



Curriculum Framework

Progress Maps

Technology and Enterprise



Curriculum Framework Progress Maps – Technology and Enterprise

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**Curriculum
Council**

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27 Walters Drive, Osborne Park, Western Australia 6017

Telephone: (08) 9273 6300

Facsimile: (08) 9273 6389

Internet: www.curriculum.wa.edu.au

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Foreword

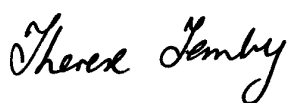
'A focus on student learning lies at the heart of everything the Curriculum Council does'.

This principle is captured in the outcomes of the *Curriculum Framework* that are considered important for students to achieve as a result of their education from kindergarten to year 12. In recent years, the Curriculum Council has collaborated with school sector/systems to develop a set of common progress maps to describe progressive student achievement of these outcomes.

Existing progress maps for government (the *Student Outcome Statements* of the Department of Education and Training) and non-government schools (the draft *Progress Maps* of the Catholic Education Office) have been reviewed and revised on the basis of advice provided by the Australian Council for Educational Research, learning area working parties, teachers and curriculum officers. Working versions of the new progress maps were produced in 2003.

The *Curriculum Framework Progress Maps* are intended to be used by teachers and schools implementing the *Curriculum Framework*, particularly in monitoring and planning for student achievement. The Department of Education and Training has used the *Curriculum Framework Progress Maps* as the basis for producing their *Outcomes and Standards Framework*.

The *Progress Maps* provide a common language that can be used throughout Western Australia to describe progressive levels of student achievement and support improvements in student learning.



THERESE TEMBY
CHAIR



NORMA JEFFERY
CHIEF EXECUTIVE OFFICER

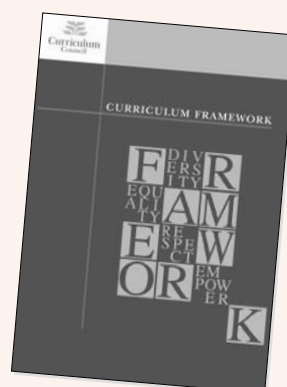
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Curriculum Framework support documents

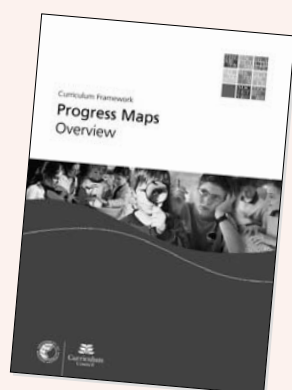
Curriculum Framework

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



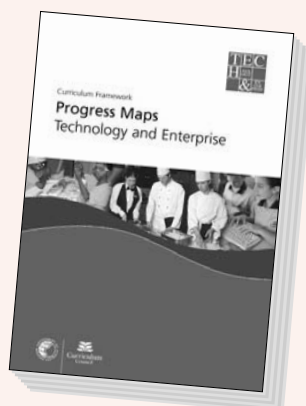
Curriculum Framework Progress Maps

Curriculum Framework Curriculum Guides



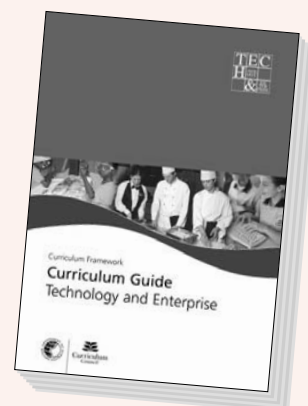
Overview

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



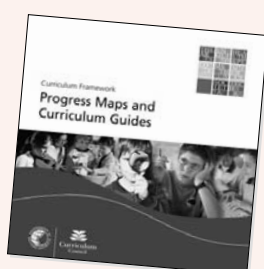
Learning Area

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



Learning Area K-12

Each guide describes content for learning area outcomes in each phase of development.



CD-ROM

Contains further content sequences in each phase of development for particular outcomes in each learning area and Portable Document Format versions of the *Curriculum Framework Curriculum Guides K-12* and *Curriculum Framework Progress Maps*.

Introduction

Curriculum Framework Progress Maps

Relationship of the Curriculum Framework to the Progress Maps

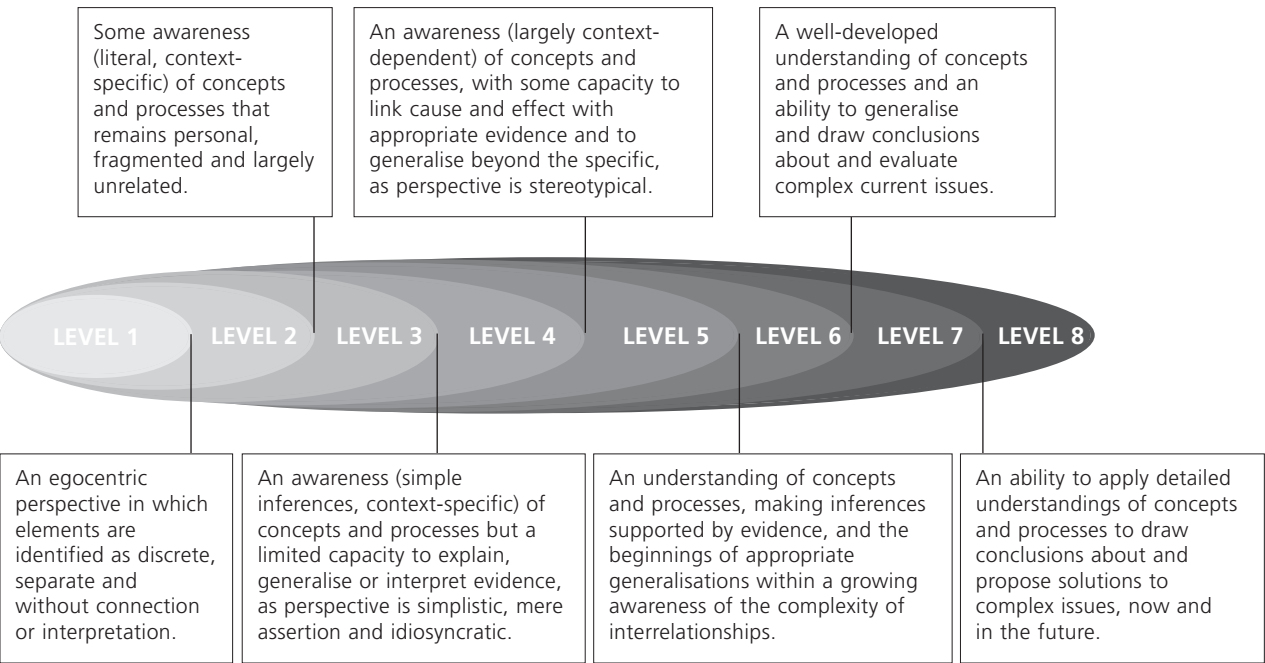
The *Curriculum Framework* identifies the outcomes that all students are expected to achieve as a result of the programs they undertake in Western Australian schools. Schools and teachers develop learning and teaching programs according to their particular circumstances and ethos and the needs of their students to ensure that they achieve these outcomes. Through ongoing assessment of their work, students' progress is monitored and plans are made for further improvement. The *Curriculum Framework Progress Maps* support this approach by describing the nature of achievement as students develop the outcomes described in the *Curriculum Framework*.

Nature of Progress

For each *Curriculum Framework* outcome, descriptions have been developed for students achieving at Foundation and then at eight levels of achievement (1 to 8). The Foundation descriptions are intended for students for whom achievement beyond this level may be a long-term goal. The descriptions at each level are based on a developmental continuum of how students demonstrate their knowledge, skills, understandings, values and attitudes in increasingly-challenging contexts.

For those *Curriculum Framework* outcomes that do not lend themselves to a developmental sequence: *Attitudes and Values* (Health and Physical Education); *Appreciating Mathematics* (Mathematics); *Communicating Scientifically, Science in Daily Life, Acting Responsibly* and *Science in Society* (Science); and *Active Citizenship* (Society and Environment), monitoring advice is provided in the learning area *Progress Maps* books.

Progressive Achievement of an Outcome



Structure of the Technology and Enterprise Progress Maps

Descriptions of Achievement

Each progress map describes student achievement of a *Curriculum Framework* outcome and of its aspects where appropriate. The level descriptions for Foundation and Levels 1 to 8 describe the sequence of student achievement for an outcome.

For outcomes, mainly in the English, Mathematics, Society and Environment and Technology and Enterprise learning areas, level descriptions for both the outcome and its aspects are provided. For some other outcomes, mainly in The Arts, Health and Physical Education, LOTE and Science learning areas, only outcome level descriptions are available.

In each learning area progress map book, the descriptions are presented on fold-out pages as shown below.

| Outcome | | Foundation Descriptions | | | | | Outcome Level Descriptions | | | | |
|--|---|--|---|--|--|---|--|--|--|--|--|
| The outcome from the Curriculum Framework. | | Intended for students for whom development at or beyond this level of achievement may be a long-term goal. | | | | | For each level of achievement (Foundation, Levels 1 to 8), a description of student achievement is provided. | | | | |
| Technology and Enterprise > Materials | | | | | | | | | | | |
| Materials | FOUNDATION | LEVEL 1 | LEVEL 2 | LEVEL 3 | LEVEL 4 | LEVEL 5 | LEVEL 6 | LEVEL 7 | LEVEL 8 | | |
| Students select and use materials that are appropriate to achieving solutions to technology challenges. | M F The student explores and safely uses familiar materials and equipment. | M 1 The student: Recognises the relationship between the use of familiar materials for different purposes and their safe and simple manipulation to achieve a solution. | M 2 The student: Considers properties when selecting materials and relates this understanding to the selection and safe, careful and more controlled use of familiar and appropriate equipment when producing solutions to design challenges using common materials. | M 3 The student: Considers the need to relate the properties of materials to the requirements of own design, including consideration of the aesthetic, functional and environmental effects. The student selects equipment and processes that are appropriate to work materials safely to achieve intended solutions. | M 4 The student: Matches the materials to the requirements of their own design, considering values related to aesthetic, functional and environmental effects. The student applies their understanding effects. The student applies their understanding when using appropriate skills, techniques and equipment to work the selected material safely. | M 5 The student: Understands that when considering aesthetic, functional and environmental requirements, the selection of materials is based on the appropriateness of their properties and suitability for the design. The student applies this understanding to the selection of appropriate equipment, skills and techniques to achieve specified results carefully and safely. | M 6 The student: Understands that the physical, chemical and aesthetic properties of materials determine their performance. The student applies this understanding when selecting suitable materials, techniques and equipment appropriate to the material and the production processes to achieve defined standards of quality and safety. | M 7 The student: Understands that research and testing of any materials substantiates the selection of those materials to meet design, production, functional, cultural, social and environmental requirements. The student applies this understanding to the management of suitable production processes that achieve specified standards of quality and safety. | M 8 The student: Understands how the physical and chemical structure and properties of existing, new and emerging materials influence their cultural, social, environmental and functional suitability. The student applies this understanding to the selection of appropriate materials, equipment and techniques to achieve solutions that meet a client or intended user's requirements. | | |
| The nature of materials Students understand the properties and nature of materials. | M F1 Explores familiar materials. | M 1.1 Understands that materials may be used for different purposes. | M 2.1 Understands that when selecting materials, their properties are considered. | M 3.1 Understands that properties of materials need to be related to the requirements of own design, considering aesthetic, functional and environmental effects. | M 4.1 Understands that the properties of materials are matched to the functional, aesthetic and environmental requirements of own design. | M 5.1 Understands that the properties of materials are considered when meeting functional, aesthetic and environmental requirements. | M 6.1 Understands that the physical, chemical and aesthetic properties of materials need to meet design, production and functional requirements while addressing cultural, social and environmental requirements. | M 7.1 Understands that research and test information is used to match effectively the properties of any materials to design, production and functional requirements. | M 8.1 Understands that when selecting and using existing, new and emerging materials, their physical and chemical structure and properties need to match detailed design requirements while meeting cultural, social and environmental requirements. | | |
| The selection and use of materials Students apply an understanding of the nature of materials, when selecting and using materials to meet technology needs. | M F2 Uses equipment safely when working with materials. | M 1.2 Uses equipment to safely manipulate and process familiar materials. | M 2.2 Selects and uses equipment with increasing accuracy and control to safely manipulate and process materials. | M 3.2 Selects and safely uses techniques and equipment for working materials to the aesthetic, functional and environmental requirements of own design. | M 4.2 Applies a range of techniques for safely working materials considering functional, aesthetic and environmental requirements of own design. | M 5.2 Selects and uses techniques and equipment to work materials with the precision, care and safety required to achieve specifications. | M 6.2 Selects and uses techniques and equipment to suit particular production situations and to work materials to defined standards of quality and safety. | M 7.2 Applies research and testing when working with materials to improve production standards of accuracy and presentation to achieve specified standards of quality and safety. | M 8.2 Uses specialised equipment and uses and modifies specialised techniques for processing and working materials to achieve outcomes that meet a client or intended user's requirements. | | |
| Aspects | | Aspect Descriptions | | | | | | | | | |
| The aspects that comprise student achievement of the outcome are listed beneath each outcome. | | For each level of achievement (Foundation, Levels 1 to 8), descriptions of achievement for each of the aspects at the level are provided. | | | | | | | | | |

Elaborations

Each description of student achievement (Foundation, Levels 1 to 8), is further elaborated and exemplified by means of a statement about the nature of progress students have made at that level, followed by several paragraphs that provide a holistic view of achievement at the level.

Outcome Level Descriptions
The description of student achievement at the level being elaborated.

Materials > Level 3 Elaboration

3

The student considers the need to relate the properties of materials to the requirements of own design, including consideration of the aesthetics, functional and environmental effects. The student selects equipment and processes that are appropriate to work materials safely to achieve intended solutions.

At this level
Students adopt a purposeful approach to the development of their technologies. They select materials according to functional and aesthetic requirements and take into account people's needs and wants and effects on the environment. They make safe and efficient use of resources and use recognised techniques and equipment when working with materials.

The nature of materials
Students recognise the need to relate the properties of materials to the requirements of their designs and to their intended use: for example, they identify natural, made and composite materials used to manufacture familiar products. When considering the requirements of their designs, including functional and aesthetic criteria and environmental effects, they examine ways of testing materials for properties. They represent their findings in forms such as tables, pie charts or photographs.

The selection and use of materials
When selecting and using materials, students explore ways of limiting damage to the environment. They identify how factors of time, cost, availability of materials, equipment and expertise affect decisions relating to the selection of materials. They recognise that different materials respond in different ways to different treatments and that this affects their use. When the need arises to substitute materials (through their being unavailable, too expensive or inappropriate in meeting the design requirements), they are enterprising in seeking alternatives that overcome the identified constraints. In choosing a replacement material, they locate a substitute that has similar properties and appearance and responds similarly to different treatments.

Students research and describe the processes and techniques used to manipulate materials. They use a variety of methods to convey how they intend to use materials. With their increasing understanding of the properties of materials, they plan and evaluate the steps in the production process and calculate the cost of materials used. Working individually or in groups, they share ideas, equipment and materials when constructing models and products. They work safely and accurately: for example, they use suitable methods to join and finish materials and control the use of materials. They operate equipment safely and efficiently according to their design and purpose. They understand the need to care for the working environment, such as ensuring that work surroundings are not damaged.

Throughout the development of products, students assess the effectiveness of their choice of materials and processes used in meeting the requirements of their designs.

At this level
This paragraph describes the nature of student progress at this level.

Outcome Level Elaborations
An elaboration of student achievement at each level is provided. Each elaboration is inclusive of pointers (where appropriate) that are in existing progress maps. Some pointers, however, will appear as part of the scope and sequence in the curriculum guides.

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Curriculum Framework Progress Maps – Technology and Enterprise

Use of the Curriculum Framework Progress Maps

The Curriculum Framework Progress Maps are designed to support outcomes-focused teaching, learning and assessment, as shown below.

Progress Maps provide a common language to describe student achievement within and between schools. They can also be used as a framework for setting performance targets.

Progress Maps can be used to gain a sense of current student achievement of outcomes and where improvement is required. Specific aspects of achievement can be identified as foci for teaching, learning and assessment.

Evaluating student learning and the processes

- The effectiveness of the teaching, learning and assessment strategies is reviewed.
- Decisions are made about further learning experiences required.
- On the basis of judgements made, student achievement of outcome/s is communicated and reported.

Identifying students' needs and outcomes

- Outcomes in which students need to progress are identified by ongoing monitoring.
- The outcomes are analysed to determine which aspects should be given particular attention with students.
- A view is formed of what progress in student achievement of the outcomes will look like.

Teaching and monitoring student needs and outcomes

- Students are engaged in tasks from the teaching, learning and assessment strategies being implemented.
- These tasks are modified according to ongoing monitoring of student progress.
- On completion of the tasks, the teacher and students use evidence gathered to reflect on student performance.
- Feedback and guidance about the extent to which progress has been made in achievement of outcome/s is provided.

Planning learning experiences and identifying resources

- Content that students need to know, understand, value and do for progress to be made is identified.
- Tasks and environments through which content can be taught to facilitate progress are developed.
- Teaching, learning and assessment strategies to facilitate progress are developed.
- Resources are gathered to support these strategies.

Reference to Progress Maps can ensure evidence of student performance gathered during and at the completion of tasks is valid for providing feedback and making judgements about student progress in achievement.

Progress Maps provide a focus for teaching, learning and assessment. Strategies for gathering sufficient and consistent evidence of student achievement are evident in programs.

Curriculum Framework Progress Maps and Curriculum Guides

For students to progress in their achievement of outcomes, as described in the *Curriculum Framework Progress Maps*, an increasing repertoire of knowledge and understandings, skills and processes needs to be taught. The *Curriculum Framework Curriculum Guides* for each learning area identify the scope of content required and the sequence in which it is taught to support progress in achievement of the outcomes. They build on the 'Scope of the Curriculum' sections of the *Curriculum Framework*.

The introduction pages to the *Curriculum Framework Curriculum Guides* identify the ways in which the *Guides* support this outcomes-focused cycle of review and action aimed at student improvement.

Inclusivity and the Curriculum Framework Progress Maps

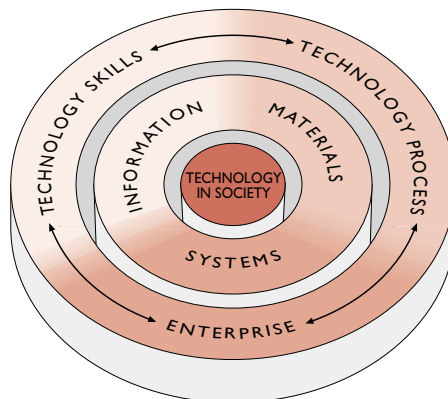
Inclusivity means ensuring that all groups of students are included and valued (*Curriculum Framework*, p. 9). The diversity within groups is as wide as the diversity between groups. In defining and assessing students' achievement of outcomes, their perspectives and experiences should be considered in terms of the impacts of social, cultural, linguistic, geographic and economic circumstances, as well as their abilities, needs and interests.

Some strategies that promote inclusive curriculum practices, by recognising and addressing the advantages and disadvantages experienced by some individuals and groups, include:

- acknowledging that students with physical or intellectual disabilities do not achieve different outcomes. The difference is in their rate of achievement and the way in which they demonstrate particular outcomes;
- recognising that for students from culturally and linguistically diverse backgrounds who are in the early stages of learning English as a second language, the ESL Bandscales may provide a more accurate map of their development;
- valuing all forms of communication. Terms such as 'explain', 'describe', 'assess' and 'evaluate' encompass both verbal and non-verbal interaction; and
- ensuring fair and valid assessment of students with conductive hearing loss (otitis media).

Technology and Enterprise

In the Technology and Enterprise learning area, students apply knowledge, skills, experience and resources to the development of technological solutions that are designed to meet the changing needs of individuals, societies and environments. Students become innovative, adaptable and reflective as they select and use appropriate materials, information, systems and processes to create solutions that consider the short- and long-term impact on societies and environments.



Curriculum Framework, 1998

The *Progress Maps* for Technology and Enterprise describe student achievement of the seven outcomes that provide a framework for kindergarten to year 12 curriculum in Technology and Enterprise:

1. Technology Process
2. Materials
3. Information
4. Systems
5. Enterprise
6. Technology Skills
7. Technology in Society

Considerations in using the Technology and Enterprise *Progress Maps*

All Technology and Enterprise outcomes are linked. The **Technology Process** outcome is integral to the achievement of the other six outcomes and all learning involves this outcome through the contexts of the **Materials**, **Information** and **Systems** outcomes.

Achievement of **Enterprise**, **Technology Skills** and **Technology in Society** outcomes is demonstrated through the **Technology Process** outcome, so the planning of learning and teaching activities to facilitate student achievement should provide opportunities for students to achieve all outcomes through **Technology Process**.

Technology and Enterprise >

Technology Process



| Technology Process | | FOUNDATION | LEVEL 1 | LEVEL 2 | LEVEL 3 |
|---|--|---|---|--|--|
| Students apply a technology process to create or modify products, processes, systems, services or environments to meet human needs and realise opportunities. | | TP F The student: Explores the form of familiar products and their uses in everyday life, uses production processes and expresses feelings about the results. | TP 1 The student: Uses an awareness of the form of familiar products and their uses, applying a trial-and-error approach when creating or modifying technologies, and expressing feelings about the result. | TP 2 The student: Uses an awareness of how existing products and processes affect people, applying a more methodical approach when creating or modifying technologies that meet human needs, communicating ideas and comparing the result with the original intention. | TP 3 The student: Uses an understanding of the relationship between aesthetics, social and environmental effects when generating and communicating designs and when creating and modifying technologies and evaluates results using functional and aesthetic criteria. |
| Investigating | Students investigate issues, values, needs and opportunities. | TP F.1 Explores the form of products and their everyday use. | TP 1.1 Investigates the form and identifies the uses of everyday products. | TP 2.1 Investigates and identifies the uses and effects of products, systems, processes, services and environments. | TP 3.1 Examines and identifies key design features, including aesthetic features, and environmental effects of products, systems, processes, services and environments. |
| Devising | Students devise and generate ideas and prepare production proposals. | TP F.2 Indicates, suggests or describes their ideas verbally or by gestures. | TP 1.2 Generates ideas for own designs, using trial-and-error, simple models and drawings. | TP 2.2 Generates designs and recognises some practical constraints using text, drawings or models and introducing related technical terms. | TP 3.2 Generates designs that take into account some social and environmental implications and communicates using a range of graphical representations, models and technical terms. |
| Producing | Students produce solutions and manage production processes. | TP F.3 Participates in production processes. | TP 1.3 Undertakes simple production processes, using trial-and-error, with care and safety. | TP 2.3 Plans production processes and makes products, systems, processes, services and environments using resources safely. | TP 3.3 Plans and carries out the steps of production processes, making safe and efficient use of resources. |
| Evaluating | Students evaluate intentions, plans and actions. | TP F.4 Expresses feelings about own processes and products. | TP 1.4 Expresses feelings about own design ideas, products and processes. | TP 2.4 Compares own products, systems, processes, services and environments with original intentions. | TP 3.4 Assesses how well the ideas, products, systems, processes, services and environments used meet design requirements, including consideration of functional and aesthetic criteria. |

LEVEL 4

TP 4

The student:

Uses an awareness of how the values and beliefs of developers and users influence design, how it is communicated and the production processes used, and considers social and environmental effects when evaluating results.

TP 4.1

Examines the values and beliefs of both the developer and user that are evident in technology.

TP 4.2

Generates designs that take into account social and environmental values relevant to the designs and communicates using a range of accurate graphical representations, models and technical terms.

TP 4.3

Organises and implements own production processes, working within given constraints, recognising hazards and adopting safe work practices.

TP 4.4

Assesses how well the ideas, products, systems, processes, services and environments used meet design requirements, including consideration of social and environmental effects.

LEVEL 5

TP 5

The student:

Applies a variety of technology processes and considers the values and beliefs held by the developer and user when determining the appropriateness of technologies. The student applies this understanding throughout the design and production process and uses social and environmental criteria when evaluating progress and results.

TP 5.1

Determines the appropriateness of technologies for communities and environments.

TP 5.2

Creates and prepares design proposals that include options considered and reasons for choices made, and uses images to visualise ideas and work out how designs might be realised.

TP 5.3

Organises and implements production processes to own specifications, recognising hazards and adopting safe work practices.

TP 5.4

Assesses the effectiveness of own designs, products, systems, processes, services and environments in relation to design requirements, including consideration of social and environmental criteria.

LEVEL 6

TP 6

The student:

Applies an understanding of the relationship between the needs of individuals, communities and environments when assessing the appropriateness of technologies and when developing design and production proposals. The student controls production to achieve specified standards and undertakes ongoing evaluation of the process, including ethical criteria and how well original design requirements are met.

TP 6.1

Investigates and explains how the design, production and use of technologies are affected by the needs of individuals, communities and environments.

TP 6.2

Creates and prepares design and production proposals that include an examination of a range of options; demonstrates consideration of functional, aesthetic, social and environmental issues; and communicates using graphics and technical languages associated with particular fields of technology.

TP 6.3

Organises, implements, adjusts and controls production processes based on detailed production plans, which are described using suitable technical languages and conventions and which achieve defined standards of quality and safety.

TP 6.4

Assesses own products, systems, processes, services and environments through continuous appraisal according to specified design requirements, including ethical criteria and comparisons with similar technologies.

LEVEL 7

TP 7

The student:

Applies an understanding of the relationship between needs, availability of resources and existing circumstances to the development and production of technologies and justifies decisions relating to functional, aesthetic, social and environmental issues. The student manages and controls production tasks, undertakes ongoing evaluation, and produces reports based on recognised evaluation methods.

TP 7.1

Analyses how needs, resources and circumstances affect the development and application of particular technologies.

TP 7.2

Creates and prepares detailed design and production proposals that show how the ideas have been developed, justifying the functional, aesthetic, social and environmental choices made; and communicates using recognised symbols, graphics and technical languages adapted to the needs of the audience.

TP 7.3

Organises, implements and adjusts production processes involving efficient use of time and resources; manages and controls tasks carried out in specific sequences; and achieves specified standards of quality and safety.

TP 7.4

Evaluates own technologies through continuous appraisal using recognised methods, with information from impact studies, product testing, market research and comparisons with similar work done by others.

LEVEL 8

TP 8

The student:

Applies an understanding of how values and beliefs underpin the development and application of technology, and the effect technology has on the development of societies and the development of design and production proposals. The student manages production and makes adjustments when needed, while achieving specified standards and using quantitative and qualitative assessments, and undertakes ongoing evaluation of the process.

TP 8.1

Analyses designs and their social, political, ethical, environmental and economic implications, the costs and benefits of particular technologies and the values and beliefs that underpin their development and application.

TP 8.2

Creates and prepares design and production proposals that explain the merits of different options; describes social and cultural implications and resource costs; and describes, where relevant, the aesthetic, mathematical, scientific and ethical principles on which decisions are based; and communicates using suitable graphics, technical language and standards.

TP 8.3

Organises, implements and adjusts production processes that make optimum use of time, facilities and resources, negotiates with others to overcome difficulties in production and maintains specified standards of safety and quality based on the requirements of clients and intended users.

TP 8.4

Evaluates own technologies through continuous appraisal using qualitative and quantitative methods to determine their social, functional and aesthetic suitability; and predicts social and environmental impacts and commercial feasibility.

F

The student explores the form of familiar products and their uses in everyday life, uses production processes and expresses feelings about the results.

Investigate

Students explore the form of products and their everyday use by giving sensory focus to their investigation: for example, they touch or rotate objects to help observe the features of an object and they move or rotate objects and equipment to explore their uses. They attend and respond to materials, resources and processes from their everyday experiences: for example, they may show curiosity toward new resources or anticipate the outcome of a cooking process. Through imitating others or by trial and error, they use products for their intended purpose, such as using a wooden spoon to stir a mixture or glue to connect paper. They also improvise and use familiar products in creative ways, such as plastic cups to build a structure or a pencil as a rolling pin. Through exploring and using products they may develop the basic skills to cut, paste, attach, roll, press or pinch.

Devise

Students indicate their ideas, such as choosing from a given selection when developing a solution for creating a technology: for example, when generating ideas for a snack, they select bread to put in a toaster and choose a knife instead of a fork to spread the topping. They use vocalisations or gestures to select from options provided: for example, they point, nod, speak, pick up or use facial expressions to accept or reject items. When asked or prompted, they indicate their preferred method for an activity or material, appropriate item or action for a specific purpose.

Produce

Students participate in production processes: for example, they may indicate a picture of interest in a magazine and help to tear out or cut and glue the picture to a birthday card they make for a friend. They follow procedures and step-by-step instructions and use tools for their intended purpose: for example, they press a switch to turn on a microwave oven, press on keys to enter information into a computer, or use sand paper to sand a wooden item. They begin to organise their own actions into a process by following pictures or visual cues: for example, they sequence a set of photographs of popcorn being prepared, or a wooden toy being made, and are able to follow the sequence to repeat the activity with support.

Evaluate

Students express feelings about the processes they used and the product they have made: for example, they use structured choice-making to show the objects they liked to use and point to pictographs or photographs of the activity they did or did not like; communicate through vocalisations or gestures their feelings about the toast they made and ate, or a birthday card they created to give to a friend. They communicate their responses to an experience in individual ways, such as using vocalisations or gestures to request repetition of particular parts of the process. They express their emotions and judgements about the product: for example, they point to a picture of a smiling face or do not eat the food they cooked. They begin to answer questions about the features of a finished product: for example, they nod when asked if their card is a certain colour or verbalise the name of the material used to make a model.

1

The student uses an awareness of the form of familiar products and their uses, applying a trial-and-error approach when creating or modifying technologies, and expressing feelings about the result.

At this level

Students start formal schooling with varying, but considerable experience with using and creating technologies. Through concrete experiences, they respond to the design tasks. They experiment, and, using a trial-and-error approach, create technologies. They express satisfaction with an approximation of their original intentions and share freely how they feel about their achievements.

Investigating

Students develop an understanding of the connection between the form of a product and its use by investigating: for example, they investigate the form (shape, size, proportion, weight, capacity, colour and texture) of commonplace products. They focus on particular human needs and ask questions as to why we need particular products and how they assist us in our daily living. They begin to develop an understanding of technology, the role it plays in meeting human needs and how it is modified over time. They begin to recognise the relationship of technology to people's paid and unpaid occupations in the local community.

Devising

When working on a design task, students develop their ideas and designs through trial and error, using past experiences. They experiment with different ways of achieving their goals and are able to choose resources for particular purposes. They describe and draw pictures to convey what they intend the solution to be, although their drawings are rudimentary, not to scale and may not represent the features they describe.

Producing

Students use a variety of materials, commercially-available products, information technologies and systems to make their product or a model representation of a familiar item selected to solve a problem. They use tools such as scissors, paint brushes, cooking equipment or computers with care and safety. They also recognise that materials and equipment need to be shared and cared for properly. They show some awareness of the stages of the design process and, although they use a trial-and-error approach, they often work in situations in which aspects of the technology process take place at the same time.

Evaluating

Students express satisfaction with an approximation of their original intentions, and are able to modify their methods and products in response to comments from their peers or teachers. When questioned, they can explain how their creation works, telling others how they feel about what they have done.

2

The student uses an awareness of how existing products and processes affect people, applying a more methodical approach when creating or modifying technologies that meet human needs, communicating ideas and comparing their result with the original intention.

At this level

Students apply the technology process in a more methodical and planned way than at Level 1. They show evidence of more considered planning, generating ideas within existing constraints when creating technologies. They begin to reflect throughout the process, communicating and evaluating their intentions more formally.

Investigating

Students investigate by asking relevant questions about how technologies affect aspects of people's lives, by direct observation or by the use of readily-available technologies. They begin to appreciate the roles of particular technologies and relate them to the application of technology to paid and unpaid work. They are becoming aware of the roles of technological developments and begin to identify the advantages of using these technologies, such as wearing protective headgear.

Devising

When formulating ideas, students consider and compare alternatives, such as the effects of choosing one process or technology over another. They generate ideas from their own personal experiences, enriched through sharing with other children.

Students communicate their designs verbally and in written forms, such as 2D representations, drawings or models. Their designs are detailed and identifiable to others, although not to scale. They begin to use related technical terms specific to the particular technology to describe these designs and present plans.

Producing

Students use their understanding of the phases to plan their production process: for example, they collect the materials needed, cut the shapes required and join them together, using resources and basic tools safely. In this way they are developing a system for producing their solution. They are also beginning to appreciate that there are practical constraints, such as limited resources, and sharing things such as tools, space and materials is necessary for everyone to achieve success.

Evaluating

When evaluating their solution, students are able to compare it with their original intentions. They can be critical of the processes used and their products and reflect on their ideas and actions to make suggestions for improvements. They share ideas with others, formally and informally.

3

The student uses an understanding of the relationship between aesthetics, social and environmental effects when generating and communicating designs and when creating and modifying technologies and evaluates results using functional and aesthetic criteria.

At this level

Students complete the phases of the technology process step by step, to help them generate ideas for a solution. They understand the relationship between the stages. They create technologies that show an understanding of the importance of functionality and aesthetics and explore alternatives beyond the familiar. They plan and make safe and efficient use of resources. They reflect on design features using functional and aesthetic criteria.

Investigating

Students extend their understanding beyond personal application or familiar experiences by examining a range of technologies to identify key design features, especially aesthetic qualities and social and environmental effects. They consider features such as balance, symmetry, colour, line and shape as well as functional aspects of size, ease of handling and cleaning, and effective operation. They investigate technologies, considering how particular ideas and practices meet certain needs and realise opportunities. They consider issues, values, needs and opportunities related to their use, identifying operating costs, safety procedures and processes for the organisation and management of the technology and how they affect people.

Students identify the environmental effects of particular technologies, such as the by-products of manufacturing operation and disposal. They begin to make realistic suggestions, such as when they match properties of materials to the requirements of their design. They select products and processes that minimise the impact on the environment, such as efficient energy use, and take people's needs and wants into account. They consider other influencing factors and constraints, such as availability of materials and tools, personal skills and time, the 'rules' set for the process and the final quality of the solution.

Devising

Students use language and conventions that are becoming increasingly more specific to the particular technologies from which they draw their ideas and begin to experiment with the presentation and format of their designs, such as using 3D representation. They can present designs using modelling. They combine drawings, models, diagrams and written statements, which they annotate. They provide reasons for their choices of resources and the processes they intend using.

Producing

Students show evidence of a planned process in which resources are selected and used safely and efficiently: for example, they focus on economical cutting to reduce waste; use and adapt existing templates and pro formas when computing; select individual or assembly-line methods for mass production; select appropriate techniques for working with selected materials or systems; and manage the working environment to ensure their own safety and that of others. As they proceed, they adhere to the production techniques and standards laid down in the design brief. They work individually and with others to improve their designs and production processes, overcoming difficulties encountered.

Evaluating

Students begin to use specific criteria to judge how well their ideas, products, processes, systems and built environments satisfy their design brief and can suggest, give reasons for and carry out simple modifications using their personal experience and preferences. They respond to new ideas and problems they encounter.

4

The student uses an awareness of how the values and beliefs of developers and users influence design, how it is communicated and the production processes used, and considers social and environmental effects when evaluating results.

At this level

Students complete each phase of the technology process step by step, but appreciate that there can be different starting points, such as evaluating a range of technologies of a given type to establish design features before investigating other alternatives. They understand that this is also a form of investigation. They use the technology process to create technologies that reflect an understanding that all technologies are underpinned by beliefs and values. Their confidence and independence is becoming increasingly evident in their more complex planning and their safe and efficient use of resources. They reflect continuously on their progress, using criteria that include consideration of social and environmental effects.

Investigating

Students examine the values and beliefs of both the developer and the user, extending their understanding beyond familiar personal applications to the less-familiar examples available in the community. They identify the key design features and can predict the values and beliefs evident in a given technology.

They understand that, to ensure success, the developer of the technology will examine issues and incorporate features that realise the users' values and beliefs. Aesthetic, social and environmental values are considered and students understand that conflict can occur when values compete for pre-eminence. They can identify, for example, that a technology can be attractive but that the materials used can have an adverse effect on the environment. They extend their understanding to instances related to the use of materials, systems and information. They consider questions of an ethical nature related to perceived impacts on society and the environment and query whether the needs of the larger community have really been met when, for example, profit is considered ahead of social and environmental values.

Devising

Students examine existing technologies to consider how ideas that demonstrate the positive aspects of aesthetic, social and environmental values can be applied in their designs. They generate ideas, prepare production proposals and communicate ideas for designs using graphical representations, recognisable conventions, symbols and technical terms and models made from materials that reflect aesthetic and environmental values and meet functional requirements.

Producing

Students display initiative and drive when carrying out the steps in the production process they have established: for example, they can identify, assess and manage risks when planning and organising resources and achieve results safely and efficiently that meet the requirements of their design.

Evaluating

Students use specific criteria based on the perceived beliefs and values of the intended users that include consideration of social and environmental effects, to judge how well their ideas, plans, use of resources, actions and final results satisfy the specifications they developed.

5

The student applies a variety of technology processes and considers the values and beliefs held by the developer and user when determining the appropriateness of technologies. The student applies this understanding throughout the design and production process and uses social and environmental criteria when evaluating progress and results.

At this level

Students recognise the different aspects of the technology process and understand that these aspects depend on each other and do not occur in a set sequence. They understand that when determining the appropriateness of technologies, it is critical to consider the beliefs and values held by developer and user and to apply this understanding throughout the process to create technologies that are ecologically sustainable.

Investigating

Students understand that technologies appropriate for one community, culture or environment may not be appropriate for another. When determining why an individual or community selects and uses particular technologies, they consider the values and beliefs held by the developer and user. Their evaluation of the appropriateness of technologies extends beyond the application of technical, financial and economic criteria and includes considerations such as the impact on environment, efficiency of energy use, and cultural, ethical and gender implications.

Students demonstrate concern about the way technologies are applied and are beginning to recognise the complexity of issues relating to the appropriate use of technology. They draw conclusions that show an understanding of how social, economic and environmental factors influence decisions about sustainability, considering how some technologies may be modified to make them more appropriate to different communities or different environments.

Devising

Students devise appropriate strategies to generate a range of designs that can be produced by others, including 2D and 3D representations, computer graphics, scale models (prototypes), discussions and written instructions. Their design proposals demonstrate that they can draw out ideas from other designs and evaluate a range of options. They recognise the need for some modification, giving well-argued justifications for their choice. They use technical terms and apply symbols and conventions appropriately.

Producing

In implementing the production process, students work cooperatively and independently, using their plans and giving attention to the constraints of timing, resource selection and availability and the appropriate delegation of tasks to peers. These behaviours, applied in a range of situations, demonstrate their application of organisational, manipulative and operational skills. They appraise all aspects of their activities critically, anticipating and overcoming problems. They also recognise potential hazards in the work environment and their work, and adopt safe work practices.

Evaluating

In assessing the effectiveness of their own designs, students evaluate critically the processes they have employed and the outcomes of their work. To do this, they collect information through testing, reflection, seeking others' views and making comparisons with alternative technologies. They assess the impact of their solutions on individuals, households, communities and associated environments. They begin to consider the market suitability of their designs. They examine possible market opportunities, use feedback from the client or intended user and others and consider evidence gathered about the historical development of similar technologies and the approximate costs of commercial application of their technology. This initiates further cycles of investigation, idea generation and design implementation.

6

The student applies an understanding of the relationship between the needs of individuals, communities and environments when assessing the appropriateness of technologies and when developing design and production proposals. The student controls production to achieve specified standards and undertakes ongoing evaluation of the process, including ethical criteria and how well original design requirements are met.

At this level

Students select and apply appropriate sequences to achieve optimum results when applying a technology process. They apply their understanding of the relationships among the needs of individuals, communities and environments when applying a technology process.

Investigating

Students understand that technology is pervasive in society and that, regardless of community or cultural differences, most types of technologies are used and valued by all. By investigating how technologies are developed, adapted and used by different individuals and communities, they understand that needs are met in different ways. From these understandings, they recognise the impact of technology on values relating to social, economic, cultural, political, religious, gender or environmental issues.

Devising

Students understand how issues, values, needs and opportunities influence the design, production and use of technologies. They devise, generate and test ideas and prepare proposals that meet design specifications and criteria. They communicate their ideas using techniques appropriate to the purpose and audience, such as conferencing and diagrammatic representation. When developing or adapting a technology they prepare design and production proposals that address functional, aesthetic, social and environmental issues. Functional issues may include reliability, cost of ongoing maintenance and performance. Aesthetic issues may include user appeal and quality of finish. Social issues may include the effect of changed protocols on work patterns, work locations, working hours or conditions. Environmental issues may include the management of waste, the sustainability of resource use and the implications for the larger environment. They understand that the relationship between the use of natural, social and economic resources ought to be maintained when meeting present needs. However, they understand that the ability of future generations to meet their own needs should not be compromised.

Producing

Students test or examine products to determine expected quality standards. They implement and control production and adjust their production processes to overcome difficulties and to achieve these specified standards of quality and efficient time, resource and energy use.

Evaluating

Through continuous appraisal of their products and processes against design criteria and similar products, students not only consider the efficiency and effectiveness of their activities, but also the associated ethics: for example, they may consider using plantation materials, labelling packets with details of ingredients and preservatives, keeping appropriate records, such as transactions, ensuring food hygiene and safety, obeying protocols and legislation, or using licensed software to transmit virus-free information.

7

The student applies an understanding of the relationship between needs, availability of resources and existing circumstances to the development and production of technologies and justifies decisions relating to functional, aesthetic, social and environmental issues. The student manages and controls production tasks and produces reports based on recognised evaluation methods.

At this level

Students understand the significance of the relationships among the separate key aspects when applying a technology process. They examine the relationships between variables such as individual, family, community or industry needs; availability, type and cost of resources; and existing and potential constraints and enabling practices.

Investigating

When investigating, students use statistically-valid and reliable techniques, such as market research methods, product testing or impact studies. They use this knowledge to understand information about people's values, beliefs and perceived needs for particular technologies, the expected qualities of the technologies and the extent of consumer satisfaction in acquiring and using these technologies.

Devising

Students select and use techniques to show how their designs or modifications have been developed, using accepted drawing, schematic and symbolic representations, justifying decisions made and keeping detailed notes and drafts. They also make choices: for example, they make decisions about the materials, styles, sizes, finishes, construction techniques and costs in the light of their expectations about the technology being developed. As they develop detailed production proposals, they analyse tasks and evaluate the skills and abilities of those involved in production.

Producing

Throughout the production process, students allocate roles and responsibilities to achieve quality of construction and finish, in a safe and healthy environment. They select and manage resources and equipment, making conscious decisions about the appropriate use of time, energy and resources. They also minimise and dispose of waste in an environmentally-conscious way. They recognise opportunities for improvement by negotiating alternatives, identifying and dealing with potential hazards, problems or changes to customer or market demands, and adjusting production processes effectively to achieve solutions that, at the project's conclusion, meet intended needs.

Evaluating

Students evaluate their solutions using information from impact studies, product testing and market research and the processes adopted to achieve them, and make comparisons with a range of similar commercial products and processes. They compile evaluation reports based on their findings and modify the information when presenting it to relevant stakeholders. Following an analysis of the impact of and interaction between each element of a solution, they highlight the features of the final solution and demonstrate the efficiency and effectiveness of the solutions reached.

8

The student applies an understanding of how values and beliefs underpin the development and application of technology, and the effect technology has on the development of societies and the development of design and production proposals. The student manages production and makes adjustments when needed, while achieving specified standards and using quantitative and qualitative assessments, and undertakes ongoing evaluation of the process.

At this level

Students consider the underpinning values of each stakeholder and the costs and benefits of particular solutions when they design their own processes to develop, manage and control technological solutions. Their designs achieve production requirements to meet the needs of clients and intended users. They synthesise ideas into practical technological solutions and analyse their intentions, plans and actions and, where needed, make modifications and improvements based on the results of valid assessment methods.

Investigating

Students' solutions demonstrate consideration of the underpinning values and beliefs of each stakeholder and the costs and benefits of particular solutions. They understand that all technologies have impacts on individuals, families, communities, economies and environments, and that, depending on the nature and extent of the impact, their influence on the development of societies varies significantly. They examine how people's values influence the complex interaction among technological systems, services, products and environments.

Students research the costs and benefits of different technologies. They understand that costs and benefits can be direct or indirect. (Indirect costs include the economic, political, social, cultural and ethical implications). When considering the manufacture of products, they recognise that the costs and benefits to people are related to their values.

Devising

When designing, students use technical language and graphics appropriate to key stakeholders, such as business and government bodies and occupational safety and health organisations. Where it is necessary to clarify design and production details, they specify the mathematical and scientific principles in order to reinforce the credibility of their proposals. To determine quantities, qualities and costs of alternative materials, they apply technical, financial, social and economic principles, including sustainability, mathematical calculations and scientific testing.

Producing

Students manage and implement production processes, modifying and adjusting them where applicable to optimise resource use while achieving safety and quality standards comparable with community expectations.

Evaluating

Students evaluate their solutions and the associated processes. They use a range of qualitative and quantitative methods to confirm whether stakeholders' requirements have been incorporated, community acceptance gained, identified needs met, predicted impacts addressed and, if applicable, commercial feasibility achieved. Although their technology may, in the short term, meet the specified criteria for evaluation, they establish longitudinal studies to ascertain unpredicted and tested impacts of technological solutions in the longer term. It is through this ongoing evaluation that decisions may be made to withdraw or modify the technology to prevent or reduce future impacts on societies and environments.

Technology and Enterprise > Materials



| Materials | | FOUNDATION | LEVEL 1 | LEVEL 2 | LEVEL 3 |
|---|---|--|--|---|---|
| Students select and use materials that are appropriate to achieving solutions to technology challenges. | | M F The student: Explores and safely uses familiar materials and equipment. | M 1 The student: Recognises the relationship between the use of familiar materials for different purposes and their safe and simple manipulation to achieve a solution. | M 2 The student: Considers properties when selecting materials and relates this understanding to the selection and safe, careful and more controlled use of familiar and appropriate equipment when producing solutions to design challenges using common materials. | M 3 The student: Considers the need to relate the properties of materials to the requirements of own design, including consideration of the aesthetics, functional and environmental effects. The student selects equipment and processes that are appropriate to work materials safely to achieve intended solutions. |
| The nature of materials | Students understand the properties and nature of materials. | M F.1 Explores familiar materials. | M 1.1 Understands that materials may be used for different purposes. | M 2.1 Understands that when selecting materials, their properties are considered. | M 3.1 Understands that properties of materials need to be related to the requirements of own design, considering aesthetic, functional and environmental effects. |
| | | M F.2 Uses equipment safely when working with materials. | M 1.2 Uses equipment to safely manipulate and process familiar materials. | M 2.2 Selects and uses equipment with increasing accuracy and control to safely manipulate and process materials. | M 3.2 Selects and safely uses techniques and equipment for working materials to the aesthetic, functional and environmental requirements of own design. |
| The selection and use of materials | Students apply an understanding of the nature of materials when selecting and using materials to meet technology needs. | | | | |

| LEVEL 4 | LEVEL 5 | LEVEL 6 | LEVEL 7 | LEVEL 8 |
|---|---|--|--|--|
| <p>M 4 The student: Matches the materials to the requirements of their own design, considering values related to aesthetic, functional and environment effects. The student applies their understanding when using appropriate skills, techniques and equipment to work the selected material safely.</p> | <p>M 5 The student: Understands that when considering aesthetic, functional and environmental requirements, the selection of materials is based on the appropriateness of their properties and suitability for the design. The student applies this understanding to the selection of appropriate equipment, skills and techniques to achieve specified results carefully and safely.</p> | <p>M 6 The student: Understands that the physical, chemical and aesthetic properties of materials determine their performance. The student applies this understanding when selecting suitable materials, techniques and equipment appropriate to the material and the production processes to achieve defined standards of quality and safety.</p> | <p>M 7 The student: Understands that research and testing of any materials substantiates the selection of those materials to meet design, production, functional, cultural, social and environmental requirements. The student applies this understanding to the management of suitable production processes that achieve specified standards of quality and safety.</p> | <p>M 8 The student: Understands how the physical and chemical structure and properties of existing, new and emerging materials influence their cultural, social, environmental and functional suitability. The student applies this understanding to the selection of appropriate materials, equipment and techniques to achieve solutions that meet a client or intended user's requirements.</p> |
| <p>M 4.1 Understands that the properties of materials are matched to the functional, aesthetic and environmental requirements of own design.</p> | <p>M 5.1 Understands that the properties of materials are considered when meeting functional, aesthetic and environmental requirements.</p> | <p>M 6.1 Understands that the physical, chemical and aesthetic properties of materials need to meet design, production and functional requirements.</p> | <p>M 7.1 Understands that research and test information is used to match effectively the properties of any materials to design, production and functional requirements while addressing cultural, social and environmental requirements.</p> | <p>M 8.1 Understands that when selecting and using existing, new and emerging materials, their physical and chemical structures and properties need to match detailed design requirements while meeting cultural, social and environmental requirements.</p> |
| <p>M 4.2 Applies a range of techniques for safely working materials considering functional, aesthetic and environmental requirements of own design.</p> | <p>M 5.2 Selects and uses techniques and equipment to work materials with the precision, care and safety required to achieve specifications.</p> | <p>M 6.2 Selects and uses techniques and equipment to suit particular production situations and to work materials to defined standards of quality and safety.</p> | <p>M 7.2 Applies research and testing when working with materials to improve production standards of accuracy and presentation to achieve specified standards of quality and safety.</p> | <p>M 8.2 Uses specialised equipment and uses and modifies specialised techniques for processing and working materials to achieve outcomes that meet a client or intended user's requirements.</p> |

F

The student explores and safely uses familiar materials and equipment.

The nature of materials

Students explore familiar materials that are part of their everyday world using their senses: for example, they feel different textures on a sensory board, participate in water play, smell and taste food and ingredients or listen and react to sounds created by certain materials. They may realise that materials create different sensations. They indicate their preference for particular properties: for example, they choose a particular colour from a selection of colours by pointing, pull their hand away from a cold object or touch a smooth object repeatedly. They begin to group familiar materials according to one observable property, such as wet and dry or edible and inedible.

The selection and use of materials

Students use equipment safely when working with materials: for example, they use a brush safely when gluing, apply butter to bread using the correct knife and handle it in a safe way. They choose from a given selection of materials for a purpose, exercising their judgements about what they like and dislike. They are aware of the use of materials for specific purposes: for example, in a kitchen, they select ingredients suitable for cooking and solvents and abrasives for cleaning. Through imitation, repeated practice or with guidance, they control and handle familiar materials safely, developing a growing awareness of the characteristics of different materials: for example, they experiment with squeezing sponges, playing with dough, soap or their own fingers to identify the different responses.

Students explore the safe use of relevant equipment through activities that involve trial and error: for example, they paint with a sponge to avoid putting their fingers in paint, determine that a spoon is better than a fork for eating soup. They handle familiar materials and equipment in a safe manner through learnt routines such as holding a knife by the handle, not eating glue and using a mitt when holding hot pans.

Students express feelings about their own products and their experiences during the application of the technology process by answering simple questions with vocalisations or gestures.

1

The student recognises the relationship between the use of familiar materials for different purposes and their safe and simple manipulation to achieve a solution.

At this level

Students manipulate and explore materials with which they are familiar and which are readily available in the home, school and community. When working with these materials, they apply the technology process and use simple equipment and techniques, such as, cutting, joining and shaping.

The nature of materials

Students handle and identify common materials and relate them to their everyday uses. When examining a common object, such as a toy, they identify that different parts of the object can be made from various materials, with different strengths, colours, surfaces and shapes. They recognise that the form of the material affects its use.

The selection and use of materials

Students develop ideas for using different materials to create particular effects. They use information from various sources, such as personal experience, their own imagination, stories and illustrations from books, film, television and magazines. When creating products, students use trial-and-error design and construction methods. Their ideas develop as they work with everyday materials. These include commercially-manufactured objects, readily-available materials, by-products from household items and food ingredients. They begin to understand that the choice of a material depends not only on how it meets requirements, but also on individual personal preferences and past experiences.

Students display initiative by modifying their original designs when they find more suitable materials. They use simple mathematical concepts to classify or group common materials into types and to explore patterns when using materials to create products.

Students use technologies such as scissors, spoons, needles, glue and hammers and can identify equipment according to its use. When making simple models, they experiment with different ways of joining materials. They are aware of the need to use materials and equipment safely and correctly, to store them appropriately and to demonstrate cooperative behaviour by sharing materials that are in limited supply. They perform simple equipment maintenance, such as cleaning after use, thereby beginning to understand the need to care for equipment so that it works properly.

When working with materials, students talk about the best ways of approaching a task. On completing the task, they talk about their result. When assembling a limited number of materials, they follow instructions that may be in the form of graphical or symbolic representations.

When talking about their finished work, students describe how they feel about the materials they have used and reflect on what they have achieved. They are usually satisfied with the finished result.

2

The student considers properties when selecting materials and relates this understanding to the selection and safe, careful and more controlled use of familiar and appropriate equipment when producing solutions to design challenges using common materials.

At this level

Students apply a more planned approach to their work. They match materials to the requirements of the task, often experimenting with common materials to determine their suitability. They work with increasing accuracy and care and are becoming aware of factors such as production time, resource constraints and safety when applying the technology process.

The nature of materials

Students understand the properties of materials, such as hardness and smoothness, and are aware of reasons for using certain materials for particular purposes. They can distinguish between natural and made materials. They obtain information about the properties, form, availability and cost of various materials, in a variety of ways, such as testing. They classify and present their results using simple tables and charts, and from this information compare the properties of materials when selecting one for a particular purpose.

The selection and use of materials

Students use their knowledge about materials to match them to the requirements of their task. Their choice of materials is based on properties such as colour, strength, durability and pliability. They also make decisions regarding the selection of a material based on technical factors (such as cost, texture, flexibility, strength and form) and subjective considerations (such as aesthetics and past experience).

Students identify some of the effects of using particular materials and try different techniques to achieve desired effects. They consider problems related to the disposal of non-biodegradable materials and determine how resources can be recycled. They recognise that the continued use, without replacement, of some materials that are already in short supply can affect natural environments for future generations.

When creating products, students overcome constraints related to the cost and availability of resources: for example, given the costs of individual components, they can calculate the cost of products made from alternative materials and use this additional information when making decisions about which material to select.

Students select and use natural and made materials to build models or products that perform specific functions. They manipulate materials in ways that are appropriate to the design, the production method and the use to be made of the product. When using equipment, they select and apply proven techniques and appropriate safety procedures suited to the material being used and the environment in which they are working. They display initiative by setting up equipment and materials for use by the class and work cooperatively to clean up before moving on to a new activity. They apply their understanding of the need to maintain equipment by carrying out simple tasks, such as cleaning, refilling and oiling.

Students identify the positive qualities of work when they appraise their results and those of their peers, suggesting ideas for improvement.

3

The student considers the need to relate the properties of materials to the requirements of own design, including consideration of the aesthetics, functional and environmental effects. The student selects equipment and processes that are appropriate to work materials safely to achieve intended solutions.

At this level

Students adopt a purposeful approach to the development of their technologies. They select materials according to functional and aesthetic requirements and take into account people's needs and wants and effects on the environment. They make safe and efficient use of resources and use recognised techniques and equipment when working with materials.

The nature of materials

Students recognise the need to relate the properties of materials to the requirements of their designs and to their intended use: for example, they identify natural, made and composite materials used to manufacture familiar products. When considering the requirements of their designs, including functional and aesthetic criteria and environmental effects, they examine ways of testing materials for properties. They represent their findings in forms such as tables, pie charts or photographs.

The selection and use of materials

When selecting and using materials, students explore ways of limiting damage to the environment. They identify how factors of time, cost, availability of materials, equipment and expertise affect decisions relating to the selection of materials. They recognise that different materials respond in different ways to different treatments and that this affects their use. When the need arises to substitute materials (through their being unavailable, too expensive or inappropriate in meeting the design requirements), they are enterprising in seeking alternatives that overcome the identified constraints. In choosing a replacement material, they locate a substitute that has similar properties and appearance and responds similarly to different treatments.

Students research and describe the processes and techniques used to manipulate materials. They use a variety of methods to convey how they intend to use materials. With their increasing understanding of the properties of materials, they plan and evaluate the steps in the production process and calculate the cost of materials used. Working individually or in groups, they share ideas, equipment and materials when constructing models and products. They work safely and accurately: for example, they use suitable methods to join and finish materials and control the use of materials. They operate equipment safely and efficiently according to their design and purpose. They understand the need to care for the working environment, such as ensuring that work surroundings are not damaged.

Throughout the development of products, students assess the effectiveness of their choice of materials and the processes used in meeting the requirements of their designs.

4

The student matches the materials to the requirements of their own design, considering values related to aesthetic, functional and environment effects. The student applies their understanding when using appropriate skills, techniques and equipment to work the selected material safely.

At this level

Students understand, use and match properties of materials within the context of their own designs to achieve different effects. They consider functional and aesthetic effects of materials, cultural and environmental implications. They apply appropriate skills, techniques and equipment to work materials safely and to meet their own design requirements.

The nature of materials

Students understand the properties and nature of materials and match them to the functional and aesthetic requirements of their own designs. They describe ways in which the properties of particular materials can be altered, considering the appearance, feel, functions, availability, limitations and alternative uses of various materials. Using a range of sources of information, they investigate the potential of new materials and different uses for 'old' materials: for example, they trace the origin and development of materials, considering their source, availability and the uses made of them by different people. In this way, they gain an understanding of the need to consider the material when developing technologies appropriate for individuals, communities and environments.

Students identify and evaluate the appropriateness of materials for particular uses. When presented with examples of technology, they are able to consider the representation of the values and beliefs of both the developer and the user, and apply this understanding when developing their own technologies.

The selection and use of materials

Students apply their understandings of materials to their selection and use. They also apply techniques for safely working materials, considering functional and aesthetic requirements of their own designs to meet technology needs. They are self-directed as they process and transform materials to achieve specified outcomes. They use equipment suited to working materials and apply skills in measuring, cutting, manipulating, joining, gluing, moulding and decorating. Individually and in teams they develop production processes (including planning, preparing, constructing, shaping, controlling, fitting, finishing and decorating) that are appropriate to the materials being used.

Students construct simple time plans to control production processes and, when working with materials, use equipment safely and correctly to achieve the specifications for the functional and aesthetic requirements of their products. Recognising potential hazards, they adjust individual and group work practices to ensure results that meet their design specifications. They maintain the equipment they use by applying appropriate procedures and storage methods.

Throughout the process, they assess the effectiveness of the materials and techniques used, considering the functional and aesthetic requirements of their designs. They also consider the consequences of the extended use of particular materials on individuals, households, communities and environments.

5

The student understands that when considering aesthetic, functional and environmental requirements, the selection of materials is based on the appropriateness of their properties and suitability for the design. The student applies this understanding to the selection of appropriate equipment, skills and techniques to achieve specified results carefully and safely.

At this level

Students work with materials, examining how their properties relate to the functional and aesthetic requirements of their work. They assess how the use of particular materials affects environments, households and communities and make decisions based on their findings.

The nature of materials

Students identify and evaluate, from various perspectives, the appropriateness of materials for particular uses: for example, they consider energy consumption, environmental sustainability, culture, gender and ethics. They examine how the properties of the materials used in products meet the aesthetic, functional and environmental requirements of particular communities. When exploring alternatives, they apply their knowledge of the properties of materials to achieve specific results and effects. They test materials to determine whether they meet design requirements related to, for example, aesthetics, performance and degradability.

Students also examine the social and environmental impacts and consequences of the use of a wide range of both natural and synthetic materials, bearing in mind the needs of individuals, families and communities.

The selection and use of materials

Students apply their understandings of materials to their selection and use. They select materials to meet design specifications developed from an identification of needs. They apply their understanding of the relationship between the materials selected, the equipment, techniques and skills used and the consequences of their decisions.

Students describe the factors required to achieve quality outcomes with materials, such as performance, aesthetics, cost effectiveness and sustainability. They justify their choice of material, using criteria they have developed. In order to achieve improved results, they devise technologies required by the design specifications, identifying factors such as accuracy, purpose, efficiency, safety and presentation.

Students apply a variety of methods for manipulating and using correctly and safely a range of fixed and portable instruments and equipment to achieve defined standards of quality. They evaluate the materials used, considering appearance, function, efficiency, ease of maintenance and impact on the environment. They work cooperatively to evaluate the results they have achieved, comparing them to the specifications of their designs and the standards achieved by others.

6

The student understands that the physical, chemical and aesthetic properties of materials determine their performance. The student applies this understanding when selecting suitable materials, techniques and equipment appropriate to the material and the production processes to achieve defined standards of quality and safety.

At this level

Students apply their knowledge of the physical, chemical and aesthetic properties of materials to achieve specific results and effects. They select and use techniques and equipment and work materials to specified standards of safety, accuracy and presentation.

The nature of materials

Students' study of materials contributes to their understanding of their physical properties (including strength, flexibility, stretch, slipperiness, absorbency, ability to insulate, flammability and resistance to water and wind) and chemical properties (including reaction with acids, alkalis, bleaches, solvents, sunlight, dyes and biodegradability). When investigating materials, they value and seek other people's knowledge and expertise about materials. They examine materials, compare similar products, establish availability, cost, care and management requirements and consider the application of materials in commercial products. From their investigations, they analyse how needs, resources and circumstances affect innovation, development and the application of technologies made from specific materials. They explain differences in substances and how these relate to their use for certain purposes.

The selection and use of materials

When selecting materials, students apply their understanding of the physical and chemical properties of these materials and how they affect aesthetics, functional and environmental requirements to meet specific design and production requirements. They use an understanding of the physical and chemical properties of materials to achieve specific results and effects. They also use standard criteria to test whether materials are suitable for particular purposes and meet design requirements.

Students apply production processes to achieve the standards of safety, accuracy, efficiency and presentation stated in the design specifications. They reflect on changes in the processing of materials when developing resources with altered characteristics.

Students use a variety of ways to evaluate their choice of materials, the selected techniques and the production processes used for working materials: for example, they can evaluate the results they achieve against the specifications of their designs, the work done by others and the standards achieved by commercial manufacturers.

7

The student understands that research and testing of any materials substantiates the selection of those materials to meet design, production, functional, cultural, social and environmental requirements. The student applies this understanding to the management of suitable production processes that achieve specified standards of quality and safety.

At this level

Students research and test materials, referring to mathematical and scientific principles when necessary, to match the properties of any materials to design and production requirements. In addition, they consider cultural, social and environmental requirements. They evaluate and use techniques and equipment when working with materials to achieve standards of accuracy and presentation within specified standards of quality and safety.

The nature of materials

Students work with new and traditional materials, investigating, researching, testing and analysing to establish their potential uses in meeting production requirements in particular situations. They match the materials' properties and performance to the design, production and performance requirements. They also consider the availability of resources and understand the environmental and social issues related to sustainability.

Students examine the interrelationships among the social, cultural and economic conditions of particular historical periods, the prevailing attitudes and values about the use of materials and the ways in which they were worked: for example, they trace the historical development of materials that are natural, synthetic, composite or in the form of alloys.

The selection and use of materials

Students experiment with applications for materials and use their understandings: for example, they compare the costs and benefits in different situations of the use of high-performance materials.

Students perform tests to determine the merit of different options regarding choice of materials. They consider factors related to a material's properties, service requirements, cost, energy consumption during manufacture and production and environmental effects. They also assess implications related to the design and select production processes by considering market size, the available resources and the social effects of new technologies on manufacturing processes.

Students combine natural, synthetic and composite materials effectively in production tasks when necessary, using appropriate techniques and equipment to work the materials to specified standards of safety and quality. They use appropriate design and processing equipment, and use or devise specialised equipment so that required effects are achieved. They use appropriate protective clothing and apply safety codes and protocols for storing and processing materials.

Students understand the principles of quality assurance in controlling the quality of a product. They apply quality control processes to measure whether standards stated in the design specifications are being met and assess whether production processes are achieving acceptable standards of accuracy, efficiency, reliability and consistency.

8

The student understands how the physical and chemical structure and properties of existing, new and emerging materials influence their cultural, social, environmental and functional suitability. The student applies this understanding to the selection of appropriate materials, equipment and techniques to achieve solutions that meet a client or intended user's requirements.

At this level

Students understand how the chemical structure and physical properties of existing, new and emerging materials impact on functional, aesthetic and service requirements. They use equipment and modify specialised techniques to process and work materials to achieve design and production requirements specified by clients and intended users.

The nature of materials

Students understand that there is a relationship between factors such as the internal structure of a material, its properties and the method of processing and finishing the product and that a change in any of these factors can affect the others and may alter the material's suitability for the task. They understand the importance of structure and properties, processing methods and finish applied. They consider the impact on local, national and international communities and environments; the complex relationship between the competing beliefs and values of individuals, groups and communities; the related moral and ethical issues; the cultural and gender considerations; and the role of government in controlling innovation, development and the application of materials.

The selection and use of materials

When selecting materials to meet aesthetic, functional, production and service requirements, students apply their understanding of the form, structure, physical and chemical properties of existing, new and emerging materials. Where necessary, they perform qualitative tests to determine appropriateness, including the cultural, social and environmental consequences of their choices.

When generating ideas, students consider the competing needs of the parties involved, such as client, designer, maker and user. They are aware of the ideas that dominate their thinking. They apply lateral thinking skills, exploring different ways of looking at situations and making the most of situations arising out of chance. They modify their design proposals: for example, they can use mathematical models for performance and costs, graphical techniques for recording information and ideas, 3D representations of the product and computer modelling.

When implementing production processes, students observe industry trends and adopt appropriate health and safety practices. Throughout the process, they analyse their intentions, plans and actions and, where necessary, make modifications and improvements. They evaluate the effectiveness of methods used and the long- and short-term consequences of using the criteria developed from the design specifications.

Technology and Enterprise > Information



| Information | | FOUNDATION | LEVEL 1 | LEVEL 2 | LEVEL 3 |
|--|---|--|---|--|--|
| Students design, adapt, use and present information that is appropriate to achieving solutions to technology challenges. | | I F The student: Attends to different forms of information and uses simple techniques to access and present information. | I 1 The student: Identifies the various ways information can be used and presented, relating this understanding to the use of simple ways of gathering, sending, receiving, recording and presenting information. | I 2 The student: Relates an understanding of the common ways information is used, processed and transmitted to the use of various techniques to gather, send, receive, store and transmit information and create information products. | I 3 The student: Understands that information has meaning when it is developed for a purpose and relates this understanding to the selection and use of various techniques to gather, send, receive, store and transmit information and create information products. |
| The nature of information | Students understand the form, structure, quality and purpose of information products and processes. | I F.1 Attends to different forms of information. | I 1.1 Understands that information can be presented and used in different ways. | I 2.1 Understands that information is used, created, constructed, stored and transmitted in different ways. | I 3.1 Understands that information is used, created, constructed, stored and transmitted in different ways, giving it purpose and meaning. |
| | Students apply an understanding of the nature of information when designing and presenting information products and processes to meet a need. | I F.2 Uses simple techniques to access and present information. | I 1.2 Uses simple techniques to access, record and present information. | I 2.2 Uses techniques to access, record, store, manipulate and transmit information and create information products. | I 3.2 Selects and uses a range of techniques to access, record, store, manipulate and transmit information and create information products. |

| LEVEL 4 | LEVEL 5 | LEVEL 6 | LEVEL 7 | LEVEL 8 |
|--|---|---|--|--|
| <p>I 4 The student: Considers the needs of a particular audience when selecting and using appropriate techniques, resources and equipment to create information products using, for example, sound, images and text.</p> | <p>I 5 The student: Understands that the meaning audiences make of information is influenced by its form, structure, style and presentation. The student applies this understanding to the creation of information products and processes, using recognised methods, rules and languages.</p> | <p>I 6 The student: Understands that the form, transmission and controls applied affect the use of information and that accuracy, privacy, global access and distribution are issues to be considered. The student applies this understanding to the use and creation of information to achieve particular effects.</p> | <p>I 7 The student: Understands that the values, attitudes and experiences of individuals, communities and societies influence the nature and development of information products and processes. The student applies this understanding and uses recognised procedures associated with appropriate information technologies when developing information solutions.</p> | <p>I 8 The student: Understands how external, local, national and global controls and recognised practices influence the development of information and the impact it has on societies and environments. The student applies these understandings to the selection and use of specialised techniques to develop information products, processes and systems that meet detailed specifications.</p> |
| <p>I 4.1 Understands that information is used, created, constructed, presented, stored and transmitted in different ways for particular audiences and users.</p> | <p>I 5.1 Understands that there are specific forms, structures, styles and presentations used in particular information products and processes.</p> | <p>I 6.1 Understands that forms, methods of transmission, standards and conventions affect the use and impact of information.</p> | <p>I 7.1 Understands that the needs of the audience influence the form and structure of information products and processes and the way they are developed and that these may be affected by particular cultural values and experiences.</p> | <p>I 8.1 Understands that access to information, regulations, statutory controls and conventions and the availability of information networks influence the form, structure and impact of information on communities and environments.</p> |
| <p>I 4.2 Selects and uses a range of techniques when transforming information and creating information products.</p> | <p>I 5.2 Selects and uses recognised procedures, conventions and languages to process information and create information products.</p> | <p>I 6.2 Manipulates, transforms and creates information to achieve particular effects and meanings.</p> | <p>I 7.2 Manipulates, transforms, processes and creates information using procedures, conventions and languages associated with particular information technologies.</p> | <p>I 8.2 Transforms, processes and creates information to meet detailed specifications negotiated with intended users or clients using specialised techniques associated with particular information technologies.</p> |

F

The student attends to different forms of information and uses simple techniques to access and present information.

The nature of information

Students attend to different forms of information around them by maintaining focus on a diverse range of stimuli in their immediate environment: for example, they look at people's facial expressions, follow a picture on a screen, turn their head toward a noise or stop to listen to music. They search for specific information in response to learnt routines: for example, they wait for the bleeping noise at a pedestrian crossing, look at a teacher while they sign 'finished' to indicate they have finished their work, or identify the male or female sign on the change-room door. They explore different forms of information, such as the school siren or their personal timetable. They make meaning from information they receive frequently, particularly when the relationship between the information and its meaning is reinforced, such as when the school siren sounds at lunchtime and they are instructed to eat their lunch or they see a familiar landmark and the bus bell rings, so they know to stand up to leave the bus. They decide which information they like and do not like, depending on their own reactions and those of others: for example, they may play simple cause and effect educational games and learn what is necessary to initiate responses that enable them to make progress through a game.

The creation of information

Students use simple techniques to access information from their immediate environment: for example, they turn on the television and then attend and respond to the picture; observe their timetable and point to the current and next symbols to identify what lesson is next; vocalise or gesture to the teacher to confirm what ingredient goes in next in a cooking activity. They initiate movements to access information: for example, they turn their head to look at a picture, manipulate an object to see both sides, vocalise and gesture to request a desired movie to view. They use learnt skills to access information: for example, they push a switch to move to the next computer screen, open a book or press the 'play' button on a remote control.

Students present their own information in various ways such as a poster, collage or verbal or gestural response to a question. To represent information verbally, they may substitute words they do not know, cannot pronounce or remember with other sounds, using similar inflections in their voices to create similar-sounding messages. To represent information in a written or graphical form, they may use their own interpretation of letters, numbers and other recognised symbols. To represent information in a pictorial form, they may use a concept keyboard or a supply of images and select from the array to create a story, message or idea, often triggered by the images' relationship to their own experience.

1

The student identifies the various ways information can be used and presented, relating this understanding to the use of simple ways of gathering, sending, receiving, recording and presenting information.

At this level

Students identify some of the different forms of information and how they and others use information: for example, at work, at home and for recreation, thereby recognising the importance of information in their lives. They use techniques that are easy to manage when accessing, recording and presenting information.

The nature of information

Students recognise a variety of familiar ways of using and presenting information. They identify and investigate the important features of familiar manual and electronic means of using and presenting information and the processes associated with their use.

The creation of information

Students gather oral, print and graphical information related to their everyday experiences or special occasions from familiar sources such as family members, peers, books, signs, posters, CD-ROMs and television. They suggest different ways of recording and presenting their ideas as information through oral means, text and simple images. They consider the resources, techniques and the equipment that are needed to find, gather, record and present various familiar forms of information.

Students use a limited number of simple techniques to present information and reflect on how they feel about the use of information technologies and the resulting information solutions. They use a range of familiar information technologies safely and carefully to access, record and present information.

2

The student relates an understanding of the common ways information is used, processed and transmitted to the use of various techniques to gather, send, receive, store and transmit information and create information products.

At this level

Students understand the ways people use, construct, present, store and transmit information, drawing on commonly-available examples, and use simple techniques to access, record, use and manage information when producing familiar information products.

The nature of information

Students understand the common ways in which information is used, processed and transmitted, such as posters, pamphlets, books, product packages, road signs, photographs, tapes, digital disks and electronic files. They investigate the form of such familiar information solutions, including the medium used and its shape, size and construction material, and recognise how design and production features are employed for particular audiences. They examine their own and others' reaction to different information technologies, and recognise that feelings such as excitement, mistrust, fear, lack of understanding, fascination, fun and confusion can influence an individual's use of information technologies.

Students recognise that the form and structure of information and information products can affect the meaning conveyed. They also reflect on the impact on their lives of common forms of information.

The creation of information

Students present, publish and store information in oral, textual and simple image forms such as electronic displays, static graphics, maps, photographs and recorded messages. They specify information required for a particular task and then find, store, sort, analyse, manipulate and/or transform it, often combining information from several sources: for example, they may need information in the form of statistics, results from simple material testing, opinions of peers and others, subject or topic research, procedures for operating equipment, or historical or geographical information.

Students apply an understanding of the way information is used, constructed, presented, stored and transmitted to the creation of their own information solutions. They select the most appropriate medium for the particular audience in order to convey the intended ideas and purpose.

Throughout the creation of their information product or process, students reflect on the techniques they have applied, the practical constraints considered, the use to which it has been put and the skills they have demonstrated when using equipment and resources. They judge the effectiveness of their completed product or process by comparing it with their original intention.

3

The student understands that information has meaning when it is developed for a purpose and relates this understanding to the selection and use of various techniques to gather, send, receive, store and transmit information and create information products.

At this level

Students understand that information is used, created, constructed, stored and transmitted in different ways, giving it purpose and meaning. They use familiar examples, such as road signs, classroom rules, recipes, correspondence, advertisements and the television news to demonstrate their understanding. They select and use a range of techniques to access, record, store, manipulate and transmit information and create information solutions, identifying the reason for the development.

The nature of information

Students understand that information has meaning when it is developed for a purpose by investigating the form of familiar and unfamiliar information solutions and identifying the purpose. They describe how the form affects its use and people's access to information. They identify the relationship between the form and content, and recognise how the solution has been designed and produced for particular audiences. Using an expanding vocabulary of technical terms, they explain the different ways the information is used, created, stored and transmitted and how this contributes to its purpose and meaning.

Students examine people's use of different information technologies and recognise that people do not make the same use of all information technologies and use different technologies for different purposes.

The creation of information

Depending on the purpose, students select and use manual and digital techniques to create information solutions. When creating information solutions, they use a range of techniques to access, record, store, manipulate and transmit information. They consider what information they need and how to present it in different ways to make it more accessible to others. They plan the production by setting out the steps and identify resources such as tools and materials. They use the tools safely, correctly and efficiently.

Students collect information to meet an identified need: for example, they prepare a newspaper targeting parents that describes highlights of students' academic and sporting achievements over the term. When working on a project, they store the information logically, in a digital or hard-copy format, retrieving it as needed.

Students judge the effectiveness of their completed information solution by considering whether it achieved its purpose. They reflect on how the techniques they applied contributed to the meaning, taking into account constraints such as availability of time, how they planned the process and the way they used manual and digital tools and equipment such as drawing tools and graphic organisers safely to create text, sketches and images for a particular purpose.

4

The student considers the needs of a particular audience when selecting and using appropriate techniques, resources and equipment to create information products using, for example, sound, images and text.

At this level

Students understand that information is designed and produced for particular audiences. They explain the procedures for the development of an information solution aimed at a target audience. They select and use techniques to access, record, use and manage information when creating and producing particular information solutions.

The nature of information

Students understand that different forms, styles and presentations of information can be used to create different effects and meanings. They are increasingly aware of quality and the purpose of the images and messages in information. They discriminate between the various forms used for presenting information to suit a particular audience. They identify and discuss ways information can be presented and interpreted, noting bias, selection and emphasis in printed and non-printed texts. They understand and can identify examples of special effects, such as the use of sound and light, that can enhance or modify the presentation and interpretation of information.

The creation of information

Students combine a range of forms, including images, sound and text, to create information solutions that reflect a consideration of the needs of the target audience in terms of functional and, where applicable, aesthetic criteria. They consider the social impacts of their solution, assessing the suitability of the information for the particular audience and whether the presentation is appropriate.

Students use a variety of sources to obtain information and, depending on the need, gather appropriate information that may include surveys, statistics, experimental results and interviews. They record, sort, interpret, transfer and transform information, using various means such as graphics, tables, drawings, images and files. When creating information solutions, students use different forms, styles and presentations, adjusting techniques where necessary to create different effects for particular audiences. They are able to alter the form of a piece of information to suit their purpose. To achieve their purpose, they select and operate appropriate information equipment safely and efficiently, using correct techniques.

When evaluating performance, students assess how well their design ideas, production processes and information solutions meet the needs of the particular audience. They apply specific criteria, developed from the design specifications, to judge performance.

5

The student understands that the meaning audiences make of information is influenced by its form, structure, style and presentation. The student applies this understanding to the creation of information products and processes, using recognised methods, rules and languages.

At this level

Students develop an understanding of how variations in form, structure, style and presentation of information may be used to better meet the needs of particular audiences. They consider how sets of recognised methods and rules have been developed to assist in meeting the needs of audiences for information solutions. They begin to apply these methods and rules thoughtfully to various forms of information solutions to adjust the structure, style and presentation to better meet the needs of particular audiences.

The nature of information

Students understand that there are specific forms, structures, styles and presentations used in particular information solutions. They examine a variety of information solutions and identify significant features of particular solutions. They develop an understanding that the meaning conveyed by information is influenced by its form, structure, style and presentation. They investigate how the form influences the structure, style and presentation of the information, and how it has been modified for the audience. They investigate and discuss the role and impact of information technologies on society. They begin to examine some ethical considerations about information, such as authenticity, access to data banks, copyright, plagiarism and credit card use.

Students classify particular forms of information solutions, such as advertisements, informational text, descriptive prose and formal correspondence, and determine the styles used in creating them. They describe how the processing and transmitting of information has evolved, and continues to do so. They explore how these technologies affect communities and environments, make judgements about their appropriateness using them as a basis for predicting future developments.

The creation of information

Students create information solutions using recognised methods, rules and languages. Through their understanding of the needs of their audience and the purpose for developing the information solution, they select the most appropriate form, structure, style and presentation.

Depending on their area of interest, students use different information sources to support their work. They analyse the needs of the intended market, using research techniques, such as surveys and questionnaires, and think critically when making choices based on an analysis of their research.

Students apply their understanding of, and skills in using, recognised procedures, commonly-understood rules and accepted practices to the processing of information and the creation of information solutions. They record, sort, interpret and transfer information by a variety of means, including files, spreadsheets, graphics, drawings, tables and reports. They transform or manipulate information to suit given purposes. They monitor and maintain the information equipment they use.

Students are critical of the information solutions they develop and assess their effectiveness in relation to design requirements and social and environmental criteria.

6

The student understands that the form, transmission and controls applied affect the use of information and that accuracy, privacy, global access and distribution are issues to be considered. The student applies this understanding to the use and creation of information to achieve particular effects.

At this level

Students add to their understanding of the factors that influence the impact of various forms of information solutions on particular audiences by considering the influence of methods of transmission, standards and conventions. They discuss the important issues of accuracy, privacy, global access and the distribution of information in terms of their effect on individuals and communities.

The nature of information

Students understand the interrelationships among the variables relating to form, methods of transmission, standards and conventions and how these affect the use and impact of information. They investigate the ethical, social and economic issues involved in developing and applying information technology, relating these issues to everyday needs. They explore information solutions used in a range of contexts, such as commerce, leisure, sport, agriculture, manufacturing and the service industries. They consider the accuracy of information and the particular purpose it has been designed to achieve, determining, for example, whether it is current, from a reliable source, subject to bias, affected by translation or influenced by cultural factors. They consider the consequences of using inaccurate and outdated information.

Students understand the implications of new methods for managing information and compare them with processes used in the past. They evaluate the efficiency of transmitting, receiving, storing and manipulating processes, and explain how the use of recognised conventions can enhance efficiency. They explain how the storage of digital information can affect the privacy of individuals, families, communities or organisations. They describe how the power of computers to search and retrieve at high speed facilitates the collation of small pieces of information about an individual or commercial enterprise. They reflect on the security issues relating to the control and use of information in a variety of private, business or industrial situations. They are aware of freedom of information legislation, and describe why it was developed, how it is managed and individuals' rights of access. Importantly, students address issues related to both the present and future management of information networks and systems, considering the appropriate form, transmission and controls for quality personal, business and global transactions.

The creation of information

Students adjust the form, structure and style of their information solutions to meet the needs of different audiences and tasks, using traditional and electronic means. This requires them to interpret and make judgements regarding ease of access, clarity, reliability and quality, and to understand the advantages of knowing the conventions for accessing and presenting information. They evaluate the economic and social benefits, costs and impacts for individuals, small business, corporations and government associated with the use of one form of information over another, justifying the methods they would select.

When planning and developing information solutions, students manipulate, transfer and create information, using a wide range of information equipment. They are innovative and creative, demonstrating initiative, flexibility, persistence and problem-solving skills in applying their understandings. They generate 2D and 3D images. They devise or use specialised ways of managing and handling information, and transfer information using electronic systems.

Students compare their solutions with others from similar technologies, and apply ethical criteria when assessing effectiveness from a personal, local and global perspective.

7

The student understands that the values, attitudes and experiences of individuals, communities and societies influence the nature and development of information products and processes. The student applies this understanding and uses recognised procedures associated with appropriate information technologies when developing information solutions.

At this level

Students develop an appreciation of the two-way connection between values, attitudes and experiences and the nature and development of the information solutions used by individuals, communities and societies. While they have developed understandings and skills in designing various forms of information solutions for particular audiences, this is now informed by an empathetic understanding of the values, attitudes and experiences of these people.

The nature of information

Students investigate the ethical, social and economic issues involved in developing and applying information technology to meet the needs of the audience, relating these issues to commercial enterprises, manufacturing and service industries and everyday life. They understand how people's values, attitudes and experiences influence and help create information solutions. They also understand the positive and negative impacts of this information on society and the environment.

Students examine the influence of popular culture and personal experiences on society, making comparisons with the capacity of past information solutions to shape societal attitudes and values. They analyse different ways of presenting the same information and assess the effectiveness of a particular method, noting its advantages and disadvantages. They relate the impact of digital forms of information on the popularity and growth of particular segments of the information market to the cultural values and experiences of consumers. They question the authenticity and validity of information and identify cultural values evident in particular information products.

Students investigate how the technical capabilities of equipment, including software and hardware, influence the techniques used and the conventions applied to structure products and processes. They recognise constraints and understand how constraints may determine the way information is presented.

The creation of information

Students plan and create information solutions by selecting information technologies and techniques appropriate to the needs of the target audience and the availability of resources. They justify their choices for different communities and environments by considering criteria related to access, compatibility, user capabilities and social effects. They relate their judgements to the present and future management of information systems.

Students collect and analyse data, looking at patterns, trends, reliability, authenticity, sample size and points of view when making decisions regarding the development of information solutions to meet identified needs. When handling information, they use a wide range of procedures. They use terms and language associated with particular information technologies accurately. When developing information and information products, they routinely manipulate, sort, search, spell check, add or modify computer graphics, animations, digital photos, scanned images or video clips. They apply their understanding of how the structure of a particular form can be developed through the use of methods such as storyboard or non-linear hyperlink.

Students examine the positive and negative consequences of the development and application of information solutions, comparing their work objectively and subjectively to similar work done by others.

8

The student understands how external, local, national and global controls and recognised practices influence the development of information and the impact it has on societies and environments. The student applies these understandings to the selection and use of specialised techniques to develop information products, processes and systems that meet detailed specifications.

At this level

Students understand increasingly how regulations, statutory controls, conventions and available information infrastructure affect the form and structure of information in different communities and environments. They apply this understanding to the production of information solutions to detailed specified standards. From an informed perspective, they evaluate how external local, national and global controls and recognised practices influence the development and use of information, as well as the impact this has on societies and environments. In this way, they develop an understanding of the impact of regulations and controls on the access of individuals and communities to quality information.

The nature of information

Students understand how regulations, statutory controls, conventions and available information infrastructure affect the form and structure of information in different communities and environments. They evaluate the critical role that information infrastructure plays in the lives of individuals, families and communities. They examine the economic, environmental and cultural appropriateness of a range of information technologies, and assess how people's needs, values and expectations influence the services provided. By investigating topical issues, students examine reasons for inequities of access. They also consider the impact on people's lives and the ethical implications of decisions. They examine the rapid growth of the Internet and how its global nature affects local regulations, conventions and information networks, and evaluate its effectiveness as a source and means of sharing quality information.

Students investigate the conceptual and technical principles that underpin information processes and systems. They assess critically ethical issues and dilemmas concerning the application of present and emerging technologies. They explore the issues associated with the need to develop systems that protect the rights of individuals and maintain the integrity of complex information systems. Aware of the availability of increasingly sophisticated computer software, they examine the effectiveness of security methods such as passwords, bar codes and encryption. They then apply their understanding of the management of information to investigating the impact of varying levels of access to information and information infrastructure, and to developing security procedures.

The creation of information

Students create and manipulate information to meet standards comparable with those in their community. They apply their understanding of the form, structure, organisation and management of information to the completion of complex tasks. They devise alternative ways of using information technologies for particular purposes. They use a wide range of equipment and specialised techniques associated with particular information technologies to efficiently transform, process and create valid, accurate and authentic information. They apply appropriate occupational health and safety standards, making optimum use of time, facilities and resources.

Students use qualitative and quantitative methods to assess their information solutions, and develop ways of modifying or improving the results. They analyse the impact of their solutions on clients, communities and society in terms of technical, social, economic, environmental and aesthetic considerations.

Technology and Enterprise > Systems



| Systems | | FOUNDATION | LEVEL 1 | LEVEL 2 | LEVEL 3 |
|--|---|---|--|---|--|
| Students design, adapt and use systems that are appropriate to achieving solutions to technology challenges. | | S F The student: Uses the cause and effect relationship when they operate a system using simple techniques. | S 1 The student: Identifies some systems in the immediate environment and the role they play. The student fits together the parts of a simple system and carries out a short sequence of steps to operate a system safely. | S 2 The student: Understands systems are used for specific purposes and can describe their component parts, the relationships between them and how people make a system work. The student relates this understanding to assembling, controlling, trialling and evaluating simple systems. | S 3 The student: Understands simple cause and effect relationships in systems and explores how human and physical systems affect people and the environment. The student uses this understanding to modify and test systems. |
| The nature of systems | Students understand that systems have elements and processes. | S F.1 Uses the cause and effect relationship when they operate a system. | S 1.1 Identifies systems in immediate environments, their role and importance in everyday life. | S 2.1 Understands that systems are designed for specific purposes, and are comprised of elements (people and parts) that have functions and work together. | S 3.1 Understands that cause and effect relationships occur within systems that are used to fulfil particular purposes but that these can affect people and the environment in different ways. |
| | | S F.2 Operates a system using simple techniques. | S 1.2 Selects and safely operates simple systems that involve a short sequence of steps. | S 2.2 Selects and safely controls a simple system. | S 3.2 Selects and devises ways of safely monitoring and testing the performance of simple systems. |
| | | S F.3 Is working toward achieving Level 1. | S 1.3 Assembles simple systems following instructions using components provided. | S 2.3 Assembles and trials simple systems using everyday components in which the elements are connected in a single sequence. | S 3.3 Constructs simple systems for specific purposes, taking into consideration the effect on people and the environment. |
| The use of systems | | Students appropriately select and safely use systems. | | | |
| The development of systems | | Students develop or adapt appropriate technology systems. | | | |

| LEVEL 4 | LEVEL 5 | LEVEL 6 | LEVEL 7 | LEVEL 8 |
|---|--|--|--|--|
| <p>S 4 The student: Understands how the elements of a system interact and uses this information to control and adapt existing systems, and design and create solutions to technology challenges.</p> | <p>S 5 The student: Understands that the elements of a system, including people and components, are related and can work in a variety of sequences. The student relates this understanding to their design and creation of systems and associated sub-systems and measures performance using chosen methods.</p> | <p>S 6 The student: Understands how particular systems and their sub-systems work, and their influence on communities and the environment. The student applies this understanding when using and adapting existing systems and developing systems that perform specific functions.</p> | <p>S 7 The student: Understands how the nature of complex human and physical systems influences their organisation, control and impact. The student applies this understanding to the design, construction and operation of such systems to optimise output.</p> | <p>S 8 The student: Understands how the design, operation and management of complex systems influences their impact on communities and environments, and applies this understanding to the design, construction, operation, maintenance, management and evaluation of complex systems.</p> |
| <p>S 4.1 Understands that the elements in systems interact in a sequence to meet different technology needs.</p> | <p>S 5.1 Understands that the elements in systems work together through a variety of sequences to use inputs and feedback to provide optimum outputs.</p> | <p>S 6.1 Understands that the elements, structure, sequences, operation and control of systems and their sub-systems influence the ways they interact with people and the environment.</p> | <p>S 7.1 Understands that the principles, structures, logic, organisation and control of complex systems influence the impact of systems on people, communities and the environment.</p> | <p>S 8.1 Understands that the operation, management and structure of complex systems, described through their logic, sequences and controls and using mathematical, scientific and/or organisational principles, influence the nature of their use and impact on communities and environments.</p> |
| <p>S 4.2 Selects and safely maintains and controls systems through a variety of means using supplied techniques, and applies knowledge of the elements of these systems to the selection, control and testing of them.</p> | <p>S 5.2 Selects, safely operates and controls systems and their sub-systems.</p> | <p>S 6.2 Selects, safely manages and controls systems and their sub-systems.</p> | <p>S 7.2 Selects and safely uses specialised procedures and techniques to operate, manage and control a range of complex systems.</p> | <p>S 8.2 Selects, and safely operates, manages and controls complex systems optimising their performance.</p> |
| <p>S 4.3 Designs and constructs systems, choosing resources appropriate for the purpose.</p> | <p>S 5.3 Designs, modifies and constructs systems and their sub-systems for specific purposes, controlling them through a variety of means, and measures performance using chosen methods.</p> | <p>S 6.3 Selects and uses a range of techniques to organise, construct, manage and evaluate systems and their sub-systems and considers the impact on people and the environment.</p> | <p>S 7.3 Uses specialised procedures and techniques to construct and test complex systems and organises and adjusts sub-systems to optimise their outputs while minimising undesirable impacts.</p> | <p>S 8.3 Devises, justifies, constructs, and tests complex systems effectively and efficiently, considering the needs of clients and users and their technical performance and human, environmental, social and economic short- and long-term consequences, using qualitative and quantitative methods.</p> |

F

The student uses the cause and effect relationship when they operate a system using simple techniques.

The nature of systems

Students use the cause and effect relationship when they operate a system: for example, they press a switch to activate a toy, turn and pull a knob to start a washing machine. They respond in an expected manner when a particular stimulus occurs: for example, they go to class when the siren sounds, stand up and leave the bus when it stops at their house or bus stop. They recognise through repetitive trial-and-error experiences that they are able to trigger a result to occur through their own actions: for example, in a computer activity, they can access a piece of music and graphics they like by pressing a certain button as programmed, receive a piece of food by using the appropriate request from their augmentative communication device. They may respond to achieving the desired outcome in a variety of ways, such as smiling when the anticipated response occurs or being frustrated when the expected outcome does not happen. Students may over-generalise the cause and effect relationship: for example, crossing the road when they see the green man symbol at all traffic lights or hitting every red switch they see.

The use of systems

Students operate a system using simple techniques in a safe way: for example, they press the power button on the computer, wait and then press a pre-programmed button to activate a desired activity; they place food in a microwave, close the door, and then press the start button to heat their food; they turn on the television, open the DVD player, insert a DVD and then press 'play'. They also become a part of systems, achieving success by following a learned routine, such as planting seedlings in the garden. They use learnt skills to operate relevant equipment: for example, they operate a CD player, use the telephone, turn a door handle to open a door. They may seek assistance when the system fails to operate in the expected manner: for example, they hold out the CD to the teacher when it fails to play. In organisational systems, they join in class activities, eat lunch in the classroom on a wet day or appropriately queue for lunch at a food outlet. They use construction systems such as Lego® to build towers, joining the blocks in a sequence that maintains balance. When they have run out of blocks or are satisfied with their construction, they may knock it over, reinforcing their understanding of the cause and effect relationship of construction and destruction of a system and their part in it. It is through this process of testing the system to evaluate its limits that students develop an understanding of cause and effect. When using a system for personal hygiene, they apply routine procedures for each stage of the process. They may use a transport system, such as the school bus, taxi or public bus.

The development of systems

Students are working toward achieving Level 1.

1

The student identifies some systems in the immediate environment and the role they play. The student fits together the parts of a simple system and carries out a short sequence of steps to operate a system safely.

At this level

Students work with simple systems that involve short sequences of steps applying the technology process. They follow instructions and use components provided to assemble systems. They operate simple systems safely and describe their feelings about the systems they have used or assembled. They identify systems in their immediate environment and investigate the role and importance of systems in everyday life.

The nature of systems

Students identify systems in their immediate environment, such as communication, energy, mechanical, management, entertainment, advertising, transport and cooking systems. They investigate and discuss the role and importance of these systems in their everyday life.

The use of systems

Within their immediate environment, students operate safely a variety of simple systems that involve a short sequence of steps, such as computer games and simple rosters and those systems incorporating mechanical devices.

The development of systems

Students assemble simple systems following instructions and using components provided, such as when playing a board game, developing a simple roster, following a pictorially-presented procedure in a recipe or building structures using interlocking construction blocks.

2

The student understands systems are used for specific purposes and can describe their component parts, the relationships between them and how people make a system work. The student relates this understanding to assembling, controlling, trialling and evaluating simple systems.

At this level

Students continue to work with simple systems, including linear and other systems, to develop an understanding of component parts (including humans) and the relationships between them. They become aware that systems are controlled and operated by people for specific purposes and begin to devise and construct simple systems based on this understanding. They trial and evaluate such systems and note the output and how this relates to the input and operation of the components.

The nature of systems

Students investigate a system designed for a specific purpose, describing the basic parts, their function and the relationships among the components. This will include the role of the person in the system. By examining the human element of systems, they evaluate the important role of people in the operation of a system. They investigate a range of systems to understand how a system works: for example, they can find out how energy and information can be transferred.

The use of systems

Students control simple systems using techniques, such as manipulating remote controls and timing devices when operating mechanical and battery-operated toys and games. They follow graphical and written instructions when operating systems. They examine the basic relationship between the components in a system and are able to identify the reason for simple causes of system failure, such as human error, broken parts and power failure.

The development of systems

Students develop and trial simple systems in which the elements are connected in a single sequence. They compare their system with what they planned to achieve to evaluate the effectiveness of the system. They understand that everyday components are used in constructing and testing simple systems and for following procedures. They devise simple methods of using energy sources to drive such systems.

3

The student understands simple cause and effect relationships in systems and explores how human and physical systems affect people and the environment. The student uses this understanding to modify and test systems.

At this level

Students work with simple systems, including linear and other systems, to develop more sophisticated understandings of their working, purpose and impact on society and the environment. They identify cause and effect relationships to further develop their understandings of the relationships between component parts. They modify and test systems. They develop an historical perspective on the development of systems to fulfill particular purposes and devise and construct simple systems to match those purposes. Through design activities, they become increasingly aware of the functional, social and environmental implications of human and physical systems.

The nature of systems

Students investigate the origin, nature and operation of a variety of systems: for example, they investigate communication, energy, mechanical, structural, electronic, organisational and entertainment systems, and determine cause and effect relationships in them. They explore how systems have been developed and applied and how they meet human physical, intellectual, emotional and social needs. They investigate and compare past and present systems developed to meet particular purposes and their impact on people and the environment in terms of benefits and costs.

The use of systems

Students devise ways of monitoring and testing the performance of systems, using tests that involve factors such as speed, time, movement, stability, flexibility, durability, reliability and energy inputs and outputs. They evaluate subjectively how a system affects people. They use a range of energy sources safely to make systems work.

The development of systems

When devising systems, students consider the reasons for using particular systems in certain situations and the effect on people and the environment. They safely construct systems for specific purposes, such as measuring, signalling, communicating, storing, cataloguing, managing, preserving and locking, as well as for motion and propulsion.

4

The student understands how the elements of a system interact and uses this information to control and adapt existing systems, and design and create solutions to new technology challenges.

At this level

Students work with simple systems, including linear and other systems, to develop an understanding of how the elements interact with each other and the external environment. They use this information to control the systems to use the inputs to provide appropriate outputs to meet technology challenges through a variety of means, including simple instructions, switches, levers, gears and sequences. They assess the performance and impact of the outputs of such a system and relate them to the values that underpin it. They apply this information and these understandings to the design and construction of systems as well as adaptations of existing systems.

The nature of systems

Students investigate the elements in simple systems and how the elements interact in a sequence to meet different technology needs. Through research, they are able to explain how the elements work together in a sequence to create a desired effect. They discuss how a system has developed, the values that underpin it and the changes that have occurred over time.

When exploring simple systems and the interaction of elements (people and components) students explain the principles related to the structure, organisation, control and assessment of these systems. They establish the boundary of the system and determine the inputs needed to obtain the required outputs. They observe, dismantle, construct, modify, operate and control a range of systems, to understand the principles that apply in their operation.

The use of systems

Students control simple systems through a variety of means including simple instructions, switches, levers, gears and sequences. They apply their knowledge of the elements of simple systems to the selection, control and testing of the systems to meet technology needs. They apply supplied techniques to the operation and maintenance of such systems.

The development of systems

Students apply their understandings of simple systems to the design and construction of new systems. When creating and preparing design proposals, students illustrate the components of their systems, such as sensors, levers, circuits or the pathway to be followed. They develop production processes and schedules to their own specifications. They choose resources to make systems, appropriate to their environments. To measure the performance of their system, they use design criteria they have developed based on requirements such as speed, strength, consistency, energy inputs and outputs, efficiency, conductivity and reliability.

5

The student understands that the elements of a system, including people and components, are related and can work in a variety of sequences. The student relates this understanding to their design and creation of systems and associated sub-systems and measures performance using chosen methods.

At this level

Students begin to work with systems that include their associated sub-systems. They build on their understandings of linear systems to consider the elements of non-linear systems and their relationships. In particular, they understand that the control and operation of such systems may involve a variety of sequences to providing different results. When studying and working with systems, they develop a 'system way of thinking', in that they understand the principles related to the structure, organisation, management, control and assessment of their systems. They apply these understandings to the construction, management and control of systems and associated sub-systems.

The nature of systems

Students investigate the elements of systems and their associated sub-systems, their relationship with one another and how they work together through a variety of sequences. They establish the boundary of a system and determine the inputs needed to obtain the required outputs. To do this, they understand that, by breaking the system up into sub-systems, they will see how the inputs and outputs of the system need to be arranged. They also understand that there needs to be feedback from one part of the system to another to make the system work and to optimise performance of the system through continuous analysis of its efficiency and effectiveness. They are becoming increasingly aware of the historical gender links to particular systems. They understand how a system developed, the values that underpin it, and the changes that have occurred over time. They examine how communities value particular systems, and how this influences individuals to use a diversity of systems and to create technologies in the home and workplace or for recreation.

The use of systems

Students manage and control systems and their sub-systems. They observe, dismantle, operate and control a range of such systems to develop an understanding of the principles that apply in their operation. They debate the complexities of the design and operation of such systems.

The development of systems

Students design, modify and construct systems and their sub-systems for specific purposes, controlling them through a variety of means, including simple instructions, switches, levers, gears and sequences. When creating and preparing design proposals, students illustrate the components of their systems. They develop production processes to their own specifications, developing production schedules with the assistance of charts, such as flow charts or Gantt charts. They choose resources to make systems, considering the environment of each system. They select appropriate techniques using a range of manipulative, operational and organisational skills. To measure the performance of their system, they use design criteria they have developed based on considerations such as speed, strength, consistency, energy inputs and outputs, efficiency, conductivity and reliability.

6

The student understands how particular systems and their sub-systems work, and their influence on communities and the environment. The student applies this understanding when using and adapting existing systems and developing systems that perform specific functions.

At this level

Students continue to work with systems and their sub-systems and use their understanding of such systems to investigate their relationships with individuals, communities and the environment. They consider the impact, particularly in terms of the use of energy, when they use, manage and operate such systems. They apply this knowledge within the technology process to begin to design and construct such systems.

The nature of systems

Students investigate the elements, structures, sequences, operation and control of systems, and determine how each influences the way in which a system interacts with people and the environment. When considering the operation and maintenance of systems, they investigate the use of different energy sources and their potential impact on the environment. In relation to the purposes of systems, they identify the complex and often-conflicting aspects of each system's interaction with people and the environment. In a similar way, students identify relevant implications when they consider systems: for example, structural, mechanical, electrical/electronic and biotechnological systems.

The use of systems

Students manage and control systems and their sub-systems, taking into consideration ethical criteria and the social and environmental impacts of their decisions in meeting short- and longer-term needs of individuals and the wider community. They ascertain what expertise is needed and available to plan, install, operate and maintain such systems.

The development of systems

Students select and use a range of techniques to organise, construct, manage, maintain and evaluate new systems and their associated sub-systems in order to reduce their impact on people and the environment. They consider the types and quantities of materials, expertise and equipment needed to design and construct each element of each sub-system. They manage the integration of the sub-systems to achieve a balance among stability, ease of entry and exit, operation, safety, comfort, efficiency of energy use, quality of finish, reliability and ease of maintenance and repair. They also ensure the process is time and resource efficient.

When designing, modifying and adapting systems to meet specific requirements in diverse ways, students select the appropriate elements, structures and sequences and the processes of operation and control. In order to determine the various elements of systems needed to meet particular requirements, they also assess the source and cost of resources and the characteristics of the technology challenge. They determine which particular control mechanism is most appropriate for managing the sequence of operation of the sub-systems for particular purposes.

Students begin to take into account risk management factors when they generate ideas for system design, adaptation and management. They use these criteria to evaluate the effectiveness of their construction or adaptation in meeting specified requirements and environmental standards.

7

The student understands how the nature of human and physical systems influences their organisation, control and impact. The student applies this understanding to the design, construction and operation of complex systems.

At this level

Students develop a thorough understanding of the nature of complex systems through the organisation, control, design and construction of such systems. They investigate the nature of such systems and the influences on their organisation and control. They consider the purposes of such systems, why they were developed and the way in which they are used by individuals and communities. They begin to evaluate the impacts of such systems on communities and the environment.

The nature of systems

Students investigate how the principles, structure, logic, organisation and control of systems affect their impact on people, communities and the environment by considering how and why different technologies have been developed. They examine how the components of systems have been developed in an attempt to make life easier by being more economical, avoiding complex procedures or saving time and resources. They evaluate the positive impact of systems on individuals, communities and environments and identify and evaluate less-desirable impacts, including the cost to society and the environment of the disposal of by-products, components and whole systems resulting from the large-scale uptake, use, obsolescence or misuse of innovations.

Students investigate the complex issues arising from changes to a system and how they affect people, communities and environments. They debate the cultural implications for individuals and communities. They explore systems designed to extend equity of access to services. They investigate and evaluate the educational, social, economic and environmental impacts (costs and benefits) to customers. This enables them to determine the complex, interdependent nature and effectiveness of the system's elements and sub-systems.

The use of systems

Students organise and control complex systems. They observe and dismantle systems and use specialised techniques to operate and control a range of such systems to develop an understanding of the principles that are applied in their operation. They debate the complexities of the design and operation of such systems.

The development of systems

Students generate ideas, designs and plans, and select appropriate resources, tools and techniques to optimise the outputs of complex systems. In addition to planning physical methods, they define resource, operational and output standards to control their system's output. They determine the possible need to modify their system's operation, management and controls, by evaluating its effectiveness in optimising outputs and minimising undesirable impacts.

8

The student understands how the design, operation and management of complex systems influences their impact on communities and environments, and applies this understanding to the design, construction, operation, maintenance and management of complex systems.

At this level

Students understand how the design, operation and management of complex systems influence the impact of the systems on communities and environments. Their in-depth exploration of the form, structure, organisation, operation and management can be applied to complex tasks related to the construction and operation of systems. Through study of the historical development of systems (such as mechanical, electronic, computing, organisational, management, business, production, transport or energy) in different cultures and environments, they increase their understanding of the benefits and costs of particular systems and the way they contribute to the development of societies. This understanding enables them to make decisions regarding the design, operation and management of systems in a range of cultural and environmental circumstances.

The nature of systems

Students investigate the development and application of new and emerging systems. They research the application of systems to achieve social goals and analyse the human, environmental, social and economic consequences of particular systems. They explore the way in which systems such as computers have transformed society. They understand that global economic growth depends on energy use and determine the benefits and costs of energy sources such as fossil fuels, and renewable and human energy sources. They apply these understandings to a range of technology challenges. They understand the complex issues associated with individuals and communities adopting innovations that reduce the impact systems have on the environment.

The use of systems

Students operate and manage complex systems to understand the structure of such systems and their logic, sequences and control, and their relationships to the impact on communities and environments. They can describe these aspects using mathematical, scientific and organisational principles. They apply understandings in managing the system, optimising its performance and controlling its impact on communities and the environment.

The development of systems

When devising complex systems, students consider the needs of clients and users. They use appropriate modelling techniques and systems analysis to analyse and justify the development and application of systems in terms of their technical performance and human, environmental, social and economic consequences. They develop and test their systems. Their designs and production proposals contain graphics, technical language, descriptions of the merits of alternatives and evaluations of the projected impact on communities and environments. When producing systems, students implement processes that ensure the specified standards for quality and safety are achieved, and that optimum use is made of resources such as time and equipment. They also assess the social, cultural and environmental impact, to determine short- and long-term consequences of their systems.

Technology and Enterprise > Enterprise



| Enterprise | | FOUNDATION | LEVEL 1 | LEVEL 2 | LEVEL 3 |
|--|---|---|--|---|---|
| Students pursue and realise opportunities through the development of innovative strategies designed to meet human needs. | | E F The student: Attends and responds to technology challenges. | E 1 The student: Applies a trial-and-error approach to generating ideas and developing technologies and modifies work in response to self evaluation and comments from others. | E 2 The student: Uses a purposeful approach when generating ideas, considering alternatives, sharing and communicating ideas and, within given constraints, developing solutions that meet human needs. | E 3 The student: Displays initiative and drive when generating and communicating ideas, planning and undertaking production while considering design requirements and constraints. |
| Enterprising attitudes | Students display attitudes that support the development of innovative technologies designed to meet human needs. | E F.1 Is working toward achieving Level 1. | E 1.1 Participates in planning, production and evaluation and modifies work in response to the comments from informed others. | E 2.1 Plans action, investigates, considers and compares alternatives, shares and communicates ideas, reflects on work done and responds to feedback when developing solutions. | E 3.1 Explores alternatives; provides reasons for choices made; participates in research; plans, produces and reflects on progress; comments constructively on the ideas of others; and reviews, modifies and adapts plans, techniques and processes in response to new ideas and problems encountered. |
| | | E F.2 Is working toward achieving Level 1. | E 1.2 Applies a trial-and-error approach to generating and evaluating ideas, modifying their products and methods, sharing and communicating ideas orally and through drawings. | E 2.2 Applies a purposeful approach when developing solutions; communicates ideas through writing, drawings and modelling; compares alternatives, evaluates work and makes suggestions for improvements. | E 3.2 Generates ideas, considering constraints; integrates these ideas into designs and communicates them in a variety of ways; plans and checks on progress when carrying out steps of production; considers efficient use of resources; and uses specified criteria when reflecting and evaluating. |
| Enterprising capabilities and skills | Students take initiative, generate innovative ideas and employ skills and strategies to optimise opportunities, recruit and manage resources, and communicate and work with others. | | | | |
| | | | | | |

| LEVEL 4 | LEVEL 5 | LEVEL 6 | LEVEL 7 | LEVEL 8 |
|--|--|---|--|---|
| <p>E 4 The student: Displays initiative and drive when generating and communicating ideas, considering their beliefs and values and those of others. The student identifies, assesses and manages risks, and organises, plans and carries out production steps and monitors and evaluates results.</p> | <p>E 5 The student: Identifies opportunities, considering the appropriateness of existing technologies; creates and prepares design proposals that include options considered and reasons for choices made; plans and organises production processes to own specifications; monitors and evaluates progress.</p> | <p>E 6 The student: The student understands and employs a recognised strategy to realise opportunities through creating and preparing innovative design proposals, organising, implementing and adjusting production processes creatively, and monitoring systematically and evaluating progress.</p> | <p>E 7 The student: The student understands and employs some recognised strategies to assess, select and realise opportunities through creating and preparing innovative design proposals; makes efficient use of resources when organising, implementing and adjusting production processes, monitoring effectively and evaluating progress and collaborating with others.</p> | <p>E 8 The student: The student understands and employs a range of recognised strategies to realise selected opportunities; explains the merits of different options in innovative design proposals; makes optimum use of resources when organising, implementing and adjusting production processes; monitors and evaluates progress; and negotiates with others to overcome difficulties.</p> |
| <p>E 4.1 Displays initiative and drive, manages risks, modifies processes and evaluates results. The student considers a range of factors, including beliefs and values of the developer and user; and acknowledges sources and ideas when generating innovative solutions.</p> | <p>E 5.1 Looks for opportunities; displays creativity and develops specifications for production processes; manages and evaluates courses of action; works collaboratively and independently; responds positively to evaluations; and takes into account ethical considerations.</p> | <p>E 6.1 Pursues opportunities and displays positive attitudes toward making efficient use of time, resources and facilities, monitoring, evaluating and adjusting production processes to improve results.</p> | <p>E 7.1 Displays positive attitudes toward utilising resources in strategic ways, collaborating with others on tasks, monitoring effectively and evaluating progress; and considering alternative modifications to products and processes.</p> | <p>E 8.1 Displays positive attitudes toward promoting ideas, negotiating with others to overcome difficulties and constraints, pre-empts problems and determines alternative courses of action, and takes a strategic approach to all aspects of their work.</p> |
| <p>E 4.2 Explores opportunities, generates designs and communicates ideas and alternatives that take into account the beliefs and values of the developer and user; uses procedures to identify, assess and manage risks; devises and uses strategies to organise, plan and carry out steps of production; and evaluates and modifies plans, techniques, processes and results.</p> | <p>E 5.2 Explores opportunities, presents options considered and reasons for choices made when generating designs and communicating ideas and alternatives; assesses the appropriateness and market suitability of technologies; implements plans; solves problems methodically and evaluates data collected to devise appropriate courses of action.</p> | <p>E 6.2 Uses strategies to explore options, generate ideas and communicate innovative design proposals; organises, implements and controls production processes to achieve optimum results; and makes adjustments based on systematic monitoring and evaluation.</p> | <p>E 7.2 Employs, assesses and selects opportunities; makes efficient use of resources; predicts and overcomes potential constraints; collaborates with others; and plans and carries out modifications based on evaluation when creating and managing opportunities for market potential. The student applies practices and accepted strategies as used in industry and monitors and evaluates individual and collective progress.</p> | <p>E 8.2 Employs a range of strategies to assess opportunities, manage potential constraints, problems and limitations, making optimum use of time, facilities and resources when creating opportunities for exploiting market potential. The student negotiates effectively with others to overcome difficulties and promote ideas; communicates design proposals that explore the advantages and disadvantages of different options considered, and evaluates progress continuously, devising innovative ways for improving practices.</p> |

F**The student attends and responds to technology challenges.**

Students attend and respond to technology challenges in their environment: for example, they are surprised when a model or a toy they have made keeps falling over and then respond by trying to hold it upright; they express frustration when a door will not open and then respond with repeated attempts to open it. To arrive at an acceptable solution they become involved in generating solutions through interaction with and support from their peers and teachers, who connect the current technology challenge with present and past experiences.

Students participate in a technology process to develop a solution to a technology challenge that involves investigating, devising, producing and evaluating. They are unlikely to take the initiative, but respond positively to requests to participate and contribute to finding solutions. They are supported in communicating ideas with vocalisation or gestures in one-to-one and small- and large-group situations.

1

The student applies a trial-and-error approach to generating ideas and developing technologies and modifies work in response to self-evaluation and comments from others.

At this level

Students employ a trial-and-error approach when they apply a technology process. They draw upon past experiences and ideas presented to them. They choose resources for particular purposes, such as scissors to cut cardboard to make a box, and communicate their ideas using simple strategies involving oral and drawing skills. They can modify their work in response to their own evaluation and that of others.

Enterprising attitudes

Students participate in a technology process to develop a solution to a challenge. They present their ideas readily to their peers and accept the ideas of peers. They are prepared to modify their work in response to their own evaluation or that of informed others, such as teachers and parents.

Enterprising capabilities and skills

Students employ strategies based on trial-and error-approaches to generating and evaluating their ideas when developing or modifying technologies. They use oral presentations and drawings to communicate their ideas to their peers. When producing a solution in response to a challenge that is not successful, they modify their idea or try a new idea.

2

The student uses a purposeful approach when generating ideas, considering alternatives, sharing and communicating ideas and, within given constraints, developing solutions that meet human needs.

At this level

Students apply a methodical approach when they use the technology process, understanding and employing simple but informed strategies to generate ideas and compare alternatives. They communicate their ideas with form, meaning and identity. They employ systematic strategies for producing a solution and are beginning to appreciate that resources and tools are limited and need to be shared. They reflect on their ideas and processes and make suggestions for improvements.

Enterprising attitudes

Students begin to instigate plans of action, not relying solely on being told what to do by others. They reflect on their own actions and are receptive to feedback provided by others who are involved in the processes. They display positive attitudes toward investigating alternative ideas, plans and processes that are either self-generated or generated by their peers. They are willing to share and communicate their ideas with others who may benefit from them.

Enterprising capabilities and skills

Students employ purposeful strategies and work within given constraints, making use of available resources when developing solutions. These strategies are not based solely on a trial-and-error approach: for example, they take account of alternatives, use a list of known solutions, solutions suggested by informed others or a solution selected on the basis of good use of resources. They share and communicate their ideas using strategies incorporating drawings and models, such as diagrams and model replicas. When they produce a solution in response to a challenge, they identify reasons for the success or failure of their idea, employing a structured approach to evaluating their work: for example, they undertake performance tests and consider users' questions, including the feedback of informed others, to make suggestions for improvements and to determine future directions.

3

The student displays initiative and drive when generating and communicating ideas, planning and undertaking production while considering design requirements and constraints.

At this level

Students consider opportunities and understand the need to collect, organise and analyse information about technologies to decide how particular ideas and practices may meet certain needs and how those opportunities may be realised. They display initiative and drive in working within a technology process toward realising their ideas for solutions. They employ strategies to integrate a variety of ideas into their designs, considering other influencing factors and constraints. This enables them to initiate some risk-management procedures. They begin to experiment with regard to communicating and resourcing their solutions to justify the selections they make.

Enterprising attitudes

Students display initiative and drive toward planning and carrying out steps of production and checking on progress. They treat problems as challenges and participate in research. They comment constructively on the ideas of others and are prepared to review, modify and adapt plans, techniques and processes in response to new ideas and problems encountered. They are usually self-motivated to engage in a technology process.

Enterprising capabilities and skills

Students use strategies to generate and communicate ideas in a variety of ways when proposing ideas and plans of action to meet needs and realise opportunities. They integrate ideas into their designs in appropriate ways, incorporating writing, drawings and models. They generate plans, considering and overcoming a range of constraints: for example, the availability and suitability of materials and tools; personal skills; and functional and aesthetic criteria. They use risk-management procedures and efficiently select resources that are best suited to the task: for example, they consider reducing wastage, using renewable and available materials. When generating solutions, they carry out steps of production, check on progress and use specified criteria to reflect on and evaluate products and processes.

4

The student displays initiative and drive when generating and communicating ideas, considering their beliefs and values and those of others. The student identifies, assesses and manages risks, and organises, plans and carries out production steps and monitors and evaluates results.

At this level

Students become increasingly independent and collaborative, showing initiative and drive in applying a technology process to realise opportunities using their own solutions. They generate and use creative ideas and processes as they respond to changing needs in a flexible way. As they design and implement their solutions, they employ strategies to identify, assess and manage risk associated with the implications for individuals, society and the environment.

Enterprising attitudes

Students display initiative and drive toward managing risks, modifying processes and evaluating results. They acknowledge sources of information and the ideas of others. They consider readily a broad range of factors when generating solutions: for example, availability and suitability of materials and tools; personal skills, values and beliefs of creators and users; functional and aesthetic criteria; and environmental and social effects. They work with others both collaboratively and cooperatively.

Enterprising capabilities and skills

Students apply a variety of strategies to support processes within a technology process. When exploring and optimising opportunities, they take into account the beliefs and values of the developer and user of technologies and identify, assess and manage risks associated with the implications for individuals, society and the environment. They explore ways to use resources efficiently, supporting the concept of sustainability. When developing technologies, they select and use strategies that identify, assess and manage constraints, resources and skills efficiently. When implementing steps of production, they use criteria to monitor and evaluate progress critically, modifying plans, techniques and processes.

5

The student identifies opportunities, considering the appropriateness of existing technologies; creates and prepares design proposals that include options considered and reasons for choices made; plans and organises production processes to own specifications, monitors and evaluates progress.

At this level

Students design, select and use particular technologies, taking into consideration stakeholders' beliefs and values and specified criteria. Through reflection, they consider how some technologies may be modified to make them more appropriate to different communities or in different environments. They begin to understand and consider the market suitability and opportunities of their design, which often initiates further cycles of investigation, idea generation and design implementation. They decide when to work collaboratively and independently to achieve quality solutions, identifying and managing risk in the process.

Enterprising attitudes

Students seek out opportunities actively and aim to display creativity whenever possible. They demonstrate positive attitudes toward developing specifications for production processes and managing and evaluating courses of action. They work collaboratively, cooperatively and independently. They respond positively to evaluations that take into account ethical considerations and readily modify processes to take account of the needs of others and environments.

Enterprising capabilities and skills

Students select appropriate strategies when generating and communicating ideas and alternative solutions that present options considered and reasons for choices made. Their exploration of possible markets and evaluation of the appropriateness of technologies extend beyond the application of technical and economic criteria, such as how well it works and how much it costs, and include considerations such as the impact on the environment, efficiency of energy use and cultural, ethical and gender implications. When planning and organising production processes to their own specifications they take into account concepts, implications and practicalities of copyright and patent law: for example, they acknowledge sources and ideas. When evaluating critically and modifying plans, techniques and processes, they use such methods as testing, reflection and comparison. They analyse the data collected for efficiency and effectiveness and use this to devise appropriate courses of action.

6

The student understands and employs a recognised strategy to realise opportunities through creating and preparing innovative design proposals, organising creatively, implementing and adjusting production processes, and monitoring systematically and evaluating progress.

At this level

Students understand that people's needs are met in different ways, using different technologies. This diversity enables students to identify options for quality solutions that recognise the impact of technology on a range of social, economic and environmental factors. Through continuous monitoring and evaluation, students gather specific data that enable reflection on the efficiency and effectiveness of their activities. They adjust their processes in response to this monitoring and to ethical considerations for potential marketing.

Enterprising attitudes

Students display greater persistence, flexibility and creativity within a technology process. They display positive attitudes toward adjusting production processes in the light of monitoring and evaluation. They look for creative solutions to problems associated with production processes. They respond to feedback from monitoring and evaluation processes.

Enterprising capabilities and skills

Students select strategies to create and make the most of opportunities, including those associated with market potential. They take into account the fact that technology solutions vary for individuals and communities and that people's needs can be met in different ways by different technologies. They create and prepare design proposals that demonstrate skills in effectively communicating the options considered and the reasons for choices made. When producing technology solutions, they manage effectively a range of resources. They collaborate, organise, implement and adjust production processes and implement strategies to organise and adjust these processes that are based on feedback, monitoring and evaluation.

7

The student understands and employs some recognised strategies to assess, select and realise opportunities through creating and preparing innovative design proposals; makes efficient use of resources when organising, implementing and adjusting production processes, monitoring effectively and evaluating progress, and collaborating with others.

At this level

Students understand the need to test the marketplace explicitly to inform their designs. Their focus is on achieving quality solutions for the marketplace. They develop a range of skills in working collaboratively: for example, allocating roles and responsibilities, and making conscious decisions about appropriate use of time, energy and other resources. They build readily on the success of others and learn from their mistakes by evaluating in terms of similar commercial products and processes, often negotiating a compromise with stakeholders.

Enterprising attitudes

Students display persistence, flexibility and creativity within a technology process. They have positive attitudes toward making efficient use of time and other resources. They seek to collaborate with others on tasks. They readily consider alternative modifications to products and processes based on their monitoring and evaluation.

Enterprising capabilities and skills

Students select and use strategies to create, prepare and communicate innovative design proposals, including those with market potential, that make efficient use of resources. They consider a range of variables and employ strategies similar to those used in industry for predicting and overcoming potential constraints and for creating and managing opportunities: for example, they apply formal problem-solving techniques, market research and project management principles. When developing technologies, they apply appropriate Australian intellectual property laws, such as patents, copyright and trademarks. They use effective collaborative strategies when working with others on tasks, apply accepted methods for monitoring and evaluating individual and collective progress, and plan, justify and carry out modifications based on these evaluations.

8

The student understands and employs a range of recognised strategies to realise selected opportunities; explains the merits of different options in innovative design proposals; makes optimum use of resources when organising, implementing and adjusting production processes; monitors and evaluates progress; and negotiates with others to overcome difficulties.

At this level

Students demonstrate project management principles as they identify, assess and act on opportunities. They develop concept plans designed to inform stakeholders about proposed solutions for effective decision making. They negotiate with and influence others as they market their ideas for creative solutions, drawing on their own attributes and collaborating with members of established networks.

Enterprising attitudes

Students display initiative, persistence, flexibility and creativity consistently within a technology process. They negotiate proactively with others to overcome difficulties and promote ideas. They take a strategic approach to all aspects of their work: for example, when identifying, assessing and acting on opportunities.

Enterprising capabilities and skills

Students create opportunities for market potential. They employ strategies for assessing opportunities, such as exploring methodically the advantages and disadvantages of different options, taking into account the interrelationship of functional, technical, social, political, economic, environmental and aesthetic considerations. They develop innovative design proposals and communicate them, using appropriate forms, structures, styles and presentations. They apply strategies to manage potential constraints, problems and limitations: for example, they predict, pre-empt and overcome potential constraints, problems and limitations of options considered, negotiating effectively with and influencing others to overcome difficulties and promote ideas. They apply practices used in industry, such as market research and project management principles, making optimum use of time, facilities, other resources and equipment.

Technology and Enterprise >

Technology Skills



| Technology Skills | | FOUNDATION | LEVEL 1 | LEVEL 2 | LEVEL 3 |
|--|---|--|---|---|---|
| Students apply organisational, operational and manipulative skills appropriate to using, developing and adapting technologies. | | TS F The student: Uses familiar tools and procedures safely when using technologies. | TS 1 The student: Uses familiar tools and simple procedures to operate equipment with care and safety when creating and modifying technologies. | TS 2 The student: Identifies, understands and applies the necessary skills and simple operational procedures, organises and uses the tools, equipment, materials and information needed for routine tasks with care and safety, when creating and modifying technologies. | TS 3 The student: Selects the skills and standard operational procedures and organises and uses the relevant tools and equipment efficiently and safely when creating and modifying technologies. |
| Organisational skills | Students monitor and manage capital, consumable and human resources and processes in using, developing and adapting technologies. | TS F.1 Is working toward achieving Level 1. | TS 1.1 Assembles resources when using familiar tools when creating and modifying technologies. | TS 2.1 Organises the resources required when using familiar tools and equipment for routine tasks when creating and modifying technologies. | TS 3.1 Manages resources to use relevant tools and equipment efficiently and safely when creating and modifying technologies. |
| | Students understand and safely apply operational procedures to equipment in using, developing and adapting technologies. | TS F.2 Is working toward achieving Level 1. | TS 1.2 Understands and safely applies simple operational procedures when using familiar equipment. | TS 2.2 Identifies, understands and safely applies operational procedures when using familiar equipment for routine tasks. | TS 3.2 Understands, selects and safely applies standard operational procedures to use relevant tools and equipment efficiently. |
| | Students physically manipulate tools and resources in using, developing and adapting technologies. | TS F.3 Is working toward achieving Level 1. | TS 1.3 Completes routine tasks by carefully and safely manipulating familiar tools with associated resources when creating and modifying technologies. | TS 2.3 Identifies the necessary skills and independently manipulates familiar tools with associated resources carefully and safely for routine tasks when creating and modifying technologies. | TS 3.3 Manipulates relevant tools and equipment efficiently and safely when creating and modifying technologies. |

| LEVEL 4 | LEVEL 5 | LEVEL 6 | LEVEL 7 | LEVEL 8 |
|--|---|--|---|--|
| <p>TS 4 The student: Understands and applies skills and operational procedures, organises resources and recognises hazards to use tools and equipment efficiently and safely (to the requirements of own design) when creating and modifying technologies.</p> | <p>TS 5 The student: Selects techniques, operational procedures and resources; manages the environment, organises and uses tools and equipment (considering personal limitations) when creating and modifying technologies.</p> | <p>TS 6 The student: Selects techniques, operational procedures and resources and organises and uses tools and equipment efficiently, considering the requirements of own design, and achieves defined standards of quality and safety when creating and modifying technologies.</p> | <p>TS 7 The student: Manages and organises resources, techniques and processes achieving defined industry standards of quality and safety when creating and modifying technologies.</p> | <p>TS 8 The student: Manages and organises resources and processes; understands, selects and applies industry-recognised operational procedures and manipulative techniques; and considers the specifications of intended user or client, when creating and modifying technologies.</p> |
| <p>TS 4.1 Monitors and manages resources to efficiently complete tasks associated with requirements of own design when creating and modifying technologies.</p> | <p>TS 5.1 Selects resources, manages the environment and organises tools and equipment when creating and modifying technologies.</p> | <p>TS 6.1 Selects and organises resources, considering the requirements of own design, when creating and modifying technologies.</p> | <p>TS 7.1 Manages and organises resources and processes that represent proficiency in relevant industries when creating and modifying technologies.</p> | <p>TS 8.1 Independently devises systems for the management and organisation of all necessary resources and processes to create and modify technologies that meet expectations in relevant industries.</p> |
| <p>TS 4.2 Recognises hazards, selects and safely applies efficient operational procedures to use relevant tools and equipment.</p> | <p>TS 5.2 Understands, selects, safely uses and applies operational procedures for working with appropriate equipment to achieve defined standards.</p> | <p>TS 6.2 Understands, selects and safely applies operational procedures to efficiently achieve defined standards of quality and safety when using appropriate equipment, including relevant computer hardware and software.</p> | <p>TS 7.2 Understands, selects and safely applies operational procedures when using appropriate equipment, including relevant computer hardware and software, to achieve defined industry specific standards.</p> | <p>TS 8.2 Understands, selects and safely applies industry-recognised operational procedures when using appropriate equipment, including relevant computer hardware and software that support the creation and modification of technologies that meet the expectations of intended clients in relevant industries.</p> |
| <p>TS 4.3 Recognises hazards and selects and manipulates tools appropriately to efficiently complete tasks associated with requirements of own design when creating and modifying technologies.</p> | <p>TS 5.3 Selects techniques (considering personal limitations), to effectively achieve set standards of quality, safety, accuracy and presentation when creating and modifying technologies</p> | <p>TS 6.3 Selects techniques to manipulate resources efficiently to achieve defined standards of quality and safety when creating and modifying technologies.</p> | <p>TS 7.3 Selects and applies techniques to manipulate tools and resources when creating and modifying technologies to achieve defined industry specific standards.</p> | <p>TS 8.3 Selects and applies industry-recognised techniques to manipulate tools and associated materials or information to create and modify technologies that meet the expectations of clients in relevant industries.</p> |

F

The student uses familiar tools and procedures safely when using technologies.

Students apply routine manipulative skills and operational procedures when using familiar tools (such as rulers, paint brushes, scissors or hammers), everyday materials (such as natural foods, cardboard, glue or wood) and information (such as instructions, visual cues, peer modelling or electronic data) to complete typical tasks for using technology: for example, they hold and move a brush to paint a wooden block following the visual colour cues provided.

They participate in the management and organisation of resources: for example, they put tools back where they belong according to the shape of the outline on the storage board, keep materials in their respective containers, replace cold foods in the refrigerator. They follow cues to safely apply one- or two-step operational procedures when using familiar equipment: for example, they follow pictorial and verbal prompts to access drawing software using a mouse, and then to print their finished product using the printer. They are supported in the safe use of tools and materials to complete routine tasks. They first demonstrate these skills with support and then begin to take over manipulative control of the tools as they gain confidence and competence.

1

The student uses familiar tools and simple procedures to operate equipment with care and safety when creating and modifying technologies.

At this level

Students begin to develop everyday manipulative skills and understandings of operational procedures when applying the technology process. They safely use familiar tools and equipment to complete routine tasks in developing a solution to a problem or to represent an aspect of technology. They follow instructions to apply operational procedures in the use of tools and equipment, including appropriate computer hardware and software.

Organisational skills

Students follow instructions to organise and maintain everyday resources and familiar tools to complete routine tasks. They use guided visual or oral cues to organise simple, sequenced production processes and to review their work and make modifications. They maintain the manner in which resources are organised: for example, they can put tools back and keep materials in containers. They begin to organise some of their own resources, such as their bag or desk.

Operational skills

When working with everyday materials and information, students follow visual or oral instructions. They apply simple sequential operational procedures to use familiar equipment, including photocopier, printer and food mixer, and tools such as rulers, scissors and hammers. They follow visual or oral cues to ensure safety and may experiment to some degree. They also follow simple procedures to operate familiar equipment, such as CD players, video recorders, telephones, photocopiers and cameras to create, store, use, retrieve and transmit information. This may include some use of familiar and appropriate computer hardware and software for the creation of text, graphics and audiovisual information such as sounds and voice recording. They can also follow visual or oral instructions for using simple systems such as a linear production sequence and, under direct supervision, perform simple maintenance on equipment: for example, they clean, refill and oil equipment.

Manipulative skills

Students follow plans and designs to make simple products by physically manipulating familiar tools such as scissors, adhesive applicators, whisks and hammers and everyday materials such as card, wood and natural foodstuffs. They can follow visual or oral directions to ensure they use the tools safely and they may experiment to some degree with techniques. They follow visual or oral instructions to ensure that tools are cared for appropriately, such as returning and cleaning tools when working, and process common materials to create or modify technologies.

2

The student identifies, understands and applies the necessary skills and simple operational procedures, organises and uses the tools, equipment, materials and information needed for routine tasks with care and safety, when creating and modifying technologies.

At this level

Students decide on the skills they need, and then with assistance they organise the tools and equipment necessary to enable them to represent their ideas effectively when applying the technology process. They develop independence, competence and confidence in their safe use of familiar tools and equipment to complete routine tasks. They begin to manipulate and operate allocated tools and equipment independently in a safely-supervised environment, applying practised common techniques. They apply multiple-step operational procedures in the use of everyday equipment, hardware and software.

Organisational skills

Students are more independent in managing and organising resources and processes when using familiar tools, equipment, materials and information for routine tasks. They incorporate more of their own ideas and consider those of others. They generate and follow plans. They organise to share resources and equipment and implement routine methods for maintaining resources, equipment and tools. Their organisation of processes includes references to safety and the management of some risk and methods of reviewing, modifying and adapting work. They manage simple systems successfully, including employing strategies to identify failures.

Operational skills

Students understand and apply multiple operational procedures to use familiar equipment with everyday materials or information and operate simple systems. They begin to identify and select sequences of procedures from familiar sets to be appropriate for the required task. They are increasingly independent in their operation of the equipment within supervised work areas and follow safety guidelines. They follow simple procedures independently to operate familiar information technology equipment such as personal computers, CD players, video recorders, telephones, photocopiers and cameras and use software such as text, graphics and audio graphic editors to create, store, use, retrieve and transmit information. They publish information in text and images, slide shows, print, simple graphics, maps and photographs.

Manipulative skills

Students become increasingly independent as they physically manipulate familiar tools and components of simple systems with everyday resources on routine tasks. They are also increasingly independent in using recognised techniques to ensure safety and care for the tools and systems. They begin to select the manipulative techniques that are most appropriate for the task from a range of familiar techniques.

3

The student selects the skills and standard operational procedures and organises and uses the relevant tools and equipment efficiently and safely when creating and modifying technologies.

At this level

Students begin to independently develop the skills they need to carry out specific tasks and processes when applying the technology process. They begin using computer-based technology to enhance their organisational skills by organising resources and are more autonomous in working safely. They begin to use tools and equipment independently in a safely-supervised environment to complete simple routine tasks. They select and efficiently use computer hardware and software and equipment requiring moderate operational control.

Organisational skills

Students independently monitor and manage resources and processes using familiar methods that they have organised to use relevant tools and equipment efficiently and safely. They create and follow plans that incorporate the efficient selection and use of resources, the identification and management of risks and hazards, and strategies to manage the review and modification of plans, techniques and processes. They organise to work with others and work within practical constraints, such as time and resources, using recognised strategies. They determine the resources, techniques and procedures needed and incorporate strategies to access them in their plans.

Operational skills

Students understand, select and apply standard operational procedures. They control simple systems through a variety of means: for example, switches, lever, gears and sequences including programming simple devices to perform required functions. They operate information equipment such as computers, DVD players, amplifiers and programs with relevant software to present information in a variety of forms. They operate equipment properly and safely: for example, saws, cameras, scissors, sewing machines, punches, recorders, sanders, staplers, tape measures and computers.

Manipulative skills

Students independently manipulate familiar tools with everyday materials in a supervised work environment. They routinely employ efficient and safe manipulative techniques in which they have been instructed and select the appropriate available tool for the task, such as pliers instead of a spanner. They create products that meet particular functional and aesthetic requirements: for example, adequate joining, connecting and finishing of materials. They use techniques that ensure safety and care for the tools and materials.

4

The student understands and applies skills and operational procedures, organises resources and recognises hazards to use tools and equipment efficiently and safely to the requirements of own design, when creating and modifying technologies.

At this level

Students are more conscious of safety issues and can anticipate hazards and take appropriate preventive measures when applying the technology process. They choose appropriate available resources for tasks. They continue to use computer-based technology to enable them to organise their tasks in a more holistic manner and to computer-control some manual operations. They manage their own work areas. When students develop and modify designs in response to their own identification of problems, their knowledge of the skills required to carry out particular tasks becomes one of the parameters of the management and organisation. They organise and use tools and equipment independently and with regard for the safety of themselves and others. They use appropriate computer hardware and software requiring operational control.

Organisational skills

Students begin to develop their own plans to monitor and manage resources and processes efficiently. They incorporate strategies in which they have been instructed but will also include their own ideas and research. Their plans include strategies to effectively maintain the various resources that they use and exercise control of the selection and use of resources, within the requirements of their own design. They also employ strategies that allow them to work cooperatively and independently. They manage and maintain linear and other systems.

Operational skills

Students understand and independently apply efficient sequences of operational procedures that may include some branching sequences. They operate and control a range of systems and their sub-systems (such as electronic, human and hydraulic) to perform specific functions such as irrigation or crowd control. They recognise hazards and use fault-finding procedures effectively to monitor equipment and systems. They select, devise and apply efficient recognised operational procedures with relevant computer software such as LOGO to manage data and control systems and use a wide range of information hardware: for example, they may use cameras, printers, plotters, mixers or editors. They begin to develop skills in the use of specialised computer software: for example, simulation packages, desktop publishing, computer-assisted design and drawing, and authoring.

Manipulative skills

Students combine physical manipulative skills with the appropriate tools and materials to develop products that meet detailed specifications and standards. They routinely adopt recognised safe work practices and recognise hazards in unfamiliar situations. They apply skills in the construction and assembly of linear and other systems.

5

The student selects techniques, operational procedures and resources; manages the environment, organises and uses tools and equipment (considering personal limitations) when creating and modifying technologies.

At this level

Students increasingly manage the integration of all the skills required in a project, including the planning and evaluation of those skills when applying the technology process. They internalise safe practices and are efficient in a variety of skills. They begin to transfer skills independently from one context to another, and their awareness of their own personal skill limitations is reflected in their design planning. They select, organise and use tools and equipment independently with regard both to the requirements of their design and to the safety of themselves and others. They select, organise and use efficiently appropriate computer software and hardware requiring complex operational control.

Organisational skills

Students monitor and manage resources, processes and the work environment efficiently and effectively by organising themselves and other resources to meet the demands of their own designs and plans. They record, assess and reflect on their own effectiveness and that of the processes and systems they use. They efficiently manage the inputs for systems and their sub-systems and organise the effective use of outputs. They routinely incorporate strategies to maintain the variety of tools, equipment, materials and information required.

Operational skills

Students select and apply skills required to overcome potential problems and to operate equipment such as sewing machines, mixers, lathes, drills, sprays, hoes, editing suites and modems. They operate complex systems and tools and equipment safely, including relevant computer software and hardware using, for example, simple branching sequences of procedures with some potential for feedback loops.

Manipulative skills

Students physically manipulate tools with a range of materials to achieve set standards of quality, accuracy and presentation. They apply a variety of methods for manipulating materials: for example, mixing, welding, fabricating, stitching, moulding, spraying, shaping, gluing, casting and fastening. They adapt techniques to consider their personal limitations and to ensure tools and equipment are used safely and carefully.

6

The student selects techniques, operational procedures and resources and organises and uses tools and equipment efficiently, considering the requirements of own design, and achieves defined standards of quality and safety when creating and modifying technologies.

At this level

Students are responsible for efficient resource management. They are proactive rather than reactive in their skill organisation and application when applying the technology process. They are autonomous in applying a range of skills and operational procedures to ensure a healthy and safe environment. Where appropriate, they select relevant computer applications to facilitate the tasks that they have chosen in their design development. They select, organise and efficiently use tools and equipment (including those which are computer based). These tools require independent complex operational control with regard both to the requirements of their design and defined standards of quality and safety.

Organisational skills

Students independently organise all the resources needed, considering the requirements of their own design, when creating and modifying technologies. They work efficiently, collaboratively and independently. They organise their own time using effective and recognised strategies, and proactively manage and organise resources to ensure they meet production plans and deadlines.

Operational skills

Students understand, select and apply operational procedures to efficiently achieve defined standards of quality and safety when using equipment, including relevant computer software and hardware. They apply complex operational controls, such as branching and iterative procedures. They apply sets of procedures to control complex systems with materials: for example, computer-controlled mill or sewing machine and information such as relational databases. They apply appropriate operational procedures to meet the requirements of their designs and defined standards of quality and safety.

Manipulative skills

Students apply techniques to efficiently manipulate tools with various materials to achieve defined standards of quality and safety when creating and modifying technologies. They apply appropriate advanced skills to achieve accepted commercial standards of quality. They begin to develop their own practices for the safe use of these tools rather than relying on those provided for them. They begin to readily transfer skills and practices in the use of one tool to other similar tools.

7

The student manages and organises resources, techniques and processes achieving defined industry standards of quality and safety when creating and modifying technologies.

At this level

Students proceed independently through a sequence of organising all the resource requirements for successful design completion when applying the technology process. They use computer-based technologies to enhance this organisation and to supplement manual processes where appropriate. Throughout their application of a technology process, they reflect on their understanding and skill development and acquisition in terms of their design effectiveness, efficiency and successful completion. They select, organise, manage and use tools and equipment, including those which are computer based and require complex independent operational control, with regard both to the requirements of their design and specified industry standards of quality and safety.

Organisational skills

Students monitor and manage resources and processes, making conscious, informed decisions about factors in production, such as use of time. Their plans include the identification, minimisation and control of hazards through industry-standard risk management strategies. They organise, monitor and manage the work environment, taking into account issues of waste and energy, and use recognised industry and commercial practices, including appropriate occupational health and safety standards. They organise their own time and capabilities and that of others with whom they collaborate.

Operational skills

Students understand and apply operational procedures when using tools and equipment. They use a wide range of recognised procedures to create, transform and process materials and information: for example, they use image processing, computer programming, remote sensing, electronic switching and multimedia presentations. They use software to manipulate audiovisual information, including animation, pixilation, visual effects, lighting and editing. Their understandings and operational skill level meet defined industry standards in the relevant industries.

Manipulative skills

Students physically manipulate tools with materials to develop technologies to meet detailed specifications and commercial standards. They use a wide range of recognised techniques and manipulative skill levels to meet defined industry standards in the relevant industries.

8

The student manages resources and processes; understands, selects and applies industry-recognised operational procedures and manipulative techniques; and considers the specifications of intended user or client, when creating and modifying technologies.

At this level

Students select confidently from an extensive range of personal understandings and skills to organise an environment conducive to successful design completion when applying the technology process. If new knowledge and/or skills are required for a specific task, students have confidence in acquiring them independently. They are self-reflective throughout the process and utilise metacognitive skills to provide feedback about the effectiveness of their process and make adjustments accordingly. In the context of a broad conception of technology, they produce high-quality outcomes in response to set specifications in a safe and healthy environment that they organise. They select, organise, manage and use tools and equipment (including those which are computer-based) independently, safely and proficiently.

Organisational skills

Students manage all the resources and processes effectively and efficiently in a project to meet a technology challenge in relevant industries. They use industry-recognised strategies, such as market research and performance management and practices and creative, lateral and scientific thinking to develop, tailor and adjust processes to meet project needs and to overcome problems and limitations when meeting intentions and standards. They organise themselves and other resources optimally, in an integrated fashion, using mathematical, scientific and organisational principles to complete complex tasks to specified standards of quality and safety.

Operational skills

Students select and apply industry-recognised operational procedures when using equipment with information and relevant, new and emerging materials. They operate complex systems controlling inputs and outputs. They operate specialised equipment and implement production processes for achieving specific effects such as moulding, clamping, shaping, cooling, stitching, heating and cleaning, when working with materials and may use computer-aided design when working with information. They operate programmable devices using mathematical principles within structured programs and control methods, such as switching, remote sensing, computing, managing and phasing. They create and modify technologies to meet the expectations of intended clients in relevant industries.

Manipulative skills

Students apply physical manipulative skills in the use of tools with materials to create and modify technologies that meet the expectations of clients in relevant industries. They use industry-recognised specialised techniques to work with natural, synthetic and composite materials in a wide range of production tasks to specified standards of safety and quality. They apply industry standard safety codes and use up-to-date methods for assembling materials, such as fabrication, connection, welding and adhesives.

Technology and Enterprise >

Technology in Society



| Technology in Society | | FOUNDATION | LEVEL 1 | LEVEL 2 | LEVEL 3 |
|---|--|---|---|---|---|
| Students understand how cultural beliefs, values and ethical position are interconnected in the development and use of technology and enterprise. | | TIS F The student: Uses technologies in different ways to suit their needs. | TIS 1 The student: Understands that people use technologies in different ways and have different attitudes toward technologies. | TIS 2 The student: Understands that people use technologies for different reasons and that this use has an impact on their lives. | TIS 3 The student: Understands that people value differently features related to aesthetics and the impact of different technologies on the environment. |
| Influencing factors | Students understand that technological developments are influenced by the interplay of cultural beliefs, values and ethical positions. | TIS F.1 Is working toward achieving Level 1. | TIS 1.1 Understands that technologies are suited to the interests and abilities of people and may be used in different ways. | TIS 2.1 Understands that people may choose to use different technologies and use them in different ways for a variety of reasons. | TIS 3.1 Understands that the aesthetic qualities of the design of a technology, and beliefs concerning the impact of the use of a technology, influence the use of the technology by individuals. |
| | Students consider the interplay of cultural beliefs, values and ethical positions and act on this understanding. | TIS F.2 Is working toward achieving Level 1. | TIS 1.2 Considers the uses they and their families make of technologies. | TIS 2.2 Compares the use of technologies. | TIS 3.2 Assesses the impact of different technologies on society and the environment. |

| LEVEL 4 | LEVEL 5 | LEVEL 6 | LEVEL 7 | LEVEL 8 |
|--|--|---|---|---|
| <p>TIS 4 The student: Understands how cultural beliefs and values affect the development and use of technologies.</p> | <p>TIS 5 The student: Recognises that beliefs and values of individuals and communities influence the development and use of appropriate technologies.</p> | <p>TIS 6 The student: Understands that the needs of individuals, communities and environments affect the development and application of technologies.</p> | <p>TIS 7 The student: Understands that needs, availability of resources and existing circumstances influence decisions related to the development and production of appropriate technologies.</p> | <p>TIS 8 The student: Understands that social, environmental, ethical, economic and political values underpin the development and application of technology and that decisions based on beliefs and values affect the costs and benefits of technologies.</p> |
| <p>TIS 4.1 Understands that cultural beliefs and values influence the use of a technology by individuals.</p> | <p>TIS 5.1 Understands that cultural beliefs and values influence the development, design and use of a technology by communities.</p> | <p>TIS 6.1 Understands that the development, design and use of a technology are influenced by the needs of individuals, communities and environments.</p> | <p>TIS 7.1 Understands that the development, design and use of a technology are influenced by a combination of needs, availability of resources, ethical position and existing circumstances.</p> | <p>TIS 8.1 Understands that the development, design and use of a technology are underpinned by a combination of social, environmental, ethical, economic and political values and factors.</p> |
| <p>TIS 4.2 Applies their understanding that different technologies and their use impact on the cultural beliefs and values of individuals.</p> | <p>TIS 5.2 Applies their understanding that different technologies and their use impact on the cultural beliefs and values of communities.</p> | <p>TIS 6.2 Applies their understanding that the design, development and application of technologies have a variety of impacts on individuals, communities and environments.</p> | <p>TIS 7.2 Applies their understanding that the design, development and application of technologies have interrelated impacts on individuals, communities and environments.</p> | <p>TIS 8.2 Applies their understanding that the design, development and application of technologies affect the costs and benefits for individuals, communities and environments.</p> |

F

The student uses technologies in different ways to suit their needs.

Students use technologies in different ways to best suit their own interests and needs: for example, they use a jar as a storage container, paint holder or a vase, but not to store hot liquids because it is hot to the touch. With prompts, they identify some of the familiar technologies they use and may begin to explore the reasons why they use them: for example, they recognise, name and use a washing machine to clean clothes and may discover that this technology removes dirt and odours from their clothing, which promotes personal hygiene and is important in some cultures. They begin to develop an awareness that actions may satisfy their needs while inaction may be harmful to themselves or others.

1

The student understands that people use technologies in different ways and have different attitudes toward these technologies.

At this level

Students identify some of the factors that influence the design and use of familiar technologies. They also identify some consequences of the use of those technologies by themselves and individuals close to them.

Influencing factors

Students understand that different technologies are suited to the interests and abilities of people and may be used in different ways by different people. Students investigate familiar technologies and recognise that they can be used in different ways and that people choose to use them in different ways to meet their needs. For these technologies they identify the particular needs the technologies are designed to meet and consider the interests and abilities to which they are suited. They identify how the function of such a technology is designed to meet their own needs.

Consequences

Students share their personal feelings about the technologies they use and produce, and listen to how others feel. Through this process, they begin to consider some consequences of the use of familiar technologies used in their environments, such as in the home. They recognise that some of these consequences may be helpful and some may be harmful.

2

The student understands that people use technologies for different reasons and that this use has an impact on their lives.

At this level

Students investigate some of the reasons why people use technologies and what impact this has on their immediate communities.

Influencing factors

Students understand that people may choose to use different technologies and use them in different ways for a variety of reasons. They consider the reasons why familiar technologies are developed and how they use these technologies compared with others in their immediate communities (such as friends, members of their family and class) and why they use them in the way in which they do. They consider how this may influence the way in which they continue to use these technologies.

Consequences

Students consider how different uses of familiar technologies can impact on communities. They generate and pose questions about how technologies affect many aspects of people's lives. The ideas generated from their personal experiences are enriched through sharing with other students. They talk about the effects on their communities, including family, class and friends. They note that the impact of the use of a technology may be different for different individuals and in different communities.

3

The student understands that people value features related to aesthetics and the impact of different technologies on the environment.

At this level

Students focus on the influence of aesthetic design features of technologies and some of the impacts of different technologies on the natural environment of their communities. They select products and processes that minimise the impact on the environment and take people's needs and wants into account.

Influencing factors

Students understand that the aesthetic qualities of the design of a technology and beliefs concerning the impact of the use of a technology can influence that technology's use by individuals. They consider the aesthetics of design features and use of technologies in their communities. They extend their understanding beyond personal application by examining a range of technologies to identify their key design features, especially their aesthetic qualities. They identify instances in which the aesthetic qualities of the design of a technology influence its adoption and use. They consider how beliefs concerning the impact of the use of a technology on the natural environment influence the use of the technology by individuals. They begin to justify the selection of certain technologies as being more suitable for certain environments and lifestyles.

Consequences

Students recognise that different technologies and their use may have very different impacts on people's aesthetic appreciation and on the environment. They evaluate some of the impacts of different technologies on the natural environment and the consequences of this for their communities. They identify the environmental effects of particular technologies, such as the quantity and type of energy used and the by-products of manufacturing, operation and disposal. They recognise that these impacts may vary for different environments and different communities.

4

The student understands how cultural beliefs and values affect the development and use of technologies.

At this level

Students examine how the values and beliefs of developers and users may influence design and how this is communicated and taken through to production. They understand that when they design new or modified technologies for use within their own communities, they must consider the needs of the members of the communities, their values and beliefs, and the impact on their own and related environments.

Influencing factors

Students understand that cultural beliefs and values influence the development and use of a technology by individuals. They investigate the role that the values and beliefs of developers play in the design of a technology. They consider how this is communicated within their communities and taken through to production. They also investigate the way in which the values and beliefs of users of a technology influence the design of the technology and consider this when devising and producing technologies.

Consequences

Students apply their understanding that different technologies and their use impact on the cultural beliefs and values of people. They investigate the role of technologies in shaping values and cultural beliefs. They recognise that particular technologies are important to, and have shaped, their own communities, culture and environment and that they may have different impacts on different groups within their communities, such as those of different ages, genders, ethnicity and abilities.

5

The student recognises that beliefs and values of individuals and communities influence the development of appropriate technologies.

At this level

Students understand that technologies appropriate for one community, culture or environment may not be appropriate for another. When determining why an individual or community selects and uses particular technologies, they consider the values and beliefs held by the developer and user. Their evaluation of the appropriateness of technologies includes considerations such as the impact on the environment, efficiency of energy use and cultural, ethical and gender implications. They consider how some technologies may be modified to make them more appropriate to different communities or different environments.

Influencing factors

Students understand that cultural beliefs and values influence the development, design and use of a technology by communities. They begin to consider the range of factors, including cultural beliefs and values, that may contribute to the appropriateness of the use of a technology for a community, culture or environment. They consider the relative influence of developers, users and communities on the development, design and production of technologies.

When they devise and produce technologies they consider the appropriateness for their community, culture or environment and for those who may use the technologies and suggest how the technology may be used.

Consequences

Students apply their understanding that different technologies and their use impact on the cultural beliefs and values of communities. They investigate the differences in impacts of a technology on different communities, cultures and environments. They reflect on the way technologies are applied and are beginning to recognise the complexity of issues related to the appropriate use of technology. They assess the impact of their solutions (including possible effects on cultural beliefs and values) on individuals, households, communities and associated environments.

6

The student understands that the needs of individuals, communities and environments affect the development and application of technologies.

At this level

Students understand that, regardless of community or cultural differences, most technologies that persist in a community do so because they are used and/or valued by most people in that community. By investigating how technologies are developed, adapted and used by different individuals and communities, they understand that needs are met in different ways. From these understandings, they recognise the impact of technology on values relating to social, economic, cultural, political, religious, gender or environmental factors. They explain how environmental conditions influence the design, production and use of technologies. Through continuous appraisal of their products and processes, they consider the ethical considerations.

Influencing factors

Students understand that the development, design and use of a technology are influenced by the needs of individuals, communities and environments. They consider the key design features of a number of technologies that are valued and can explain why these features have persisted as key design features.

Consequences

Students apply their understanding that the design, development and application of technologies have a variety of impacts on individuals, communities and environments and evaluate the overall impact of the application of various technologies. In their evaluation, they consider the balance between the benefits and costs to individuals and communities. They analyse this balance for the technologies they devise and produce and suggest modifications to the design, development and application of technologies that may improve this balance.

7

The student understands that needs, availability of resources and existing circumstances influence decisions related to the development and production of appropriate technologies.

At this level

Students select and manage resources and equipment, making conscious and ethical decisions about appropriate use of processes, time, energy and other resources. They consider the impact of beliefs, values and ethics as they assess the impact of their solutions on individuals, households, communities and associated environments.

Influencing factors

Students understand that the development, design and use of a technology are influenced by a combination of needs, availability of resources and existing circumstances. They investigate the resource requirements and circumstances associated with a range of technologies. When devising and producing technologies, they consider the combination of needs of potential users and their range of interconnected beliefs and values, abilities and ethical positions.

Consequences

Students apply their understanding that the design, development and application of technologies have interrelated impacts on individuals, communities and environments. Their evaluations assess the variety of impacts connected with the design, development and application of those technologies and the associated ethical considerations. In their evaluation they also consider the balance between the benefits and costs for communities and environments and between different communities and environments. They recognise that these balances may be connected.

8

The student understands that social, environmental, ethical, economic and political values underpin the development and application of technology and that decisions based on beliefs and values affect the costs and benefits of technologies.

At this level

Students understand that all technologies have an impact on individuals, families, communities, economies and environments, and that, depending on the nature and extent of these impacts, their influence on the development of societies varies significantly. They examine how people's values influence the complex interactions among technological systems, services, products and environments as, for example, in the planning of a housing development. They research the costs and benefits of different technologies. They understand that costs and benefits can be direct or indirect and that the costs and benefits to people and their values are related. To evaluate their solutions and the associated processes, they confirm whether stakeholders' requirements were incorporated, community acceptance attained, identified needs met and predicted impacts addressed.

Influencing factors

Students understand that the development, design and use of a technology are underpinned by a combination of social, environmental, ethical, economic and political values and factors. They investigate the underlying value systems of stakeholders and the way in which these values influence the design, development and application of these technologies for individuals and communities. They also recognise the variety of ethical positions that may be held by these stakeholders and how they, in combination with social, environmental, economic and political values and factors, including sustainability, determine the design, development and application of these technologies in communities. They articulate their own values and ethical positions and how these influence their own design, development and application of these technologies. They compare this with the value systems and ethical positions of others who design, develop and apply these technologies.

Consequences

Students examine how that the design, development and application of technologies affect the costs and benefits for individuals, communities and environments. They evaluate the overall impact of the design, development and application of a technology used by individuals or communities on other individuals, communities and environments. They analyse and predict how the balance of costs and benefits for individuals, communities and environments relates to the balance of costs and benefits for other individuals, communities and environments. They recognise that the decisions they make should be sustainable and meet the needs of current and future generations through an integration of social, environmental, ethical, economic and political considerations.



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27 Walters Drive, Osborne Park, Western Australia 6017
Telephone: (08) 9273 6300 Facsimile: (08) 9273 6389
Internet: www.curriculum.wa.edu.au