teachers to gather evidence about students' demonstrations of outcomes. These experiences will determine the specific sources of evidence and assessment techniques used. The expectations of assessment processes are made explicit when the basis for judgments about students' demonstrations of learning outcomes and characteristics of typical demonstrations are identified by the development of sets of anticipated evidence or criteria. Assessment opportunities may provide evidence about more than one learning outcome.

Identifying or designing assessment opportunities

Learning activities that have been planned to provide opportunities for students to develop the necessary knowledge, practices and dispositions to demonstrate the learning outcomes may also provide contexts for assessment. Teachers can plan to utilise learning activities as assessment opportunities by considering:

- why they have included the learning activities in their program (that is, which learning outcomes relate to the activities)
- which knowledge, practices and dispositions the students might demonstrate in the activities (that is, what students might show they know and can do in the learning activity).

Developing a checklist of 'what to look for' in a particular learning context may assist teachers to systematically collect and record evidence from assessment opportunities that arise during the learning and teaching process. The elaborations for each Technology strand could provide information to assist teachers in identifying what to look for.

Gathering and recording evidence

Evidence about students' demonstrations of learning outcomes should be obtained from a variety of sources and should be gathered and recorded over time using a variety of assessment techniques and recording instruments. This will ensure that teachers have available a broad range of evidence when

making overall judgments about students' demonstrations of learning outcomes.

Technology project folios

Technology project folios are maintained by students and may be used to inform assessment in Technology. These folios help students to record and track their progress as they meet design challenges. They provide teachers with evidence they can use to make judgments about the demonstrations of learning outcomes.

Technology project folios may include:

- student reflections in the form of journal entries, notes or multimedia presentations
- sketches, drawings, designs or models
- production plans
- prototypes or products
- reports
- other material that students use as they meet design challenges or learn in Technology.

Technology project folios can be useful for reporting to different groups including students, parents/carers and teachers.

Evidence should be relevant to the learning outcomes that are being assessed and should be gathered and recorded in a focused and systematic way. The following techniques provide types of information that can be useful in different situations.

Observation involves teachers observing students as they participate in planned activities. Teacher observation occurs continually as a natural part of the learning and teaching process and can be used to gather a broad range of information about students' demonstrations of learning outcomes. Teacher observations can also be structured to gather particular kinds of information in relation to learning outcomes.

Consultation involves teachers discussing student work with students, colleagues, parents/carers or other paraprofessionals. The varying perspectives of the participants in consultations can help enrich the evidence gathered about students' demonstrations of learning outcomes. Consultation can be used to verify the evidence gathered using other techniques. Some consultations may reveal a need for more detailed assessment.

Focused analysis involves teachers in examining in detail students' responses to tasks or activities (e.g. roleplays, group discussions, tests, debates or research projects, dramatic presentations, video presentations, responses to stimulus). This technique provides detailed evidence about students' demonstrations of learning outcomes.

Self- and peer-assessment involve students in using the above techniques to assess their own work and the work of their peers. Self- and peer-assessment allow teachers to take account of students' perceptions when gathering evidence.

Making judgments

Judgments of student demonstrations of learning outcomes are made without reference to the performance of other students and should be based on a range of evidence. This evidence should be judged using specific criteria drawn from the learning outcomes that should be made known to students so that the basis for the judgment is clear.

Some students may be able to demonstrate a learning outcome the first time they are provided with an opportunity to do so. If they are then provided with additional opportunities in a range of contexts and again demonstrate the

learning outcome, they could be deemed to have demonstrated the learning outcome consistently. Other students may require many more opportunities to demonstrate the learning outcome before the same decision could be made about them. A judgment can be made when a pattern of demonstration of the outcome has been established.

Teachers, therefore, make judgments about students' demonstrations of learning outcomes when they are satisfied that they have sufficient evidence of such demonstrations. To make these judgments, teachers:

- analyse what it is that students are expected to know and be able to do with what they know
- consider the learning outcomes at the level before and the level after the focus core learning outcome(s)
- use a range of evidence
- make a judgment about which core learning outcome(s) the student has demonstrated.

Teachers can record evidence of students' demonstrations of learning outcomes using instruments that are manageable and easily incorporated into classroom activities. These include:

- annotated work samples
- anticipated evidence statements or criteria sheets
- audio recordings and/or visual recordings
- checklists
- diaries and journals
- observation notes and anecdotal records
- student folios
- test results over time.

Consistency of teacher judgments relies on teachers having shared understandings about the learning outcomes. Teachers should participate in opportunities to develop shared understandings about:

- what students need to know and do with what they know to demonstrate learning outcomes
- what students' demonstrations of learning outcomes might look like in different contexts
- what constitutes sufficient evidence for a teacher to be confident that a student has demonstrated a learning outcome
- what are appropriate assessment opportunities for students to demonstrate learning outcomes
- what anticipated evidence (assessment task criteria, assessment expectations) will be used (or has been used) as the basis for judgments about students' demonstrations of learning outcomes
- how evidence of students' demonstrations of learning outcomes has been gathered and recorded.

Materials and processes to support the consistency of teacher judgments within and among schools can be developed through:

- shared understandings about typical demonstrations
- samples of typical responses or student demonstrations
- statements of anticipated evidence or criteria sheets
- collaborative planning
- common assessment tasks
- moderation processes (formal and informal)
- student profiles.

Shared understandings about typical demonstrations

Where possible, teachers are encouraged to collaborate with others to develop a shared understanding of tasks and consistency in making judgments about demonstrations of learning outcomes. This can be either a formal or informal process in which teachers discuss and compare their evidence and decisions in relation to students' demonstrations of outcomes. Comparison of evidence and justification of teachers' judgments are central to accountability.

Samples of typical responses of student demonstrations

Descriptions of typical responses (such as student work samples) provide concrete references for teachers to use when determining whether an outcome has been demonstrated. They are not standards in themselves, but are indicative of them.

Statements of anticipated evidence or criteria sheets

The anticipated evidence that will be used to judge students' responses to assessment tasks should be clearly drawn from the learning outcomes. The anticipated evidence should be described in language that is easily accessible to students and parents/carers. Where an assessment opportunity is multilevelled, statements of anticipated evidence should be identified to distinguish between levels.

Statements of anticipated evidence could also be referred to as:

- assessment task criteria
- assessment expectations.

Collaborative planning

To promote the consistency of teacher judgments, it is desirable that teachers collaboratively identify what students need to know and do to demonstrate learning outcomes and discuss what the demonstration of learning outcomes might look like in different contexts. Collaboratively analysing learning outcomes develops shared understandings about the:

- meaning and intent of the learning outcomes
- basis for judgments about students' demonstrations of learning outcomes.

Common assessment tasks

A common assessment task can be collaboratively planned and/or moderated, and is useful in promoting consistency because:

- all students are provided with the same opportunity to demonstrate the core learning outcome in a particular context
- all teachers and students have a shared understanding of the requirements of the assessment task and the criteria to be used in judging students' responses
- teachers can easily compare the judgments they make about students' responses to the same task.

Moderation processes (formal and informal)

Formal moderation processes occur when schools or school authorities require teachers from within or across schools to compare student work and to discuss the consistency of judgments about demonstrations of learning outcomes. Informal moderation occurs any time that teachers share their understandings of judgments of student demonstrations of learning outcomes.

Student profiles

Student demonstrations of learning outcomes should be tracked in written or electronic form that has been developed at teacher, school and/or system level. Student profiles may provide a framework for monitoring student progress

against described learning outcome sequences. The maintenance of student folios is strongly recommended so that examples of the most recent evidence may be used to facilitate judgments about the demonstration of learning outcomes. These judgments will be influenced by the purpose for which the profile is intended. Information recorded on the profile may be used, for example, to plan future learning experiences, to place students on a learning continuum, to report to parents/carers or to understand trends.

Reporting

Results of assessment need to be clearly communicated to students, parents/carers, other teachers and paraprofessionals who support students' learning progress. Teachers may opt to report in different ways for different key learning areas.

In an outcomes approach, reporting occurs in terms of learning outcomes. A range of approaches for reporting is possible. While the final decision rests with school authorities or individual schools, teachers could report to parents/carers about students' demonstrations of all or some of the learning outcomes by referring, for example, to:

- core learning outcomes and core content in each strand
- strand level statements
- key learning area outcomes
- cross-curricular priorities.

Curriculum evaluation

When curriculum is evaluated, a number of factors need to be considered:

- the purpose of the curriculum evaluation
- the role of accountability and improvement
- data collection and analysis
- reporting.

Other considerations should include deciding who will perform the evaluation and who will manage the evaluation, oversee the tasks and outline the timeline within which the evaluation will be conducted.

The timing of the evaluation is another consideration. It may take place at the conclusion of a program, unit or period of time. Ongoing evaluation allows continuous refinement of a program. End-point evaluation enables a holistic picture of a program or unit to be formed. The timing of evaluation depends on its purpose.

An identification of key stakeholders is also important. These may include students, teachers, school administrators, parents/carers and community members.

Purpose of the curriculum evaluation

The purpose of curriculum evaluation is to provide a basis for decision making about the need for and direction of change. It may provide reassurance that current programs and practices are continuing to meet specific needs. On the other hand, evaluations may show discrepancies between students' needs and the current programs and practices. This may mean that changes need to be made in one or more areas.

Role of accountability and improvement

Accountability and improvement in curriculum evaluation depend on the *appropriateness* and/or *effectiveness* and/or *efficiency* of what is being evaluated.

Appropriateness and/or effectiveness and/or efficiency may be used to evaluate:

- student learning in relation to the demonstration of learning outcomes resulting from planned experiences
- school curriculum materials that document school programs, units and activities and their relationship to syllabuses and the needs of students
- school support for curriculum planning and implementation
- the use or implementation of school programs, units and activities.

Student learning in relation to the demonstration of learning outcomes

The *appropriateness* of the core learning outcomes chosen to be the focus of learning is evaluated by gathering data and making judgments about the extent to which the resultant learning outcomes match the expected learning outcomes for particular groups of students.

Consider:

- what outcomes students are demonstrating
- whether students' demonstrations of learning outcomes are appropriate, given the starting points of students' understandings
- whether the expectations of the teachers and school community about the levels of students' demonstrations are appropriate, given the starting points of students' understandings.

School curriculum materials

The *appropriateness* of the materials used to document school programs, units and activities is evaluated by gathering data and making judgments about the extent to which this documentation matches the learning needs of students, and syllabus and policy requirements.

Consider the extent to which school program, unit and activity documentation about learning and assessment:

- reflects an outcomes approach
- identifies and caters for the characteristics and needs of students, including those in target groups
- acknowledges and incorporates students' life experiences and interests
- is appropriate to the diverse learning styles of students and includes opportunities to use physical activity as a medium for learning
- caters for the possible range of student development levels
- describes planning for both learning and assessment
- reflects the equity principles and considerations
- is consistent with the characteristics of worthwhile programs, units and activities
- focuses on core learning outcomes and incorporates core content
- is consistent with relevant school authority policies.

The *effectiveness* of school program, unit and activity documentation is evaluated by gathering data and making judgments about the extent to which it has the potential to impact on student learning as measured through students' demonstrations of learning outcomes.

Consider the extent to which school program, unit and activity documentation about learning and assessment:

- adds value to student learning, given the starting points of students' understandings
- displays continuity in the planned development of conceptual understandings and caters for a range of developmental levels
- incorporates assessment as a learning opportunity and uses the information gathered to inform future planning
- leads to the demonstration of learning outcomes
- maximises active student engagement and reflects the characteristics of worthwhile activities
- allows multiple opportunities in a range of contexts for demonstrating learning outcomes including across key learning areas, cross-curricular priorities and extracurricular contexts
- establishes clear expectations for student performance
- incorporates a process for making consistent judgments
- promotes the use of strategies and techniques that reflect the nature of learning in particular key learning areas.

The *efficiency* of school program, unit and activity documentation is evaluated by gathering data and making judgments about the amount of resources required or effort needed to produce and implement the documentation.

Consider the extent to which the school program, unit and activity documentation requires physical, human and material resources in its preparation and implementation.

School support for curriculum

The *appropriateness* of school support for curriculum planning and implementation is evaluated by gathering data and making judgments about the extent to which physical and human support match the curriculum needs of teachers, paraprofessionals, parents/carers and students.

Consider the extent to which physical resources:

- facilitate demonstrations of learning outcomes of the syllabuses
- allow the provision of learning spaces and storage areas for both current and future needs
- match student and program needs
- promote safe practices.

Consider the extent to which human resources enable learning opportunities to be offered that match the needs of students' learning.

The *effectiveness* of school support is evaluated by gathering data and making judgments about the impact that physical and human support have on students' learning and demonstrations of learning outcomes, and on the curriculum knowledge and expertise of teachers, paraprofessionals and parents/carers.

Consider the extent to which physical resources:

- allow equitable access to learning spaces
- are of suitable quality and quantity to support students in their learning
- are planned to identify future learning needs.

Consider the extent to which human resources:

- enable the maintenance and enhancement of the professional knowledge of teachers
- use the elaborations of learning outcomes as a basis for developing shared understandings of the core learning outcomes
- develop skills to assist consistency of teacher judgments
- encourage and assist teachers to use sourcebook modules as a model for planning for learning in, and assessment of, units that focus on learning outcomes, core content and the cross-curricular priorities
- encourage and assist teachers to access information in the sourcebook guidelines to inform their planning for learning and assessment so that it is inclusive and relevant to student needs
- identify and utilise curriculum expertise both within and outside the school
- utilise a range of strategies that enable all members of the school community to develop a shared understanding of the learning outcomes of the school curriculum
- engage in support activities that promote the outcomes approach described in the syllabuses.

The *efficiency* of school support is evaluated by gathering data and making judgments about the amount of physical and human resources required or the effort needed to support curriculum planning and implementation.

Consider the extent to which physical resources:

- are purchased and distributed to maximise student learning
- are managed to maximise use
- provide value for money.

Consider the extent to which human resources are organised in a timely and efficient manner to maximise understandings of syllabuses and associated curriculum materials.

Use or implementation of school programs, units and activities

The *appropriateness* of the use or implementation of school programs, units and activities is evaluated by gathering data and making judgments about the extent to which implementation strategies and pedagogy match the learning needs of students and syllabus and policy requirements.

Consider the extent to which school programs, units and activities:

- match their stated intentions
- match the needs of particular students
- are modified or adapted according to ongoing feedback from students.

The *effectiveness* of the use or implementation of school programs, units and activities is evaluated by gathering data and making judgments about the extent to which implementation strategies and pedagogy impact on students and student learning.

Consider the extent to which school programs, units and activities:

- include resources that enhance students' opportunities to learn
- actively engage students in the learning process and provide opportunities for them to negotiate the sequence and pace of their own learning
- challenge students
- involve students in becoming aware of what they are learning and include opportunities for reflection and self-assessment
- provide students with time to produce work of a high standard
- provide opportunities and sufficient time for students to demonstrate learning outcomes in a range of contexts
- incorporate assessment that enables consistent judgments to be made about students' demonstrations of learning outcomes
- lead to the planning of future learning opportunities for students who have not yet demonstrated the core learning outcomes.

The *efficiency* of the use or implementation of school programs, units and activities is evaluated by gathering data and making judgments about the amount of resources required or effort needed for implementation.

Consider the extent to which the use or implementation of school programs, units and activities requires physical, human and material resources.

Data collection and analysis

Data sources and modes through which the data could be collected should be identified. Modes of data collection could include analyses of the program, interviews, focus groups, discussions and questionnaires and must be appropriate to the sources. A data collection matrix detailing focus questions, data sources and modes of collection may be an efficient and beneficial representation of the evaluation to be conducted.

Both qualitative and quantitative data should be analysed to ensure that the responses to the focus questions are accurately represented.

Reporting

Reports should present the results of the evaluation clearly, simply and accurately and should be able to be accessed and considered by all stakeholders. Reports should identify conclusions and recommendations for future program development based on these conclusions.

Glossary

For the purposes of this syllabus, the following definitions have been adopted:

Appropriateness refers to suitability for a particular purpose. When 'working technologically' students are provided with opportunities to consider the aesthetic, cultural, economic, environmental, ethical, functional and social appropriateness of products.

aesthetic refers to a product's appeal to a user. Consideration of aesthetic appropriateness allows students to make judgments about products and their uses in terms of touch, taste, sound, sight, smell and use of space.

cultural consideration of the beliefs, nuances, practices and dynamic nature of different cultural and ethnic groups in the application of technology, and the effects that a product or process may have on those groups.

economic consideration of the immediate and long-term costs to individuals and environments of the application of technology and the impacts of those costs over time.

environmental involves making judgments about the balance between the benefits of new products and the non-beneficial environmental impacts and consequences.

ethical assessment of the application of technology based on personal and shared beliefs.

functional considerations of the product's suitability in relation to the user's intended purpose.

social consideration of the needs and conventions of societies and groups within those societies in the application of technology and the effects that technology has on those groups.

Contexts the circumstances or particular situations in which knowledge of technology, capability with technology, and practices and dispositions of 'working technologically' may be applied. Technology key learning area contexts may include personal and global, agriculture, business, community, home and family, industry, leisure and recreation, and school.

Design brief a summary of the aims of a design and the kind of product that is needed. A design brief is a statement that explains the challenge or the task. It may include a background statement and a written description of the specifications or details about the resources, for example, time, cost, materials, equipment, audience. Some design briefs include guidance regarding ways of evaluating the solution to the given task. A design brief is written to address a design challenge.

Design challenge a situation, problem or task that requires technology-related knowledge, practices and dispositions for the challenge to be met.

Design proposal a workable plan that communicates design ideas. It may include drawings, plans, various options and their advantages or disadvantages, and strategies for managing resources.

Ideation	as described in the learning outcomes of the Technology Practice strand, ideation involves considering problems in new and creative ways, generating possible ideas or solutions, selecting ideas with the view of developing products that meet needs or wants, or capitalising on opportunities and communicating ideas in design proposals.
Handling collection	a collection of artefacts that could be explored for a variety of purposes.
Investigation	as described in the learning outcomes of the Technology Practice strand, investigation involves the identification and analysis of needs and wants, opportunities, possibilities and challenges to generate a range of creative ways to develop possible solutions. It includes considerations of contexts, management and aspects of appropriateness.
Logic	the logic of a system is the organisation of the components in systems and subsystems and the links between them.
Management	the act or manner of handling, directing or controlling. It is an integral and important aspect of learning in the Technology key learning area. Management skills are developed as learners work with people, resources, opportunities and constraints.
Products	the result of the application of technology. Products may include artefacts, processes, systems, services and environments.
Systems	ways of organising components or combinations of components so that they work together to achieve specific purposes or goals. Systems consist of inputs, processes and outputs and may function in simple or complex ways.
Technology	involves the processes of exploring possibilities and envisioning the development of practical, purposeful and innovative products to meet human needs and wants, capitalise on opportunities and extend human capabilities.
Technology practice	is the design element of 'working technologically'. It refers to the actions of investigation, ideation, production and evaluation that people engage in when they design and develop products. These actions may be undertaken in a variety of combinations that can be cyclic, iterative or recursive in structure. It is not restricted to a rigid sequence of distinct stages.
Technology project folio	a collection of ongoing or completed student work. It may include journal entries or notes, sketches, drawings, designs, plans, multimedia presentations, models or products. It provides a map of how the student considered and addressed the design brief or challenge. A Technology project folio is different from a student folio as it relates to a design challenge or design brief rather than specifically to the demonstration of learning outcomes.
'Working technologically'	refers to ways in which people combine technology practice, information, materials, and systems interwoven with appropriateness, contexts and management to develop products that meet needs, wants and opportunities.

Appendix 1: Students with disabilities and learning difficulties

Ten documents relating to students with disabilities and learning difficulties are included in the equity section of the Queensland Studies Authority website (www.qsa.qld.edu.au). These documents provide general introductory information on students with:

- acquired brain injury
- autistic spectrum disorder
- hearing impairment
- intellectual impairment
- learning difficulties
- multiple impairment
- physical impairment
- social emotional disorder
- speech–language impairment
- vision impairment.

The information in these documents is organised under headings such as:

- description
- terminology
- population
- disability-specific needs
- teaching strategies
- classroom modifications and strategies
- safety and independence.

There is also a section that provides information on further references, resources and relevant contacts.

Specific information on individual students may be accessible through support services and structures available at a local level.

Appendix 2: An introduction to the use of tools, equipment and associated items in Technology

Introduction

Students undertaking activities in Technology are often required to use tools and equipment. To ensure safety, it is essential that teachers and students have knowledge and understandings about the correct use of the tools and equipment that could be used in this key learning area.

The purpose of this appendix is to:

- identify safety issues associated with the use of tools and equipment
- provide basic information to teachers about tools and equipment, such as:
  - their selection
  - their classroom use
  - their appropriateness for certain tasks.

The appropriateness of tools and equipment for a task must be considered. Tools and equipment need to be manageable and safe to use. This may mean that they are smaller and lighter than adult tools. They need to be sturdy and robust. The tools and equipment covered in this appendix have been grouped under the actions of joining, cutting, heating, and computing.

This appendix provides only general guidance. More detailed advice is available in other publications — for example:

- *Department of Education Manual* (1999, Brisbane) — this document provides policy, procedures and advice and is for use by Queensland state schools. Teachers in other school authorities may wish to consult this document for advice. It is available on the Education Queensland website (http://education.qld.gov.au/corporate/doem/).
- *Workplace Health and Safety Act 1995* — this is designed to promote the health and safety of people performing work and to protect members of the public from dangers. Links to this document are available at the Department of Employment, Training and Industrial Relations website (http://dtir.qld.gov.au/hs/hs/htm).
- *Aspects of Science Management: A Reference Manual for Schools* (1996, Department of Education, Brisbane) — this handbook contains information pertinent to the safe use of science-related materials that may be used in science- and technology-related subjects.
- *Food Safety Matters* (2002, Queensland Health, Brisbane, kit) — this resource kit was developed for use in secondary schools and TAFE colleges to promote the safe handling of food. It comprises seven posters, student booklets and black-line masters. More information is available from the Queensland Health website (http://www.health.qld.gov.au) and from the website of the Home Economics Institute of Australia (http://www.heia.com.au).
  Enquiries should be directed to: Environmental Health Unit, Queensland Health, GPO Box 48 Brisbane Qld 4001. Phone: (07) 3234 0938 email: ehu@health.qld.gov.au
- Manufacturer's instructions — these documents provide advice on the use of specific tools and/or equipment. For specific tools and/or equipment, the manufacturer's instructions take precedence over the general guidance given in this appendix.

An introductory general statement about some broad aspects of safety has been provided in the notes below. Safety issues with certain tools are highlighted with the symbol shown in the left margin.

Safety

Safety is directly affected by:

- human behaviour — actions which are associated with, or contrary to, manufactuer's instructions, lack of training, insufficient instruction, failing to follow procedures
- environmental issues — fumes, noise, heat, hygiene, light
- design — poorly designed equipment, inferior workplace layout
- procedures — lack of appropriate procedures, clarity of instructions.

Risk assessment and management is the responsibility of each teacher and should be considered in the planning of activities. Special consideration may be required for students with disabilities.

Before students use tools and equipment, teachers should:

- make themselves conversant with guidelines provided by the school or school authority for the use of specific tools and equipment, or the management of students in specified locations such as workshops
- carry out and document risk assessment and risk management if necessary
- ensure the maintenance of tools and equipment in a safe, operational condition
- provide suitable demonstrations of the tools and equipment
- provide clear instructions on the use and care of specific items
- explain safety procedures, including procedures to follow should a mishap occur.

Electrical safety

Electrical tools and equipment require regular safety checks. Teachers should inspect the cords of tools and equipment to ensure they are free of visible damage that may have been caused by wear and tear or accidental damage. Students should draw teachers' attention to any defect they observe with any tools and equipment.

It is recommended that mains-operated and hand-held electric tools and equipment are used with a residual current device. Residual current devices (RCDs) may be known by other names — for example, trip switches or safety switches. Such equipment works on the principle that if a fault or accident occurs that may lead to electric shock then the device cuts off the power in a few milliseconds. These devices are available in several forms:

- built into building's electrical switchboard
- general power point outlets with RCD capability
- individual or multiple outlet units that plug into wall power sockets
- earth leakage units.

Professional advice should be sought on the installation and use of these devices and particularly on the distinction between RCDs and resettable power boards with overload cut-out.

Below are some general safety rules relating to electricity:

- dry hands thoroughly before operating any switch
- do not use damaged power points or switches
- ensure the switch is in the 'off' position before inserting or removing plugs
- pull on the plug and not the lead when removing plugs from sockets
- operate portable tools and equipment through an RCD
- disconnect tools and equipment not in use
- disconnect portable or fixed equipment from the power supply before cleaning
- use a qualified electrician to carry out all electrical repairs
- use a power board when several appliances need to be plugged in

- do not use damaged tools or equipment
- do not use tools or equipment with damaged power leads
- do not use damaged extension leads
- inspect and test tools and equipment on a regular basis.

The work environment

In most primary school situations, Technology activities will be undertaken in a general learning area. In secondary school situations, specialised learning areas such as workshops, kitchens or laboratories may be utilised for Technology activities. Each situation presents its own unique set of safety issues. Teachers will need to make judgments and undertake a risk assessment about safety issues depending on the age, maturity, competence, skill, attitude, confidence and physical capability of their students.

Primary teachers need to be particularly conscious of safety issues because of the temporary and makeshift nature of facilities that may be set up for Technology in general classrooms. Examples of issues that may require consideration include:

- location and set up of the workspace
- provision of bench area for tasks such as hammering or sawing
- stability and suitability of tables/desks for the equipment being used — for example, student desks may not be suitable for equipment such as an electric fry pan
- location of electrical cords to power tools and equipment
- provision of earth leakage units or residual current devices (RCDs) that cut power in milliseconds should a fault occur
- use of power boards to provide additional power outlets
- the load placed on individual power outlets
- movement of students and adults around the learning space especially when anything hot, sharp or heavy is in use
- potential hazards such as power cords
- height of work areas in relation to students' physical sizes
- type of floor covering
- wearing of suitable clothing and shoes, particularly if required under workplace, health and safety regulations
- correct use and manipulation of tools
- adequate ventilation, especially if adhesives, cleaning agents and paints are being used
- protective clothing or equipment such as gloves, eye protection, hearing protection and the use of dust masks
- storage and location of tools and equipment so that there is no access to them when there is no authorisation or supervision for use
- tools that have been temporarily set aside for later use should be placed in a safe location
- display space
- access to water
- removal of jewellery and neckties
- tying back of long hair
- adequate supervision of all students.

Protective equipment

The use of protective equipment will depend on the activity being undertaken. As part of risk assessment, teachers should assess the potential for harm that may arise and the need to provide equipment that protects students. For example:

- eyes could be protected by:
  - safety goggles
  - face shield
  - safety spectacles
- ears could be protected by:
  - ear muffs
  - ear plugs
- lungs could be protected by:
  - dust masks
  - respirators
- hands and feet could be protected by:
  - gloves and footwear
- clothing could be protected by:
  - aprons
  - overalls.

Adhesives

As some adhesives and fixatives emit fumes, they should only be used in well-ventilated rooms. The product to be used will depend largely on the application in question. Typically, products include:

- P.V.A. glue and other water-based non-toxic products
- aerosol fixative sprays
- aerosol spray adhesives
- adhesive powders to mix with water such as wallpaper glues
- paste
- gum
- acrylic cement
- pressure sensitive adhesive cement
- two-part chemical glues.

Cleaning agents

Cleaning agents may be required in certain instances. As these may emit fumes or be flammable, adequate ventilation is essential.

Paint

The painting of artefacts made during Technology activities is best carried out in well-ventilated space, particularly when non-water-based paints are used. If spray cans are used, ensure that the spray location is not too draughty as fumes may affect others.

Material safety data sheets (MSDs) provide data on all chemicals, including adhesives, cleaning agents and paints. It may be necessary to display these sheets and include first aid requirements to deal with any mishaps that may occur when using such materials.

Management strategies

Teachers should adapt and practise management strategies that ensure safety in the classrooms. Such strategies could include:

- using teacher aides or parent/carers to assist with task supervision
- colour coding of tools and equipment to signify which items can be used with and without supervision
- ensuring that tool boxes and tool racks are stored in accessible but secure locations
- producing safety posters to remind students of safety issues and procedures
- keeping student movement to a minimum in areas where mishaps may occur
- designating specific areas or locations for particular tasks — for example, a particular desk or bench space located near a power point for a melt adhesive glue gun
- storing tools and equipment in such a way that they can be readily moved from classroom to classroom
- working cooperatively with another teacher to provide adequate supervision of groups
- considering supervision ratios of adults to students depending on the activity
- being aware that there may be hidden dangers in some situations — for example, corrosive batteries in items being dismantled at a tinkering table
- keeping track of tools through the use of racks with tool shadows
- keeping tools and equipment in good condition
- storing sharp tools in slotted blocks of timber or cork.

Students with special needs

Students with specific needs in Special Schools or Special Education Units can undertake Technology activities through the use of adaptive technologies. These students can be inhibited through a range of disabilities and each requires an individual education program. Teachers in special schools or special education units will be aware of available tools and equipment such as switch boxes or adaptive devices for computers. In situations where special students' lessons are integrated into mainstream classes, these teachers may need to consult with specialist teachers as to the availability and suitability of adaptive technologies. In all cases, close supervision is recommended both for safety reasons and to achieve the most desirable outcome for the student.

Joining

Topics covered in this section include:

- melt adhesive glue guns
- clamps
- hammers
- screwdrivers
- staplers
- sewing.

Melt adhesive glue guns (hot melt glue guns)

Melt adhesive glue guns are designed to supply a melted adhesive that can provide a quick, reliable and strong method of joining materials. The adhesive dries or sets rapidly allowing the materials to be joined in a short space of time without using nails or clamps. Glue guns are powered by electricity and consist of an insulated plastic body, a trigger mechanism and a nozzle to direct the melted glue. Glue is purchased in stick form, and is inserted into the rear of the gun.

Two types of glue guns are available:

- hot melt glue guns
- low melt glue guns.

Hot melt glue guns work at a higher temperature than low melt glue guns. Low melt glue guns are more appropriate for students in early years of schooling because of the smaller size of the gun, lighter weight and the lower operating temperature. Hot melt glue guns are more appropriate for intricate work likely to be encountered in later years of schooling.

Teachers should demonstrate the use of the glue gun prior to students working with the tool. Manufacturer's instructions should be followed when using the equipment.

Directions for use

Generally, all melt glue guns are operated in a similar way, although some variations may occur depending on the brand or model.

- Load the gun with the correct glue stick through the back of the glue gun.
- Squeeze the trigger several times to position the glue stick.
- Plug the glue gun into the power source. Most guns do not have their own switch and some brands may have an indicator light to show that the power is on.
- Wait approximately five minutes for the gun to heat sufficiently. Trying to force glue through by pressing on the glue stick or applying excessive pressure to the trigger can damage the feed mechanism.
- Squeeze the gun to allow the glue to flow from the nozzle.
- Have materials prepared and ready to join.
- Apply adhesive to one surface only and bring the surfaces together within a few seconds.
- Hold or clamp the surfaces together until the adhesive has cooled and set.
- Reload with another glue stick once there is sufficient space in the rear of the gun to support another stick.
- Do not extract glue sticks from the rear of the gun as this can damage the feed mechanism.

Safety issues

- The glue gun is an electric tool and should be used with an earth leakage unit or residual current device.
- The glue gun should not be used near water.
- The melted glue must not be touched as the hot glue is sticky and will burn the skin.
- Lightweight cotton gloves could be worn to avoid accidental burns from the melted glue. Gloves, however, reduce dexterity and loose material may get caught in moving parts of tools and equipment. Teachers will need to make their own risk assessment after considering the circumstances of the activity and with reference to policy documents.
- Avoid touching metal parts of the gun as these parts are hot and will cause burns.
- Do not force glue sticks into the rear of the gun.
- Do not push any object except a glue stick into the back of the gun.
- When the glue gun is not in use, place it on its stand. Place the stand on a piece of cardboard or timber to catch any drips of hot glue.
- Switch off when not in use.

Clamps

A clamp is a useful device for holding work while adhesive is setting or when the object must be held securely. Small spring clamps with low spring pressure are useful for student activities. The same effect can be achieved using clothes pegs or bulldog clips although these may present restrictions due to the width of opening.

G-clamps come in a variety of sizes and can be used to secure material or bench hooks to a bench for tasks such as sawing or drilling. Quick release clamps are a suitable alternative.

Hammers

The most common hammer used by students is the claw hammer although other hammers will be used for metal work. The claw hammer is used to drive and extract nails and to tap other tools such as hole punches. A mini claw hammer is smaller than an adult size hammer and is a suitable alternative as it is lighter and more manageable for younger students.

Nailing may not always be the most appropriate method of joining materials. Inappropriate selection of nail size in relation to the size of the material may lead to the splitting of the material. Consideration should be given to alternative methods of joining.

Safety issues

- A hammer should be held in one hand near the end of the handle.
- The material should be held in a clamp or similar device to keep the other hand free from the area of impact.

Screwdrivers

Screwdrivers are available in a range of sizes with ends for either slotted-head or cross-head (‘phillips’) screws. Screwdrivers are designed to be used for inserting or removing screws and not as a general purpose lever. The size of screwdriver used will depend on the size of the screw head and should fit neatly into the screw head. Smaller screwdrivers are referred to as instrument screwdrivers. Students may often use screwdrivers when dismantling or assembling objects.

Safety issues

- Care should be taken that screwdrivers are pointed away from the user in case they slip when being used.
- The free hand should be kept away from the blade when possible.

Staplers

Staplers available for student use may include hand-pressed paper staplers and staple guns. Hand-pressed paper staplers pose little danger and are frequently used by students from a young age. A staple gun is a larger and more difficult tool for students to use and poses some degree of risk. A staple gun provides a rapid method of joining materials. These tools are spring-loaded and require the user to squeeze the handle to operate the firing mechanism. This spring can be quite strong and beyond the physical capability of young students. Care must be taken to ensure that staples are fired with the materials positioned on a hard supportive surface. If the materials are thin then the staple may fix the material to the backing surface causing difficulty in removing the object being constructed.

Safety issues

- Staple guns must not be fired in the air as staples can travel some distance and could injure eyes or other parts of the body.
- Fingers must be kept well clear of the firing mechanism as staples can easily penetrate the skin.
- When passing a staple gun to another person ensure that it is not held by the firing mechanism.

Sewing

Some Technology activities may require that materials be sewn together. This may include hand sewing and machine sewing. Activities requiring the use of a machine are more likely to be undertaken by students demonstrating higher-level learning outcomes. Hand sewing can be undertaken at all levels but with varying degrees of accuracy and neatness depending on manipulative skills. Larger craft needles with a large eye and blunt point are more suitable for younger students. Materials being sewn may sometimes require pinning and this can present a danger to the student. Thimbles may be used to protect the fingers.

Sewing machines are generally electric and controlled with a foot pedal. It may take some time for a student to become proficient in regulating the speed of these machines. Students should keep hands well free of the sewing mechanism. Close supervision is required at all times when students are using a sewing machine.

Safety issues

- Care with electrical equipment.
- Care with sharp objects — pins, needles and scissors.
- Care with the sewing foot.
- Care should be taken carrying and using scissors.
- Long hair should be tied back.
- Loose jewellery and neckties should be removed.

Cutting

Tools covered in this section include:

- scissors
- trimming knife
- cutting mat and board
- safety rule
- rotary cutter
- circle cutter
- saws
- carving tools
- hand drill
- bench hook
- mitre box
- pliers
- wrench
- wire stripper
- files and rasps
- gardening tools
- kitchen tools.

Scissors

Scissors are the most common cutting tool used by students. Scissors with rounded ends provide the greatest safety. Older students may use other types of scissors for special purposes such as dressmaking. Whenever scissors are used, the free hand should be kept away from the cutting area. Scissors should be used for the task of cutting material, paper or thin cardboard. Scissors are not generally designed to cut thick card or wire.

Most scissors are designed for right-handers but left-handed scissors are available from many outlets. 'Safety scissors' especially designed for young students do not have as sharp a cutting edge and present less danger to the students.

Safety issues

- If scissors are carried, hold the hand around the closed blades.
- Pass scissors to another person by holding the blades and offering the handles.

Trimming knife

A trimming knife is a useful tool for many Technology activities, but is also one that has the potential to be dangerous to both the user and others. The danger arises from the sharpness and point of the blade. There are many types available, some of which have retractable blades that allow for safer handling. There are wide-blade and narrow-blade knives. Narrow blades usually have a score mark approximately every centimetre so that the blunt section of the blade can be snapped off. For this reason, students should not lever the blade sideways as it has the potential to snap, with the loose section possibly travelling some distance. Teachers should snap off old sections of the blade by having only a short section of the blade protruding from its case. The section to be removed should be held firmly with pliers and the snapping action should be away from the body. Large blades are reversible and require the blade to be removed from the case, turned and reinserted.

Directions for use

The safest technique for using the trimming knife is to:

- place the material to be cut on a cutting mat or cutting board
- place a safety rule along the line to be cut
- pull the knife along the edge of the rule using several gentle strokes rather than attempting to cut the material in one stroke
- only expose a short section of blade beyond the casing of the knife
- keep fingers well clear of the blade.

Safety issues

- Use a safety rule to hold the material and to guide the blade.
- Cut on a cutting mat or cutting board.
- Keep fingers away from the cutting space.
- Teachers may wish to designate a particular work area in the room where students can be adequately supervised as they use the trimming knives.
- Depending on the age of the students, the teacher may want a teacher aide or parent/carer to supervise students using trimming knives.

Cutting mat and board

Cutting mats or cutting boards are particularly useful when using trimming knives, rotary cutters and circle cutters and in the preparation of food. They protect the surface from accidental cuts, provide a non-slip cutting surface and provide a cutting surface that maintains the sharpness of the blade or knife. Different types of cutting mats or boards are available for food preparation or craft-type activities. Craft mats often have a grid system printed on the surface to guide the accuracy of cutting.

Safety rule

A safety rule should be used when thicker material has to be cut or scored. A variety of designs of safety rules are available, but they all:

- help to hold the material being cut firmly in place
- allow fingers holding the rule to be kept away from the cutting edge
- provide a clean straight edge for cutting.

Rotary cutter

Rotary cutters provide an alternative to trimming knives. Rotary cutters vary in design. Some have a protective cover around the circular blade that retracts when downward pressure is applied. Others do not have a protective cover. Some rotary cutters come with perforation blades or wave cutter blades. Rotary cutters for cutting paper, card or plastic materials should be used with a cutting mat or board and guided along a safety rule.

Rotary cutters are also used in food preparation. Pizza rotary cutters tend to be larger and the blade is thicker and not as sharp as the trimmer rotary cutter.

Circle cutter

A circle cutter is used to cut large circles or circular holes in a variety of materials. It is used like a pair of compasses. A small blade on the outer arm cuts the material as the instrument is turned. As with the trimming knife, several turns should be made to cut through the material. A cutting mat or cutting board should be used.

Saws

A variety of saws may be used by students during Technology activities. They include:

- coping saws
- dovetail saws
- tenon saws
- hand saws
- hacksaws.

Saws may be injurious if not used with care.

Safety issues

- Use a bench hook or a vice.
- Clamp the bench hook into place.
- Keep fingers of the free hand away from the blade.

Coping saw

A coping saw is best used to cut curved lines in thin materials such as plywood, small timber or plastic sheeting. The depth of the cut is limited by the frame of the saw. The blade is inserted with the teeth towards the handle and downwards from the frame and tensioned, usually by tightening the handle. The

blade is held at right angles to the work being cut. The material being cut should be clamped to the bench or cutting surface using a G-clamp or quick release clamp.

Dovetail saw

A dovetail saw is used for straight cuts of soft timber and plastics. It has a straight blade strengthened along the top edge and a straight wooden handle. The saw is held with one hand with the index finger along the top of the saw. The material being cut is held securely in place on a bench hook or in a vice. The free hand holds the material but at a safe distance to avoid the blade. The bench hook should be clamped to the work surface of the bench with a G-clamp or quick release clamp.

Tenon saw

The tenon saw consists of a straight blade, approximately 300 mm long, reinforced along the top edge and having a grip handle. The blade is thicker than the dovetail blade and is more cumbersome for a young student to use than a dovetail saw.

Hand saw

The hand saw is approximately 550 mm long with a grip handle. Three types of hand saws are panel, crosscut and rip saws. Panel saws have finer teeth than the other two hand saws. The teeth of a rip saw are coarse. A hand saw is not a practical saw for young students because of its size and robust cut. Its application for primary school use would be limited to tasks such as cutting pine logs for garden edges.

Hacksaw

A hacksaw is used for cutting metal. Mini hacksaws are also available for small metal objects such as thick wire or metal bar about the size of thick nails. Thicker metals should be cut with a full-size hacksaw. Hacksaws have a metal frame and a blade with fine teeth. The teeth of the blade should point forward away from the handle. To replace the blade, the handle is usually loosened by unscrewing it. The blade is usually held in place through the holes at each end of the blade.

The hacksaw is used by firstly creating a groove in the material by drawing the saw towards the user several times. Cutting occurs as the blade is pushed away from the user. The material being cut should be held in a vice and the cut made close to the vice. The student's free hand can hold the material on the opposite side of the vice to the cut.

Carving tools

Carving tools are tools that have handles attached to small, shaped blades. The tools usually are available in a set with a variety of shaped cutting blades. These tools are used to cut designs into surfaces of materials. Such tools could be used, for example, in cutting patterns for lino printings.

Carving tools have the potential for injury if not used with care. The direction of use should always be away from the user — never towards the user — as a slip of the tool could result in a stabbing action.

Safety issues

- Use a bench hook or vice.
- Clamp the bench hook into place.
- Always push the carving tool away from the operator.
- Keep fingers of the free hand behind the direction of the blade.

Hand drill

A hand drill is used to bore holes in various materials such as wood, plastic or metal. It can be used in a vertical or horizontal position. A hand drill is light for students to use and is a two-handed operation with one hand holding the tool and the other winding the handle. Young students may need practice in coordinating this movement. Some hand drills have fully enclosed gears to make the unit safer for students to use.

Drill stands are available to hold a drill in a vertical position for accurate drilling. The drill stand is clamped to the bench and the material being drilled is also clamped. This keeps hands free of the moving parts while downwards pressure is applied to the handle.

Safety issues

- Ensure that the drill has fully enclosed gears if possible.
- Work should be held securely using clamps.
- The teacher or aide should fit the twist drill bit into the chuck.
- Use a backing board of scrap material sufficiently thick to ensure that students do not drill through the work and into the bench.

Battery-powered electric drills are suitable for students to use. These could be relatively inexpensive versions that are low in torque with variable speed, forward and reverse and a keyless chuck. A charged spare battery is essential to ensure continuity of use during a lesson should the installed battery run flat.

Bench hook

A bench hook is a wooden device made from a flat piece of timber with a block of wood attached above and below at opposite ends. Some bench hooks have a groove next to the block that provides a niche in which material can easily be hand held. The bench hook is clamped to the benchtop before use.

Mitre box

A mitre box is a timber or metal u-shaped channel with guide cuts in each vertical surface. It is used for the accurate cutting or sawing of timber or other materials at angles of 45°, 60° and 90°. Various saws could be used with the mitre box.

Safety issues

- The mitre box should be clamped to the bench.

Pliers

Pliers commonly used for Technology activities could be one of three types:

- pointed-nose pliers
- bent-nose pliers
- engineers pliers.

Pliers are essentially used to hold items such as small nuts, screws, wires or items too difficult to hold in the fingers. They may be used to hold hot objects or objects being hammered. Pliers are not the ideal tool for loosening nuts as any slipping of the tool may damage the nut.

Wrench

An adjustable wrench is a spanner that can be opened or closed to fit a variety of nut sizes. The wrench must be adjusted so that the jaws of the tool fit tightly on the nut and will not slip when turned. The wrench must face the right way so that the turning movement tends to tighten, not loosen, its grip. It is particularly useful for students taking an object apart at a tinkering table.

Wire strippers

Wire strippers remove the plastic insulation from around the wire. Wire strippers grip the wire and remove the insulation by lever action. Young students may have to use two hands to operate the tool. Knives and scissors should not be used for stripping insulation from wire.

Files and rasps

Files and rasps are metal tools designed to smooth and shape materials. Rasps are used to shape wood and are much coarser than the surface of a file. Both files and rasps require a handle to be fitted to the pointed end so the tool can be held comfortably in the hand. The material to be worked should be held in a vice or by clamp. This allows one hand to guide the front of the tool and the other to hold the handle as the tool is worked in a forwards motion across the material.

Safety issues

- Abrasions may occur if the surface of the tool is rubbed across the skin.

Gardening tools

Tools in this section include:

- saws — bow, pruning
- secateurs
- axes, tomahawks, block splitters
- digging tools — hand tools, spade, shovel, fork, rake, chipping hoe, mattock, pick.

The tools described in this section may be used in activities in an environmental context, which may include gardening activities. Agricultural Education in lower secondary may make use of these tools and other specialised equipment. This appendix does not cover the use of specialised equipment.

As Technology activities involving the use of garden tools will most likely be undertaken outdoors, sun safety considerations must be observed.

Saws

Bow saws and pruning saws are used to cut woody growth on shrubs and trees. Pruning saws usually comprise a curved blade about 300 mm long attached to a handle. They are normally used for light woody growth. Bow saws are available in various sizes up to approximately 800 mm long, have a bow-shaped handle, coarser teeth than a pruning saw and are used to cut thicker timber such as tree branches.

Safety issues

- Hold material being sawn, keeping fingers at a sufficient distance for safety.

Secateurs

Secateurs are used to cut relatively thin plant growth. The jaws of the tool are often spring-loaded to hold the jaws open. Young students may have difficulty manipulating this tool because of the width of the opening of the handles and the toughness of the material to be cut. For safety issues, please refer to those associated with the use of scissors.

Axes, tomahawks, block splitters

Tools such as these would rarely be used, particularly in a primary school setting. These tools can be extremely dangerous. It is recommended that alternative methods of cutting be considered.

Safety issues

- The tool should be appropriate to the age and capability of the student.
- Close adult supervision is essential.
- Other persons should not be in close proximity to the user.
- A chopping block could be used.
- Clear instructions should be provided to the student.
- Tools with loose heads should not be used.

Digging tools

Digging tools range from small hand tools such as hand trowels and small forks to full size digging and levelling implements. The physical size of the students will limit the effectiveness of some of these tools and may even impact on the safe use of the tool. In undertaking a risk analysis, teachers will need to judge the value of the task in terms of whether the students can effectively undertake it. All these tools have the potential to cause injury and supervision is recommended.

Safety issues

- Tools should not be left lying on the ground.
- Rake prongs should be pointed downwards or inwards when not in use.
- Tools with loose heads, particularly mattocks and picks, should not be used.
- Enclosed footwear must be worn when using full-size garden tools.
- Persons using these tools should be well clear of others.

Kitchen tools

Technology activities related to food preparation may require the use of kitchen implements such as knives, cleavers, and graters. The type of tools may depend on the application in question. The appropriate knife should be used if available. Synthetic cutting boards should be used to protect the cutting surface, protect the cutting edge of the tool and provide a hygienic cutting surface. Students should be instructed in the correct use of the tool and this should include safety issues. Use of specialised equipment, such as a blender, will require specific consideration of its use, risk assessment and specific instructions to students. Manufacturer's instructions should be observed.

Heating

Topics covered in this section include:

- plastic vacuum forming
- heat setting/hot iron pressing
- food preparation
- cooking facilities.

Plastic vacuum forming

Plastic vacuum forming or moulding is a process of creating moulded shapes using heat-softened plastic sheeting. Sheets of plastic material are heated in an oven such as a toasting oven. The object, or mould, on which the workpiece will be moulded, is placed in a box with a vacuum cleaner connection. Once softened by heat, the plastic sheet, which is held in a frame, is placed over the mould. Air is withdrawn from the box by the vacuum cleaner. The depression draws the softened plastic on to the mould. The plastic takes the shape of the mould, quickly cools, and can be trimmed using a pair of scissors.

Moulded shapes are particularly useful for construction work and moulded components can be glued together to create the desired model.

Safety issues

- The benchtop oven must be isolated from any combustible material.
- Caution students about touching surfaces of the oven as these may be hot enough to cause burns.
- The wooden frame holding the plastic sheeting will not be excessively hot, but cotton gloves should be worn when handling the heated sheeting in the frame.
- Do not touch the heated plastic sheeting as it may stick to the skin causing burns.
- Should anyone burn themselves, immerse the burn immediately in cold water. As a precaution, have ready a large container of cold water for this purpose.
- Plastic vacuum forming is an operation best carried out by more than one operator.
- Ensure that the electrical equipment has had an electrical safety check.

Heat setting/hot iron pressing

Some Technology activities may require the use of an iron. This may involve the pressing of fabric to remove creases or the application of heat to set fabric dyes such as those applied in screen printing.

Ironing boards should be used and care taken with the electric cord.

Do not iron on the top of desks that have plastic tops such as laminex, as the heat can melt the adhesive resulting in the removal or loosening of the top.

Safety issues

- Ensure the iron is safe from accidental damage by positioning on an ironing board.
- Ensure the safety of the cord.
- Caution students about the possibility of burns from steam.

Food preparation

Some Technology activities may require food preparation and this may involve the heating or cooking of food. Danger exists when hot liquids such as boiling water or heated oil are present. Risk assessment is essential for any activity where these items or other heated materials are present. Refer to the general section on safety for information on electrical safety, the work environment and the movement of students.

Students should consider the nutritional value of the ingredients they intend using in food preparation. For example, the sugar content of lollies or the fat content of dairy products may affect people with health concerns.

Hygiene is extremely important in the preparation and handling of food. To avoid cross-contamination, cutting boards and utensils should be washed regularly after the preparation of various ingredients, for example, meats, before the equipment is used for another purpose. When cleaning up spills, teachers and students should ensure that dishcloths are not used for other purposes, such as wiping the floor.

Safety issues

- Food needs to be handled and prepared in a hygienic manner.
- Teachers must warn students that hot appliances can cause burns and protective clothing, for example, oven gloves, need to be worn when handling such appliances.
- Sharp tools such as knives need to be used in a safe fashion.
- Electrical safety must be ensured.
- The stability and suitability of work areas must be checked.
- The capability and maturity of students relative to the task must be considered.
- Activities that require deep frying should be excluded due to the risks posed by boiling oil.
- Activities that have the potential to cause burns, for example, toffee making, should be excluded.

Cooking facilities

Cooking facilities are not often available in primary schools. However, they may be located in staffrooms or school tuckshops. Equipment may include stoves, microwave ovens, toasters, benchtop ovens and sandwich makers. As there is always some level of risk involved with such equipment, supervision is always necessary whether it be by a teacher or a responsible adult such as a teacher aide or parent/carer.

Safety issues

- Ensure electrical safety.
- Use protective clothing such as aprons and oven mittens.
- Ensure regular checks on microwave ovens for microwave leakage.
- Ensure metal objects are not put in microwave ovens.
- Be fire aware and provide fire-fighting equipment such as fire blankets and extinguishers.
- Consider the ratio of adults to students for supervision.

Computing

The use of computers enhances learning in various curriculum areas, including the Technology key learning area, and can be prominent in the Information and Systems strands. Computer use will depend largely on the activities being undertaken.

Typically, schools provide computing facilities as either computer laboratories or classroom computers. Classroom computers may be networked or stand alone. Whatever facility is provided, it is important that computer workstations are ergonomically designed to suit the physical sizes of the students.

Safety issues

- Position computers so that electrical cords and other connecting cords, such as printer cords, are not causing obstructions.
- Workbench or table height should be adjusted for the physical size of the student.
- Monitors should be level with the eye height of the student while seated.
- Keyboards should be positioned so that the forearm can remain horizontal while operating the keyboard.
- Seating should allow the feet to be positioned flat on the floor.
- The back, particularly the lower back, should be adequately supported.
- Avoid positioning the computer where glare or sunlight reflects off the monitor.
- Adequate ventilation should be provided, particularly in hot climatic conditions.
- Security of equipment should be considered.
- Protect computers from the potential damage of power spikes by installing suitable surge control devices.

In addition to teaching basic computer skills, including the use of the Internet, teachers should make students aware of the privacy, ethical, copyright and security issues related to this technology.

Appendix 3: Contributors, and trial and pilot schools

The valuable contributions of the following individuals, organisations and schools to the Years 1 to 10 Technology Curriculum Development Project are gratefully acknowledged.

Queensland Studies Authority

Peter Luxton, Director
Donna George, Deputy Director, Syllabus Services
Mark Snartt, Manager, Syllabus Development and Accreditation
Jim Tunstall, former Director, Queensland School Curriculum Council
Barry Salmon, former Assistant Director, Queensland School Curriculum Council
Richard Dunlop, Principal Education Officer

Project team members

Michael Berry
Doug Buchan
Barbara Gant
Keryn Henderson
Joanne Jayne
John Martin
Peter Queale
Anthony Shearer

Technology Syllabus Advisory Committee

Lyn Allsop, Education Queensland (Primary Sector)
Betty Baram, Education Queensland (Open Access Unit)
Ann Carroll, Education Queensland (public service officer)
David Christiansen, Queensland Society for Information Technology in Education
Jolyon Clarke (1997–2002), Education Queensland (distance education sector)
Colin Colston, Queensland Board of Senior Secondary School Studies
Dudley Cowan, Unions' representative — Queensland Teachers' Union, Queensland Independent Education Union
Richard Dunlop, Queensland Studies Authority (committee chair)
Brad Ensbey, Queensland Agriculture Teachers' Association
Jenny Galligan, Association of Women Educators
Sue Garrett, Home Economics Institute of Australia (Qld) Inc.
Judith Gray (1997–1999), Queensland School Curriculum Council nominee (Literacy and Numeracy)
Iain Hay, Queensland School Curriculum Council nominee (Aboriginal and Torres Strait Islander education)
Joanne Jayne, Home Economics Institute of Australia (Qld) Inc.
Colleen Jones, Queensland Catholic Education Commission (secondary sector)
Vicki Knopke, Association of Women Educators
Rod Kyle, Education Queensland (workplace, health and safety representative)
Norena Mendiolea, Parents Representative — Queensland Council of Parents' and Citizens' Associations, Federation of Parents and Friends Associations of Catholic Schools in Queensland, and Independent Parents and Friends Council of Queensland

Howard Middleton, Tertiary sector representative — School of Vocational, Technology and Arts Education, Faculty of Education, Griffith University
Wendy Morgan, Queensland School Curriculum Council nominee (equity)
Absjorn Pettersson, Industrial Technology and Design Teachers' Association
Maree Read, Queensland Catholic Education Commission (primary sector)
Rosalie Raciti, Queensland School Curriculum Council nominee (Aboriginal and Torres Strait Islander education)
Peter Rogers, The Association of Independent Schools of Queensland Inc.
Jenene Rosser, The Association of Independent Schools of Queensland Inc.
Patricia Simmons, Business Educators' Association of Queensland
Mark Snartt, Queensland Studies Authority (committee chair)
Jeff Souter, Education Queensland (special education sector)
Jeff Spencer, Unions representative — Queensland Teachers' Union, Queensland Independent Education Union
Craig Spender, Industry representative, Microsoft Australia Pty Ltd
Wayne Swindell, Education Queensland (secondary sector)
Steve Tate, Industrial Technology and Design Teachers' Association
Doug Telford, The Association of Independent Schools of Queensland Inc. (secondary representative)
Esta Thiris, Queensland School Curriculum Council nominee (cultural and linguistic diversity)
Ann Turner, Queensland School Curriculum Council nominee (literacy and numeracy)
Laurie Vogler, Education Queensland (public service officer)
Egan Wallace, Education Queensland (secondary sector)
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Cannon Hill Anglican College
Chinchilla State High School
Coorparoo State School
Crestmead State School
Darling Point Special School (Redland Bay)
Darra-Jindalee Catholic School
Dunwich State School
Good News Lutheran Primary School (Brisbane)
Grand Avenue State School (Ipswich)
Gympie Central State School
Gympie State High School
Holy Cross School (Cairns)
Holy Spirit School (Townsville)

Ipswich Girls Grammar School
Ipswich State High School
Ironside State School
Kalamia State School (Ayr)
Kallangur State School
Kirwan State School
Labrador State School
Mountain Creek State High School
Mount Alvernia College
Mundingburra Special School (now Townsville Community Centre)
Mutdapilly State School
Park Ridge State High School
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Peace Lutheran Primary School (Gatton)
Runcorn State High School
Ryan Catholic College (Townsville)
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St Augustine's College (Cairns)
St Francis Primary School (Ayr)
St Hilda's School (Gold Coast)
St John's Catholic Primary School (Roma)
St Joseph's College (Nudgee College, Brisbane)
St Mary's Primary School (Ipswich)
St Paul's School (Bald Hills, Brisbane)
St Thomas More Catholic Primary School (Noosa)
The Scots PGC College (Warwick)
Townsville Grammar School
Trinity Lutheran Primary School (now Trinity Lutheran College Primary School, Gold Coast)
Tully State High School
Windaroo Valley State High School (Beenleigh)
Yarrabah State School

Copyright notice

Guidance in connection with the Copyright Amendment (Digital Agenda) Act

Libraries, educational institutions, and institutions helping people with a disability may have the right to:

- supply another library with digital copies of a work, or parts of a work that they hold, if the other library cannot get the work in a reasonable time at an ordinary price
- display digital works within their premises (e.g. on an intranet)
- make a digital copy for research or study
- for administrative purposes, make a digital copy of a work held in printed format
- make a copy of an artistic work to display on their premises if the original is lost or in danger.

To comply with subsection 49(5A) of the *Copyright Amendment (Digital Agenda) Act 2000*, anything that a library makes available on their computer system must be so arranged that it can be accessed only through a computer that cannot itself make a copy, or print out the copy displayed. This is made clear in subsection 49(5).

Direct quotation of subsection 49(5A), Copyright Amendment (Digital Agenda) Act

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