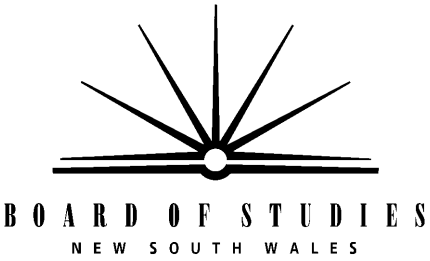

Technology (Mandatory)
Years 7–8

Advice on Programming and Assessment

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Contents

1 Introduction

This support document has been designed to help teachers understand key aspects of the new *Technology (Mandatory) Years 7–8 Syllabus* and to provide guidance for implementation. The document shows how these aspects can be incorporated in teaching and learning programs, and how these programs are underpinned by the principles of *assessment for learning (Technology [Mandatory] Years 7–8 Syllabus*, page 61).

The document provides advice about constructing a program that will cover the scope of Technology (Mandatory) for Stage 4. It sets out a process for planning and sequencing units of work, and developing teaching and learning activities.

The sample stage program plans and the sample units of work in this document demonstrate ways in which teachers can build a teaching and learning program and develop units of work to ensure coverage of the scope of the syllabus.

The document contains two Stage 4 sample units of work:

Toy Maker: This unit of work is designed for the end of Year 7 where students design, produce and evaluate a toy for a young child.

Lights, Camera, Robo Action: Students explore Software and Digital Media design specialisations as they design, produce and evaluate a video clip for a dancing robot.

These sample units can be used as models for planning units of work. They include:
- relevant outcomes and content
- assessment activities that have been designed and integrated into the units of work
- different types of possible feedback
- a variety of teaching and learning experiences
- opportunities for student reflection.

An assessment activity from each unit has been selected to show how assessment can fit into teaching and learning sequences. They are described in some detail to illustrate the process of *assessment for learning*. Teachers would not provide this level of detail in day-to-day classroom situations. The units of work and activities may be modified or amended to suit the needs, interests and abilities of students.

For a small percentage of students with special education needs who are undertaking Life Skills outcomes and content, support materials will be provided which will assist in the development of a meaningful and relevant program of study related to the *Technology (Mandatory) Years 7–8 Syllabus*. Units of work adapted for students undertaking Technology (Mandatory) Life Skills will be included in a consolidated document that will be distributed to schools early in 2004.

2 Establishing a Scope and Sequence Plan

A fundamental step in the design of effective teaching and learning programs is the establishment of a scope and sequence plan. The scope and sequence information presented in this section models one approach that can be used when planning. It provides an overview of sample units of work and details the placement, sequence and duration of the units.

Technology (Mandatory) is a 200-hour course in Years 7–8.

Design projects form the basis of units of work. When establishing a scope and sequence plan for the Technology (Mandatory) Years 7–8 course the following syllabus requirements must be met:

- Students must undertake a minimum of *four* and a maximum of *eight* design projects over 200 hours.
- At least *one* design project is to be based on *each* of the three areas of study.
- Select a minimum of *one* and a maximum of *three design specialisations* that are linked to each area of study (see table below). A design specialisation can only be studied *once* during the course.

Areas of Study		
Built Environments	Products	Information and Communications

Design Specialisations		
Architectural	Accessories	Communications Systems
Environmental	Agricultural	Information Systems
Interior	Fashion	Promotional
Landscape	Food	Software
Structural	Industrial	Digital Media
	Jewellery	

Select the *technology/ies* that will be addressed in each design project (see table below). Content from a minimum of *six technologies* must be addressed by the end of the course. The specific content for each technology can be addressed in a single project or over a number of projects.

Technologies	
Animal Production	Mixed Material
Control	Model-making
Electronics	Plant Production
Food	Polymer
Graphics	Textile
Information	Timber
Media	School Developed
Metals	

Further considerations
When designing a scope and sequence plan, schools also need to consider:

- the specific needs, interests and abilities of students and/or areas of community significance
- a model that suits the school curriculum structure
- the most effective utilisation of existing and available resources
- the previous learning experiences of students
- teacher collaboration to develop a shared understanding of what learning outcomes their students will demonstrate. Shared planning leads to consistency of judgements of learning outcomes and the different ways students may demonstrate them
- providing students with a range of practical experiences that increase in challenge and sophistication over the 200-hour course. This also includes introducing new skills in each design project and the provision of opportunities to continue to develop and refine existing skills
- teaching programs that recognise and reflect relevant state and Commonwealth legislation, Regulations and standards including Occupational Health and Safety, Chemical Safety in Schools and Animal Welfare guidelines. Teachers need to be aware of activities that may require notification, certification, permission, permits and licences.

2.1 Stage 4 Design Projects

The major emphasis of the *Technology (Mandatory) Years 7–8 Syllabus* is the active involvement of students in the development and production of quality design projects. Design projects consist of a quality solution and a design folio.

Quality solution
The design solution is the result of practical activities as students work through a design process. Technology (Mandatory*)* involves students in designing, producing and evaluating quality solutions that are functional and meet identified needs or opportunities.

Design folio
The design folio is a document that provides ongoing evidence of the application of a design process and the specific technologies used in the project. It addresses the requirements of the project, and the recording, design ideas and presentation should be clear, well laid out and technically accurate. It is not necessary for students to document and present the whole design process in a formal way for every project.

Students may use a workbook, logbook, journal or electronic journal as an informal tool to record the design thinking, planning decisions and any activities engaged in during the project.

The following table provides a range of ideas for design projects for each design specialisation within each area of study.

Area of Study	**Design Specialisation**	**Design Project Ideas**
Built Environments	Architectural	Theatrical prop and set design; facility design such as community buildings, restaurants and cafes, youth centres; exhibit design such as pet show exhibits, school promotion exhibits; theme park design
	Environmental	Public access routes; skate parks; waste management systems; water management systems; Landcare projects; energy use and solar design
	Interior	Plans and models of interiors both residential and commercial; classroom layout and design; lighting design for school productions
	Landscape	Rainforest gardens; riverbank regeneration; playground design; park and garden design
	Structural	Models of bridges; animal shelters and enclosures; playground equipment; shade systems
Products	Accessories	Clothing accessories such as bags, hats, belts; theatrical accessories such as masks; accessories for the home such as lamps, shades, furnishings
	Agricultural	Native plant production; plant propagation; market gardens; hydroponics such as growing lettuce; beekeeping
	Fashion	Clothing production lines; apparel for a range of needs and opportunities such as special occasions
	Food	Small business ventures such as catering, school canteen days; developing food products for sale; developing diets for special purposes or occasions
	Industrial	Furniture; toys and games; kite constructions; mechanisms
	Jewellery	Decorative body adornment such as necklaces, bracelets, brooches
Information and Communications	Communications Systems	School radio station and broadcasts; design of school presentation nights, graduation days, drama productions
	Information Systems	Databases; information kiosks; information management systems
	Promotional	School newsletters; litter campaigns; magazines; books; videos; multimedia presentations; packaging; brochures; advertising campaigns
	Software	Games programs; programmed robots; data management systems
	Digital Media	Internet, web design and development; on-screen presentations

2.2 Sample Stage 4 Scope and Sequence Plan

The sample scope and sequence provided is based on a 200-hour program and presents an example of one model that may be implemented by schools. The model aligns focus and contributing outcomes to each unit of work. Outcomes considered central to the unit and from which a significant amount of related content is drawn are classified as focus outcomes. Outcomes that relate to the unit of work but that are not developed in similar depth are considered contributing outcomes. To ensure adequate and balanced coverage, all outcomes receive a major emphasis at least once during the course and play a contributing role in other units of work.

This model provides the opportunity for teachers to plan assessment activities around the focus outcomes.

<table>
<tr><th>Term</th><th>Year 7</th><th>Year 8</th></tr>
<tr><td>1</td><td>Unit 7.1 Snack Food for the Cinema
Outcomes
Focus: 4.1.1, 4.1.2, 4.2.1, 4.3.1, 4.3.2, 4.4.1
Contributing: 4.1.3, 4.2.2, 4.5.1, 4.5.2, 4.6.1, 4.6.2
Area of Study: Products
Design Specialisation: Food
Technologies: Food</td><td rowspan="2">Unit 8.1 Lights, Camera, Robo Action
Outcomes
Focus: 4.3.1, 4.3.2, 4.4.1, 4.5.1, 4.6.1
Contributing: 4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.5.2, 4.6.2
Area of Study: Information and Communications
Design Specialisation: Software and Communication Systems
Technologies: Control and selected content of Media

(This unit of work is provided in Section 5.)</td></tr>
<tr><td>2</td><td>Unit 7.2 The Great Outdoors
Outcomes
Focus: 4.1.3, 4.2.2, 4.3.1, 4.3.2, 4.5.1, 4.6.2
Contributing: 4.1.1, 4.1.2, 4.2.1, 4.4.1, 4.5.2, 4.6.1
Area of Study: Built Environments
Design Specialisation: Landscape
Technologies: Model-making</td></tr>
<tr><td>3</td><td>Unit 7.3 Show the Way
Outcomes
Focus: 4.2.2, 4.3.1,4.3.2, 4.4.1, 4.5.2, 4.6.1
Contributing: 4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.5.1, 4.6.2
Area of Study: Information and Communications
Design Specialisation: Promotional
Technologies: Graphics</td><td rowspan="2">Unit 8.2 Place and Space
Outcomes
Focus: 4.1.1, 4.1.3, 4.2.2, 4.3.1, 4.3.2, 4.5.2
Contributing: 4.1.2, 4.2.1, 4.4.1, 4.5.1, 4.6.1, 4.6.2
Area of Study: Built Environments
Design Specialisation: Environmental
Technologies: Mixed materials</td></tr>
<tr><td>4</td><td>Unit 7.4 Toy Maker
Outcomes
Focus: 4.1.2, 4.2.1, 4.2.2, 4.3.1, 4.3.2, 4.6.2
Contributing: 4.1.1, 4.1.3, 4.4.1, 4.5.1, 4.5.2, 4.6.1
Area of Study: Products
Design Specialisation: Industrial
Technologies: Timber
This unit may also apply to Textiles, Polymer, Metals, Multi-material and combinations of these technologies.
(This unit of work is provided in Section 5.)</td></tr>
</table>

2.3 Stage 4 Outcomes Mapping Grid

Focus and contributing outcomes

The following sample grid maps the coverage of outcomes across Stage 4 in relation to the scope and sequence provided in section 2. Similar grids can be developed by teachers as a strategy to ensure that all outcomes are addressed by the end of the course. This model places emphasis on specific outcomes in individual units of work and provides the opportunity for teachers to plan assessment activities around the focus outcomes.

x Focus outcomes
▪ Contributing outcomes

Outcomes	Unit 7.1	Unit 7.2	Unit 7.3	Unit 7.4	Unit 8.1	Unit 8.2
4.1.1 applies design processes that respond to needs and opportunities in each design project	x	▪	▪	▪	▪	x
4.1.2 describes factors influencing design in the areas of study of Built Environments, Products, and of Information and Communications	x	▪	▪	x	▪	▪
4.1.3 identifies the roles of designers and their contribution to the improvement of the quality of life	▪	x	▪	▪	▪	x
4.2.1 generates and communicates creative design ideas and solutions	x	▪	▪	x	▪	▪
4.2.2 selects, analyses, presents and applies research and experimentation from a variety of sources	▪	x	x	x	▪	x
4.3.1 applies a broad range of contemporary and appropriate tools, materials and techniques with competence in the development of design projects	x	x	x	x	x	x
4.3.2 demonstrates responsible and safe use of a range of tools, materials and techniques in each design project	x	x	x	x	x	x
4.4.1 explains the impact of innovation and emerging technologies on society and the environment	x	▪	x	▪	x	▪
4.5.1 applies management processes to successfully complete design projects	▪	x	▪	▪	x	▪
4.5.2 produces quality solutions that respond to identified needs and opportunities in each design project	▪	▪	x	▪	▪	x
4.6.1 applies appropriate evaluation techniques throughout each design project	▪	▪	x	▪	x	▪
4.6.2 identifies and explains ethical, social, environmental and sustainability considerations related to design projects	▪	x	▪	x	▪	▪

2.4 Stage 4 Unit Overviews

Unit 7.1 Snack Food for the Cinema
An introductory unit designed for the beginning of Stage 4 from the Products area of study. Students develop an understanding of the design process as they engage in activities to design, produce and evaluate a snack food that would be suitable to be sold at the cinema using Food technologies. They explore the factors that influence the design of food products and the appropriateness of design solutions for particular groups.

Unit 7.2 The Great Outdoors
In this unit students explore needs and opportunities when designing internal and external spaces from the Built Environments area of study. They represent and communicate design ideas using models, drawings and plans. The project involves students designing, producing and evaluating a landscape solution using Model-making technologies for a student-identified need or opportunity.

Unit 7.3 Show the Way
Students explore a wide range of promotional materials and examine innovation and emerging technologies used in the Promotional Design specialisation. The unit of work focuses on the use of text and images for the purposes of conveying a message. Students design, produce and evaluate a brochure or magazine for an identified need or opportunity using Graphics technologies.

Unit 7.4 Toy Maker
This unit of work involves students in designing, producing and evaluating a toy from the Products area of study using Timber technologies. They identify the factors that affect the design of toy products and investigate the safety standards that apply. Students use a range of methods to generate and communicate design ideas and further develop communication and presentation techniques.

Unit 8.1 Lights, Camera, Robo Action
This unit of work requires students to design and produce a video clip for a robot that students have designed, built and programmed to perform a dance routine. Students explore new and emerging technologies within the Information and Communications area of study and evaluate their impact on society and the environment. The unit provides opportunities for collaborative activities including group problem-solving, investigating and decision-making. Students use Media and Control technologies when developing the design project.

Unit 8.2 Place and Space
This unit of work focuses on the Built Environments area of study and provides an opportunity for an open design project from the Environmental Design specialisation. Students investigate significant designers that work on Built Environments and consider their contributions to the world in which we live and how they improve our quality of life. Using Mixed Material technologies, students use a diverse range of interpretations to display creativity in their approach to design and independently produce a design project.

3 Advice on Assessment

3.1 Assessment for Learning

The Board's revised syllabuses advocate *assessment for learning*. Assessment that enhances learning recognises that learners use their current understanding to discover, develop and incorporate new knowledge, skills and understanding. *Assessment for learning* helps teachers and students to know whether that current understanding is a suitable basis for future learning.

Assessment occurs as an integral part of teaching and learning. Teacher instruction and assessment influence student learning and learning processes. This involves using assessment activities to clarify student understanding of concepts, and planning ways to remedy misconceptions and promote deeper understanding.

Assessment for learning encourages self-assessment and peer assessment. Students can develop and use a range of strategies to actively monitor and evaluate their own learning and the learning strategies they use.

The feedback that students receive from completing assessment activities will help teachers and students decide whether they are ready for the next phase of learning or whether they need further learning experiences to consolidate their knowledge, understanding and skills. Teachers should consider the effect that assessment and feedback have on student motivation and self-esteem, and the importance of the active involvement of students in their own learning.

By integrating learning and assessment, the teacher can choose which aspects of a student's performance to record. These records can be used to monitor the student's progress, determine what to teach next and decide the level of detail to be covered. At key points, such as the end of the year, this information is also available for the teacher to use to form a judgement of the student's performance against levels of achievement. This judgement can be used to inform parents, the next teacher and especially the student of where the student is up to. Consequently, teachers using their professional judgement in a standards-referenced framework are able to extend the process of *assessment for learning* into their assessment of learning.

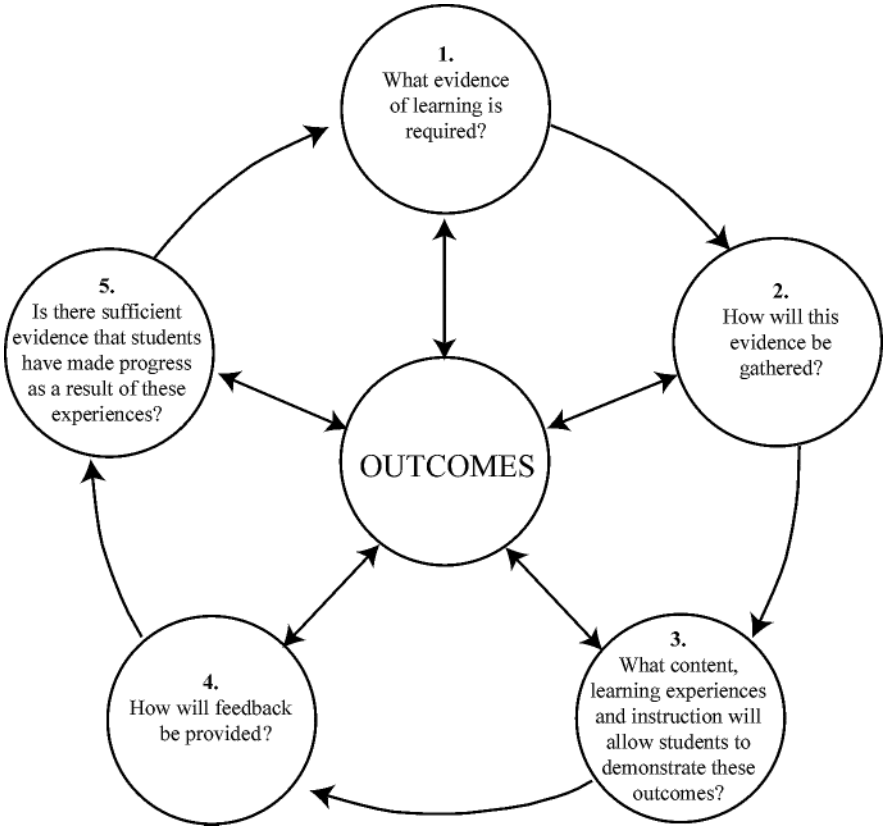
Principles of assessment for learning
Assessment for learning**:**

AP1 emphasises the interactions between learning and manageable assessment strategies that promote learning
AP2 clearly expresses for the student and teacher the goals of the learning activity
AP3 reflects a view of learning in which assessment helps students learn better, rather than just achieve a better mark
AP4 provides ways for students to use feedback from assessment
AP5 helps students take responsibility for their own learning
AP6 is inclusive of all learners.

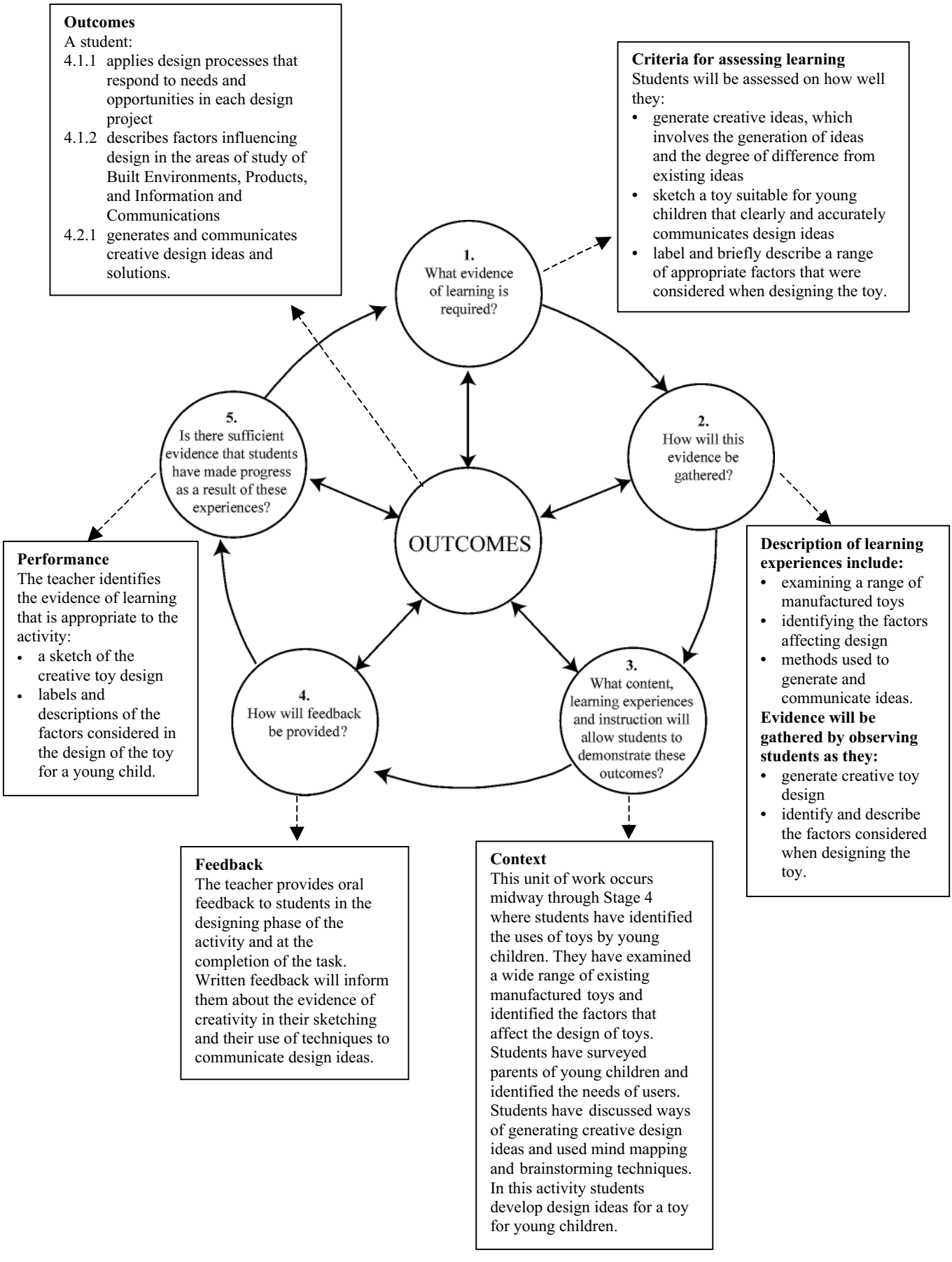
Details on how these principles translate in practice can be found on page 61 of the *Technology (Mandatory) Years 7–8 Syllabus*. One activity in this document has been annotated to show how the principles of *assessment for learning* feature in that activity. It can be found on pages 16 and 17.

3.2 Planning for Effective Learning and Assessment

The diagram below summarises a model for integrating learning and assessment. It emphasises that outcomes are central to the decisions teachers make about the learning to be undertaken and the evidence of learning that needs to be collected. This evidence enables teachers to determine how well students are achieving in relation to the outcomes and to provide students with feedback on their learning. Evidence of learning assists teachers and students to decide if students are ready for the next phase of learning or if teachers need to adapt programs to provide further learning experiences to consolidate students' knowledge, understanding and skills.



The diagram below shows how this process has been applied in the design of the sample assessment for learning activity Generating Design Ideas.



3.3 Designing Effective Learning and Assessment

Designing effective learning experiences requires the selection of activities that develop students' knowledge, understanding and skills and that allow evidence of learning to be gathered. Methods of gathering evidence could include informal teacher observation, questioning, peer evaluation and self-evaluation, as well as more structured assessment activities. Assessment should be an integral part of each unit of work and should support student learning.

When designing assessment activities, teachers should consider whether the activity:

- has explicitly stated purposes that address the outcomes
- is integral to the teaching and learning program
- shows a clear relationship between the outcomes and content being assessed
- allows students to demonstrate the extent of their knowledge, understanding and skills
- focuses on what was taught in class and what students were informed would be assessed
- provides opportunities to gather information about what further teaching and learning is required for students to succeed
- provides valid and reliable evidence of student learning and is fair.

3.4 Annotated Assessment for Learning Activity

The *Assessment for Learning Principles* provide the criteria for judging the quality of assessment materials and practices. The Stage 4 sample assessment activity, Generating Design Ideas, taken from the Year 7 sample unit Toy Maker, has been annotated to show these principles.

Sample assessment for learning activity: Generating Design Ideas

AP1 The activity shows the knowledge, skills and understanding that are being built on.
AP2 The activity clearly indicates the knowledge, skills and/or understanding to be developed.

AP1 The activity has a clear statement of purpose.
AP1 The activity forms part of the learning.
AP3 The activity models an approach that has the activity as an integral component of the learning.

Context
In this unit of work students have identified the use of toys by young children. They have examined a wide range of existing manufactured toys and identified the factors that affect the design of toys. Students have surveyed parents of young children and identified the needs of users. They have discussed ways of generating creative design ideas and used mind mapping and brainstorming techniques. Through previous experiences they have used techniques to communicate design solutions and practised and refined their skills in sketching. In this activity students apply their understanding of the factors affecting design when generating creative design ideas and solutions.

AP1 The activity lists the outcomes to be addressed.

Outcomes
A student:
4.1.1 applies design processes that respond to needs and opportunities in each design project
4.1.2 describes factors influencing design in the areas of study of Built Environments, Products, and Information and Communications
4.2.1 generates and communicates creative design ideas and solutions.

AP3 The activity has the capacity to engage the learner.
AP3 The activity has been designed to target skills and understandings that lead to deeper learning as well as knowledge.

AP1 The activity is appropriate for the outcomes being assessed.
AP5 The activity is designed so as to help students take responsibility for their own learning.
AP6 The open nature of this activity allows for a range of student responses and is inclusive of all learners.

Description of activity
Students sketch and communicate a creative toy design suitable for a young child. They label and describe the factors considered when designing the toy. The suggested duration of this assessment for learning activity is two lessons (80 minutes).

AP4 Criteria for assessing learning reflect the nature and intention of the activity and will be expressed in terms of the knowledge and skills demanded by the activity.
AP4 Criteria for assessing learning enable meaningful and useful information on performance relative to the outcomes to be gathered and reported.

Criteria for assessing learning
(These criteria would normally be communicated to students with the activity.)

Students will be assessed on their ability to:

- generate creative ideas, which involves the generation of ideas and the degree of difference from existing ideas
- sketch a toy design suitable for young children that clearly and accurately communicates design ideas
- label and briefly describe a range of appropriate factors that were considered when designing the toy.

AP2 The link between the marking guidelines and/or criteria for assessing learning and the outcomes is clear and explicit.

AP2 The language of the marking guidelines is clear and explicit.

Guidelines for marking
The following guidelines for marking show one approach to assigning a value to a student's work. Other approaches may be used that better suit the reporting process of the school and the induvidual subject requirements. Categories, marks, grades, visual representations or individual comments/notations may be useful.

Range	**A student in this range:**
High (8–10)	• demonstrates a high level of creativity in a toy design that is suitable for young children • accurately sketches and effectively communicates creative and detailed design ideas • clearly labels and perceptively describes appropriate factors considered when designing the toy
Satisfactory (4–7)	• demonstrates creativity in a toy design that is suitable for young children • sketches and communicates creative design ideas • labels and describes some factors considered when designing the toy
Progressing (1–3)	• demonstrates limited creativity in a toy design that is suitable for young children • sketches and communicates, in a limited way, basic design ideas • labels and identifies some factors considered when designing the toy.

AP5 Provides ways for students to use feedback from assessment.

Feedback
The teacher will provide written feedback to students. Comments will inform them about such things as:

- the evidence of creativity in the design idea
- their use of techniques to sketch and communicate the design idea
- their understanding of the factors affecting the design of the toy
- their use of techniques when labelling the design work.

AP1 The activity forms part of the learning and has clear links to learning goals.

Future directions
Through this activity students have developed skill in generating and communicating design ideas while considering a number of factors affecting design. This learning can be applied in further unit activities and design projects as students develop more complex projects. If students have experienced difficulty generating creative design ideas that consider the factors affecting design, further teaching and learning may be needed. Further creative thinking activities may be used to assist students to develop innovative designs.

Assessment for Learning Principles

The following table shows some of the criteria that have been used to annotate the assessment activities in this document. This list of criteria is not exhaustive; it has been included to provide support in understanding the *Assessment for Learning Principles*.

It is not envisaged that teachers will use this table as a checklist each time an assessment activity is developed. However, this could be a valuable tool for use in staff development activities.

Assessment principle 1	**Related criteria**
The activity emphasises the interactions between learning and manageable assessment strategies that promote learning.	• The activity has a clear statement of purpose. • The activity lists the outcome(s) to be addressed. • The activity is appropriate for the outcomes being assessed. • The activity forms part of the learning and has clear links to learning goals. • The activity shows the knowledge, skills and understanding that are being built on.

Assessment principle 2	**Related criteria**
The activity clearly expresses for the student and teacher the goals of the learning activity.	• The link between the marking guidelines and/or criteria for judging performance and the outcomes is clear and explicit. • The language of the marking guidelines and/or criteria for judging performance and the outcomes is clear and explicit. • The activity clearly indicates the knowledge, skills and/or understanding to be developed.

Assessment principle 3	**Related criteria**
The activity reflects a view of learning in which assessment helps students learn better, rather than just achieve a better mark.	• The activity has the capacity to engage the learner. • The activity has been designed to target skills and understandings that lead to deeper learning as well as knowledge. • The activity models an approach that has the activity as an integral component of the learning.

Assessment principle 4	**Related criteria**
The activity provides ways for students to use feedback from assessment.	• Marking guidelines and/or criteria for judging performance reflect the nature and intention of the activity and will be expressed in terms of the knowledge and skills demanded by the activity. • Marking guidelines and/or criteria for judging performance enable meaningful and useful information on performance, relative to the outcomes, to be gathered and reported.

Assessment principle 5	**Related criteria**
The activity helps students take responsibility for their own learning.	• The activity models ways that self and peer assessment can be used as valid means of assessment.

Assessment principle 6	**Related criteria**
The activity is inclusive of all learners.	• The activity is inclusive of gender, ethnicity and a variety of socio-economic and geographical groupings.

3.5 Sharing Learning and Assessment Intentions

Students must be aware of what they need to do to demonstrate evidence of learning. This information could be conveyed informally or formally by the teacher, as appropriate for the learning activity. Students should be informed of the criteria that will be used to assess their learning. They should be clear about the meaning of the language used and the subject-specific terminology. They also need to be clear about any sources or stimulus material that are appropriate to the activity.

It may be helpful to give students models of good responses and templates, or procedures to help them demonstrate the extent of their knowledge, understanding and skills.

3.6 Effective Feedback to Students

The aim of feedback is to communicate to students how well their knowledge, understanding and skills are developing in relation to the outcomes. They are then given opportunities to improve and further develop their knowledge, skills and understanding. Feedback enables students to recognise their strengths and areas for development, and to plan with their teacher the next steps in their learning.

Teacher feedback about student work is essential for students and is integral to the teaching and learning process. Student self-reflection and peer evaluation can also provide valuable feedback to students. Students should be provided with regular opportunities to reflect on their learning.

Feedback should:
- focus on the activity and what was expected
- be constructive, providing meaningful information to students about their learning
- correct misunderstanding
- identify and reinforce students' strengths and state clearly how students can improve.

Forms of feedback include:
- oral discussion with class, groups or individual students
- written annotations
- general comments to the class about those aspects of the activity in which students excelled and those aspects that still need addressing
- examples of good responses
- peer evaluation and self-evaluation.

3.7 Recording Evidence for Assessment

Recording student performance needs to be manageable. Teachers should make decisions about which aspects of student performance on an activity should be recorded, and in what format. The teacher can use this information to ascertain students' progress, what needs to be taught next and to what level of detail, and to form a judgement of student achievement at key points.

Record-keeping should reflect the reporting processes of the school and may take the form of individual comments or notations, marks, grades or visual representations for the activities.

A scale such as the one below may be a useful way to summarise the extent of students' learning. This example shows how individual students performed on the same assessment activity.

Student	Activity – Generating Design Ideas		
A			x
B	x		
C		x	
D		x	
E		x	
F	x		
	Progressing	Satisfactory	High

This method can be adapted to capture evidence of an individual student's strengths and weaknesses on various elements of one activity, or the performance of a particular student, class, group or cohort of students, across a range of assessment activities.

4 Programming Units of Work

The *Technology (Mandatory) Years 7–8 Syllabus* promotes an approach to programming that has outcomes as the focus. The sample units of work in section 5 have been developed using the following process:

Step 1

(a) Decide on the area of study and the design specialisation that will provide the context for the development of the design project.

(b) Decide on the design project and select the technology/ies appropriate for the unit of work.

(c) Select outcomes that will be focus outcomes and those that will be contributing outcomes for the unit of work. Ensure they are manageable in number.

Step 2

Decide on the specific evidence of learning to be observed through the teaching, learning and assessment activities. This evidence will facilitate judgements of student achievement in relation to the outcomes and identified content.

Step 3

(a) Select the relevant syllabus content, identifying what students are going to 'learn about' and 'learn to' do. Consider the selected outcomes and identify and organise into a logical sequence the content from the 'learn about' column. Essential design-related content must be integrated with essential technologies-specific content when developing the unit of work. The amount of content selected should be manageable in the time allocated to the unit. Note that the 'learn to' statement has a direct relationship to the 'learn about' statement located next to it.

(b) Plan the teaching and learning strategies for the identified content and decide on the *assessment for learning* strategies that will provide evidence of learning. *Assessment for learning* activities occur as a normal part of the teaching process. Strategies should include a range of student-centred experiences that promote the development of knowledge, understanding and skills. Teachers should ensure that a range of practical experiences occupy the majority of class time.

Step 4

Provide feedback so that students have the necessary information and direction to progress their learning. Teachers should consider how to maximise feedback in the context of the teaching, learning and assessment activities and how the feedback contributes to student learning.

Step 5

Reflect on the previous steps and evaluate the degree to which the unit has remained focused on the outcomes.

4.1 Sample Unit Proforma

Teachers can design a unit proforma that best meets their specific needs and circumstances. The sample unit proforma provided below has been annotated to highlight the characteristics of each section.

Sample unit proforma

Unit title:

Unit description:	**Outcomes:** Focus outcomes: Contributing outcomes:
Area of study: **Design specialisation:** **Technology/ies:** **Design project:**	
Length of unit:	
Resources:	

Identify the area of study, design specialisation and technologies to be addressed in this unit of work to ensure the syllabus requirements are met.

Identify focus and contributing outcomes to be targeted in the unit. Ensure they are manageable in number.

Allocate time to deal with the content in appropriate depth.

Identify the resources useful for the delivery of the unit of work.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**

Identify from the syllabus appropriate content related to the selected outcomes. Ensure that the selection provides an increase in sophistication and challenge over the 200 hours and that it is manageable in the time allocated.

Describe learning experiences, instruction and assessment that are best suited to the syllabus content and allow students to provide the required evidence of learning in relation to the outcomes. Ensure that a range of practical experiences occupies the majority of class time.

Decide on the observable evidence resulting from the activity that will allow judgements to be made on achievement in relation to outcomes.

Identify the nature and type of feedback and how it contributes to student learning.

5 Sample Units of Work

The sample units of work that follow are designed to assist teachers in planning for the implementation of the *Technology (Mandatory*) *Years 7–8 Syllabus*. The units provide programming ideas for selected syllabus content.

The sample units show ways in which teachers can meet the needs, interests and abilities of their students, while assessing their progress towards a demonstration of outcomes. The sample units also illustrate ways in which assessment activities may be integrated into the teaching and learning sequence. They will assist teachers to understand the importance of:

- being explicit about the outcomes and content they are addressing
- being explicit about the evidence required to demonstrate student learning
- providing meaningful feedback to students
- adapting teaching and learning programs to students' demonstrated needs
- having a sound basis for modifying future teaching and learning programs (in light of students' demonstrated needs).

The sample units provide opportunities for students to engage in questioning and dialogue, self-assessment, peer assessment and reflection. Through these activities students can become clear about their own learning, understanding and needs.

Note that the assessment activities are described here in some detail to illustrate the process of *assessment for learning*. Teachers would not provide this level of detail in day-to-day classroom situations.

5.1 Stage 4 Sample Unit of Work: Toy Maker

<table>
<tr>
<td>Unit description:
This unit of work involves students in designing, producing and evaluating their own toy design using timber technologies. They identify the factors that affect the design of toy products and investigate the safety standards that apply to the design of toys. Students use a range of methods to generate and communicate design ideas and further develop communication and presentation techniques.</td>
<td>Focus outcomes:
4.1.2 describes factors influencing design in the areas of study of Built Environments, Products, and Information and Communications
4.2.1 generates and communicates creative design ideas and solutions
4.2.2 selects, analyses, presents and applies research and experimentation from a variety of sources
4.3.1 applies a broad range of contemporary and appropriate tools, materials and techniques with competence in the development of design projects
4.3.2 demonstrates responsible and safe use of a range of tools, materials and techniques in each design project
4.6.2 identifies and explains ethical, social, environmental and sustainability considerations related to design projects.

Contributing outcomes:
4.1.1 applies design processes that respond to needs and opportunities in each design project
4.1.3 identifies the roles of designers and their contribution to the improvement of the quality of life
4.4.1 explains the impact of innovation and emerging technologies on society and the environment
4.5.1 applies management processes to successfully complete design projects
4.5.2 produces quality solutions that respond to identified needs and opportunities in each design project
4.6.1 applies appropriate evaluation techniques throughout each design project.</td>
</tr>
<tr>
<td colspan="2">Area of study: Products
Design specialisation: Industrial Design
Technology/ies: Teachers may designate one technology or students may be given a choice. For the purposes of this unit of work Timber technologies has been used. Other appropriate technologies for this unit may include Textiles, Polymer, Metals, Mixed Materials, Electronics.
Design Project: Timber toy for a young child</td>
</tr>
<tr>
<td colspan="2">Length of unit: 10 weeks</td>
</tr>
<tr>
<td colspan="2">Resources: Toy Story video; Designing Toys video (classroom Video, 26 minutes). Access to computer hardware such as digital cameras and scanners and software such as word processing.

Useful websites:
http://www.standards.com.au, www.tradingstandars.gov.uk/milton-keynes, http://www.forest.nsw.gov.au/sfkids/default.asp, http://dgl.microsoft.com
http://www.timbertrek.com.au/education/, http://www.wilderness.org.au/projects/Forests/facts.html, http://classroom.smh.com.au</td>
</tr>
</table>

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• different design specialisations	• identify a range of design specialisations relevant to each area of study	**Class** • discusses toys as products of industrial design. **Students** • view video such as *Toy Story* and discuss the concept of a toy • reflect and record their concept of a toy.	Discussion shows student knowledge and understanding of the concept of a toy.	Teacher gives oral feedback during discussion.
• needs and opportunities in the areas of study – Built Environments – **Products** – Information and Communications • factors affecting design – function – aesthetics – human form – scale – physical and material properties	• identify needs and opportunities that require solutions in the areas of study • examine factors affecting design in the areas of study Built Environments, **Products**, and Information and Communications	**Teacher** • explains the factors affecting design of products • provides a range of manufactured toys that are suitable for young children to be used in discussion. **Students** • identify and discuss factors affecting the design of toys such as the function of promoting hand-to-eye coordination, learning colours, encouraging the development of fine and gross motor skills, aesthetics such as the use of colour, safety, size of component parts, scale according to the size of the user.	Oral responses from discussion show student understanding of the influence of factors affecting toy design.	Teacher gives oral feedback during discussion.
• factors affecting design – legislation including OHS – safety	• examine factors affecting design in the areas of study Built Environments, **Products**, and Information and Communications • describe the factors affecting design in the development of each design project	**Students** • research and investigate safety standards and legislation using sources including internet sites such as: www.standards.com.au www.tradingstandards.gov.uk/milton-keynes • list the standards that impact on the design of a toy and pair-share the findings.	Student list of standards demonstrates their understanding of the legislation that applies to toys.	Sharing session provides feedback on standards.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• design processes – analysing needs, problems and opportunities – evaluating ideas and solutions • factors affecting design – function – aesthetics – human form – scale – ergonomics – legislation including OHS – cost – socio-cultural – resource availability – physical and material properties – safety	• evaluate design processes • describe the factors affecting design in the development of each project	**Class** • discusses the features of a well-designed toy. **Students** • discuss why some toys are appropriate for some age groups, and not for others • form groups, select a toy from the range provided and describe the factors affecting the design of a toy appropriate for a young child • evaluate the features of the toy that contribute to quality and present evaluations to class.	Oral responses and discussion demonstrate student understanding of design features of a well-designed toy.	Teacher observation of presentations and oral feedback.
• communication methods including – drawings, sketches and models – written reports – oral presentations – digital presentations	• sketch, draw and model to aid design development • communicate information appropriate to specified audiences	**Teacher** • explains the use of communication methods used in the design process • demonstrates how sketches are used to communicate design ideas and the importance of clarity, accuracy and labelling. **Students** • sketch the toy used in the previous activity and label the design features and factors that influenced its design.	Student sketches show an understanding of ways of communicating and labelling design ideas.	Teacher assesses the sketch and labelling and provides written feedback.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• design processes used by designers • design processes – evaluating design ideas and solutions	• identify a design process used by a designer • consider short-term and long-term consequences of design in the design process	**Students** • pair-share to list the steps of a design process that could have been used when designing and producing the toy used in the previous activity • evaluate and explain the long and short-term consequences of the toy design to two other pairs of students.	Analysis shows student understanding of product life cycle. Pair discussions reveals student ability to explain and justify the long and short-term consequences of the toy design.	Teacher observation of students' analysis. And teacher gives oral feedback during pair discussions.
• research methods – needs analysis – surveys and interviews – searching techniques including the use of the internet • characteristics and properties of timber and timber products • industrial production methods • factors affecting design – environmental – resource availability – physical and material properties • environmental and sustainability considerations • design processes – managing resources	• use effective research methods to identify needs and opportunities and locate information relevant to the development of each design project • identify, select and use appropriate materials for a design project • examine factors affecting design in the areas of study Built Environments, **Products**, and Information and Communications • identify ethical, environmental and sustainability considerations relevant to each design project • consider short-term and long-term consequences of design in the design process	**Students** **(*Assessment for learning activity 1: Investigating and Researching)*** • research a tree grown in NSW and investigate the characteristics and properties of the timber, its logging and its environmental impact and the processing of timber products • use a report format to document the life story of the tree from cradle to grave • word process the report using word-processing features.	As students investigate they demonstrate their skills in using ICT. Report demonstrates student understanding of factors affecting design, characteristics and properties of timber, and environmental and sustainability considerations. Report demonstrates student ability to use word-processing features.	Teacher provides oral feedback as student use ICT. Teacher provides written feedback on the report. Teacher gives oral feedback on the word-processed report.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• using ICTs to plan, develop and document design projects	• use word-processing features including page numbering and page breaks, find and replace, word count, spell check and thesaurus, columns and sections, inserting text/ objects/images.			
• ethical and responsible design • the nature of the work of designers as individuals and as collaborators	• explain the responsibilities of designers	**Class** • participates in a debate such as 'War toys should be banned' • views a video such as *Designing Toys* and discusses the work of toy designers • responds to teacher-led discussion on such things as: What are the responsibilities of toy designers? How do designers address issues relating to gender?	Student contribution to discussion reveals their understanding of the role of a designer and their contribution to the quality of life.	Teacher observation and oral feedback during discussion.
• needs and opportunities in the areas of study – Built Environments – **Products** – Information and Communications • the nature of the work of designers as individuals and as collaborators	• identify needs and opportunities that require solutions in the areas of study • apply group work and collaborative strategies to project development	**Students** • form groups to develop and conduct a survey of parents of young children to identify the needs and requirements of toys for young children • identify toy users' needs and report to the class • identify a need or opportunity for the development of their own design project.	Observation of the roles of the student demonstrates their ability to collaborate. The oral presentation of the survey results reveals student understanding of needs and opportunities.	Teacher observation and oral feedback on participation in the group. Teacher observation of oral presentation giving oral feedback.
• developing criteria for success as a tool for assessing design development and production	• apply criteria for success in decision making during the development of each design project	**Students** • negotiate, develop and record the criteria for success that meet the needs and constraints of the design project. The criteria should complete the sentence: A well designed toy for a young child will…	The written criteria for success demonstrates student understanding of the use of criteria as a tool for assessing design.	Teacher observation and oral feedback of written criteria.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• research methods – needs analysis – surveys and interviews – searching techniques including use of the internet • communication methods including – drawings, sketches and models – written reports – oral presentations – digital presentations	• use effective research methods to identify needs and opportunities and locate information relevant to the development of each design project • manipulate images with tools such as editing, resizing, grouping, aligning and positioning	**Students** • research the variety of toys available on the market • import and manipulate information and images to create a collage of toy designs • annotate the collage to show the design features and materials used for toys • post collages in the room for peer viewing and evaluation.	The collages produced show student skill in the use of ICT, research, planning and development of ideas and information.	Teacher assess collages and provides written feedback.
• factors affecting design – function – aesthetics – human form – scale – ergonomics – legislation including OHS – cost – socio-cultural – resource availability – physical and material properties – safety • research methods – needs analysis – surveys and interviews – searching techniques including using the internet	• examine factors affecting design in the areas of study of Built Environments, **Products**, and Information and Communications • evaluate the appropriateness of specific design solutions for different cultural groups including Aboriginal and Torres Strait Islanders and other Indigenous peoples • use effective research methods to identify needs and opportunities and locate information relevant to the development of each design project	**Class** • brainstorms toys from different cultures including Aboriginal and Torres Strait Islanders and other Indigenous peoples. **Students** • form groups and select a toy from a different cultural group • research the toy and the significance of play in the selected cultural group • evaluate the appropriateness of the toy for the cultural group • present an oral presentation of findings to the class.	Research report and oral presentation reveal student understanding of the appropriateness of solutions for different cultural groups.	Teacher observation of student research and oral feedback. Teacher gives written feedback on report and oral presentation.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• methods used to generate creative design ideas including – mind mapping – brain storming – sketching, drawing and modelling • factors affecting design – function – aesthetics – human form – scale – ergonomics – legislation including OHS – cost – socio-cultural – resource availability – physical and material properties – safety	• use a variety of methods to generate creative design ideas for each design project • describe the factors affecting design in the development of each project	**Students** • brainstorm and mind map to identify ideas for the design project ***(Assessment for learning activity 2: Generating Design Ideas)*** • sketch and communicate a creative toy design suitable for a young child • label and describe the factors considered when designing the toy.	Mind map of design ideas in workbooks and student sketches demonstrate their understanding and skill in generating and communicating design ideas. They show an understanding of the factors considered when designing toys for young children.	Teacher observation of mind map and oral feedback. Teacher gives written feedback on sketches and labelling.
• use of design folio to record and reflect on design ideas and decisions • using ICTs to plan, develop and document design projects	• use a design folio to record and reflect on design ideas and decisions • compose a design folio for a specific audience in electronic format, including features such as tabs, indents, headers and footers, margins and line and paragraph spacing and using appropriate layout and graphic design	**Students** • develop a design folio in electronic format to communicate the research and the creative ideas generated • use features such as tabs, indents, headers and footers, margins and line and paragraph spacing and apply appropriate layout and graphic design when composing the design folio.	Design folio demonstrates student use of researching, communicating and ICT skills.	Teacher gives written feedback on design folio development.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• experimentation and testing of design ideas • communication methods including – drawings, sketches and models – written reports – oral presentations – digital presentations	• apply the results of experimentation to designing and making when developing each design project • sketch, draw and model to aid design development	**Students** • experiment with a range of design ideas and document the results • refine design ideas and model these in card and paper to develop possible alternatives.	Completed experiments in student workbooks demonstrate their ability to test ideas. Models of student ideas demonstrate student ability to communicate design ideas.	Written feedback on experiment results. Teacher observation and oral feedback.
• relationship of experimentation to success criteria	• identify, interpret and evaluate data from a variety of sources	**Students** • judge the proposed toy ideas in terms of the criteria for success, eg aesthetics, usefulness, suitability, ease of production using results from experiments.	Student judgements indicate their level of understanding of the relationship between experimentation and criteria for success.	Teacher observation and oral feedback.
• communication methods suitable for specific audiences including – users and clients – technical experts – peers • skill development and refinement	• communicate information appropriate to specified audiences • practice and refine skills needed for design projects	**Students** • practice and refine sketching and drawing of design ideas • complete a selection of three-dimensional annotated sketches to communicate design ideas • select and justify the final design idea • present final design idea to class members for discussion.	Final detailed drawings of the toy demonstrate student skill in communicating design ideas.	Teacher gives written feedback on sketch.
• risk management strategies • responsible behaviour in working environments • Occupational Health and Safety practices	• manage risk when developing design projects	**Teacher** • explains safety factors to consider when using materials, tools and techniques appropriate to Timber technologies. **Students** • identify the consequences of poor OHS practices • manage risk when working with materials, tools and techniques appropriate to Timber technologies.	Students demonstrate risk management strategies when using tools, materials and techniques.	Teacher observation and oral feedback as students work with tools, materials and techniques.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• maintenance of tools and equipment	• maintain tools and equipment including computer equipment	**Teacher** • demonstrates and explains the maintenance, appropriate use and storage of tools and equipment appropriate to Timber technologies. **Students** • maintain tools and equipment during the production of the toy.	Student use of tools and equipment show their understanding of the correct methods of maintaining tools and equipment.	Teacher observation and oral feedback as students use tools and equipment.
• resource availability including – time – money – materials, tools and techniques – human skills and expertise – other resources • management techniques including action, time and budget planning	• identify resource availability and apply realistic limitations to each design project • develop and apply action, time and budget plans in design projects	**Teacher** • discusses time, action and production plans as ways to plan design activities and focus on the design process considering available resources. **Students** • deconstruct a production plan of a familiar process • construct a production plan of the steps for producing the toy and identify resources required • record the production plan in the design folio.	Production plan in design folio shows student understanding of managing time and resources and setting realistic limitations.	Teacher observation and oral feedback of production plan.
• ethical and responsible design	• be responsible and ethical in the decisions made in the development and production of each design project	**Teacher** • explains the importance of making responsible and ethical decisions in the development and production of the toy from timber. **Students** • write an individual response assessing the ethical, sustainability and environmental aspects of the timber toy, eg the use of plantation timber versus hardwood.	Written response demonstrates student understanding of ethical and environmental considerations when designing.	Teacher gives written feedback to student written response.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• suitable materials, tools and techniques for design projects • a range of appropriate fittings and hardware such as hinges, handles, catches, locks • management techniques including action, time and budget planning	• identify suitable materials, tools and techniques for a design project • identify, select and use appropriate materials for a design project • develop and apply action, time and budget plans in design projects	**Students** • identify suitable materials including timber and fittings for the toy • test and assess material suitability to the identified set of criteria including aesthetics, functionality and appropriateness • list the materials and fittings to be used and develop a simple budget plan	Student testing and assessment of the suitability of materials demonstrate their knowledge of materials. Student budget plan indicates their understanding of management techniques.	Teacher observation and oral feedback on testing and assessment. Teacher written feedback on budget plan.
• the safe and responsible use of materials, tools and techniques in each design project • specific tools related to timber technologies • the function, selection and correct use of a range of contemporary tools used for – marking out and measuring – cutting – joining – finishing including abrasives • machine tools including scroll saw, drill press and disc sanding machines	• use tools and equipment in a responsible and safe manner in each design project • select and correctly use tools of timber technology for a design project	**Teacher** • explains the function of specific tools for timber technologies • discusses the selection and demonstrates the safe use of tools for marking out and measuring, cutting, including the scroll saw and drill press, joining, finishing, including disc sanding machines. **Students** • identify the tools and techniques required for producing the toy and justify the choices • select and safely use appropriate tools and equipment when producing the toy from timber.	As the student identifies and uses tools for the project they demonstrate their understanding of the safe selection and correct use of tools.	Teacher observation and oral feedback on student safe and correct use of tools.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• construction steps that contribute to a quality solution • construction techniques including – cutting – shaping – finishing	• apply a design process that responds to needs and opportunities for each design project • cut, shape and finish timber or timber products • select and use appropriate techniques for the purposes of a design project • use appropriate surface preparations and finishes for a design project	**Teacher** • demonstrates cutting, shaping and finishing of timber to produce quality results. **Students** • practise skills of cutting, shaping and finishing timber • list technical terms related to the techniques, equipment and tools to be used for the toy • identify and use the cutting, shaping and finishing techniques appropriate for the production of their toy • implement the production process to produce the toy • construct a set of instructions that could be used by another person based on their own experiences.	Student use of techniques to construct the toy demonstrates their knowledge and skill in selecting and using techniques appropriate to the project. Student final solution reveals their skills in the use of tools, materials and techniques appropriate for the design.	Teacher observation and oral feedback on techniques used. Teacher written feedback on final solution.
• final evaluation considering – design processes used – design solutions – reflection on learning	• evaluate prior to, during and at completion of each design solution • self-assess and peer-assess design solutions	**Teacher** • evaluates the finished toy, using assessment criteria. **Students** • evaluate the toy against the criteria for success determined earlier in the project • create a class display of toys and design folios.	Student reflections indicate their understanding of the criteria for success.	Peer and teacher oral feedback on final design project.

5.1.1 Sample assessment for learning activity 1: Investigating and Researching Materials

Context
Students have established and applied a design process in earlier design projects, which responds to an identified need. In this unit students have viewed a range of manufactured toys and discussed the factors affecting their design. They have identified the materials and techniques used in the manufactured toys. The purpose of this activity is for students to investigate the factors affecting design, focusing on timber. They explore the characteristics and properties of timber and timber products and examine the environmental and sustainability consequences of its use. Students investigate and research using the internet.

Outcomes
A student:
4.1.2 describes factors influencing design in the areas of study of Built Environments, Products, and Information and Communications
4.2.2 selects, analyses, presents and applies research and experimentation from a variety of sources
4.3.1 applies a broad range of contemporary and appropriate tools, materials and techniques with competence in the development of design projects
4.6.2 identifies and explains ethical, social, environmental and sustainability considerations related to design projects.

Description of activity
Students research a tree grown in NSW and investigate the characteristics and properties of the timber, logging and its environmental impact, and the processing of timber products. They use a report format to document the life story of the tree from cradle to grave. The suggested duration of this assessment for learning activity is 4–6 lessons (160 minutes).

Criteria for assessing learning
(These criteria would normally be communicated to students with the activity.)

Students will be assessed on their ability to:
- locate resources and information
- select and record information and sources
- organise information into a report format demonstrating an understanding of tree types and characteristics, logging and its environmental impacts and the processes involved in manufacturing and disposing of timber products
- communicate and present findings using the report text type.

Guidelines for marking

The following guidelines for marking show one approach to assigning a value to a student's work. Other approaches may be used that better suit the reporting process of the school. Categories, marks, grades, visual representations or individual comments/notations may all be useful.

Range	A student in this range:
High (8–10)	• competently investigates using the information process to define, locate using the internet, select, organise, present and evaluate information • effectively communicates and presents findings using the report text type • demonstrates a high level of understanding of tree types and characteristics, logging and its environmental impact, and the processes involved in manufacturing and disposing of timber products
Satisfactory (4–7)	• carries out sound investigations using the information process to define, locate using the internet, select, organise, present and evaluate information • communicates and presents findings using the report text type • demonstrates a satisfactory level of understanding of tree types and characteristics, logging and its environmental impact, and the processes involved in manufacturing and disposing of timber products
Progressing (1–3)	• investigates and uses, with teacher support, the information process to define, locate using the internet, select, organise, present and evaluate information • communicates and presents findings with guidance using the report text type • demonstrates an elementary level of understanding of tree types and characteristics, logging and its environmental impact, and the processes involved in manufacturing and disposing of timber products.

Feedback

The teacher will provide written feedback to students. Comments will inform them about such things as their:

- ability to define, locate and record information
- understanding of tree types and characteristics, logging and its environmental impact, and the processes involved in manufacturing and disposing of timber products
- use of the report text type when communicating and presenting information.

Future directions

Through this activity students have used the information process to gather information to write a report. Evidence collected through this activity would inform the teacher whether particular students need further learning experience to consolidate their knowledge, skills and understanding. The information process should be used in research activities for future project work and across other curriculum areas. Students should become more confident in working through this process independently as further opportunities are provided.

5.1.2 Sample assessment for learning activity 2: Generating Design Ideas

Context
In this unit of work students have identified the use of toys by young children. They have examined a wide range of existing manufactured toys and identified the factors that affect the design of toys. Students have surveyed parents of young children and identified the needs of users. They have discussed ways of generating creative design ideas and used mind mapping and brainstorming techniques. Through previous experiences they have used techniques to communicate design solutions and practised and refined their skills in sketching. In this activity students apply their understanding of the factors affecting design when generating creative design ideas and solutions.

Outcomes
A student:
4.1.1 applies design processes that respond to needs and opportunities in each design project
4.1.2 describes factors influencing design in the areas of study of Built Environments, Products, and Information and Communications
4.2.1 generates and communicates creative design ideas and solutions.

Description of activity
Students sketch and communicate a creative toy design suitable for a young child. They label and describe the factors considered when designing the toy. The suggested duration of this assessment for learning activity is two lessons (80 minutes).

Criteria for assessing learning
(These criteria would normally be communicated to students with the activity.)

Students will be assessed on their ability to:
- generate creative ideas, which involves the generation of ideas and the degree of difference from existing ideas
- sketch a toy design suitable for young children, which clearly and accurately communicates design ideas
- label and briefly describe a range of appropriate factors that were considered when designing the toy.

Guidelines for marking
The following guidelines for marking show one approach to assigning a value to a student's work. Other approaches may be used that better suit the reporting process of the school. Categories, marks, grades, visual representations or individual comments/notations may all be useful.

Range	A student in this range:
High (8–10)	• demonstrates a high level of creativity in a toy design that is suitable for young children • accurately sketches and effectively communicates creative and detailed design ideas • clearly labels and perceptively describes appropriate factors considered when designing the toy
Satisfactory (4–7)	• demonstrates creativity in a toy design that is suitable for young children • sketches and communicates creative design ideas • labels and describes some factors considered when designing the toy
Progressing (1–3)	• demonstrates limited creativity in a toy design that is suitable for young children • sketches and communicates, in a limited way, basic design ideas • labels and identifies some factors considered when designing the toy.

Feedback

The teacher will provide written feedback to students. Comments will inform them about such things as:

- the evidence of creativity in the design idea
- their use of techniques to sketch and communicate the design idea
- their understanding of the factors affecting the design of the toy
- the use of techniques when labelling the design work.

Future directions

Through this activity students have developed skill in generating and communicating design ideas while considering a number of factors affecting design. This learning can be applied in further unit activities and design projects as students develop more complex projects. If evidence that students have experienced difficulty generating creative design ideas that consider the factors affecting design, further teaching and learning may be needed. Further creative thinking activities may be used to assist students to develop innovative designs.

5.2 Stage 4 Sample Unit of Work: Lights, Camera, Robo Action

<table>
<tr>
<td>Unit description:
This unit of work requires students to design and produce a video clip for a robot that students have designed, built and programmed to perform a dance routine. Students explore new and emerging technologies within the Information and Communications area of study and evaluate their impact on society and the environment. The unit provides opportunities for collaborative activities including group problem-solving, investigating and decision-making. Students use Media and Control Technologies when developing the design project.

In previous units of work students have learnt about design processes and applied a process in the development of their projects.</td>
<td>Outcomes
Focus outcomes:
4.3.1 applies a broad range of contemporary and appropriate tools, materials and techniques with competence in the development of design projects
4.3.2 demonstrates responsible and safe use of a range of tools, materials and techniques in each design project
4.4.1 explains the impact of innovation and emerging technologies on society and the environment
4.5.1 applies management processes to successfully complete design projects
4.6.1 applies appropriate evaluation techniques throughout each design project

Contributing outcomes:
4.1.1 applies design processes that respond to needs and opportunities in each design project
4.1.2 describes factors influencing design in the areas of study Built Environments, Products, and Information and Communications
4.1.3 identifies the roles of designers and their contribution to the improvement of the quality of life
4.2.1 generates and communicates creative design ideas and solutions
4.2.2 selects, analyses, presents and applies research and experimentation from a variety of sources
4.5.2 produces quality solutions that respond to identified needs and opportunities in each design project
4.6.2 identifies and explains ethical, social, environmental and sustainability considerations related to design projects.</td>
</tr>
<tr>
<td colspan="2">Area of study: Information and Communications
Design specialisation: Software Design
Technology/ies: Control Technologies, Media Technologies
Design project: Dancing Robot programmed to perform for a video clip</td>
</tr>
<tr>
<td colspan="2">Length of unit: 20 weeks</td>
</tr>
<tr>
<td colspan="2">Resources: Video Bicentennial Man; access to computer hardware and software such as word-processing software, video cameras, Robolab software or similar, RCX, Lego Dacta components or similar; selection of music for the video clip

Useful websites: www.brainpop.com, www.occdsb.on.ca/~proj4632/teachers.htm, www.ceeotufts.edu/robolab, www.edex.com.au/robolab, www.robocupjunior.org.au http://www.ni.com/robolab, www.tecsoc.org/innovate, www.techreview.com/articles, www.robotslife.com</td>
</tr>
</table>

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• relationship of design to the areas of study of Built Environments, Products, and **Information and Communications**	• describe the nature of each of the areas of study of Built Environments, Products, and **Information and Communications**	**Teacher** • describes the design specialisations in the Information and Communications area of study. **Students** • brainstorm household and personal systems and products that require or have the ability to be programmed.	Student discussion indicates their understandings of programmable systems and products.	Teacher observation and oral feedback of class discussion.
• innovation and emerging technologies relating to tools, materials, techniques or products in each area of study • the impact of innovation and emerging technology on society and the environment • research methods – needs analysis – surveys and interviews – searching techniques including use of the internet	• identify and describe a selected innovation or emerging technology in each area of study of Built Environments, Products, and **Information and Communications** • explain the impact of the innovation on society and the environment including new ICTs • use effective research methods to identify needs and opportunities and locate information relevant to the development of each design project • use the internet	**Class** • discusses robots, robot technology and the concept of control. **Students** • define robotics and robots • identify and discuss examples of robots in everyday activities and in specific applications • use the internet to research and investigate robots and innovative robot technology and explain their impact on society. Useful websites include: www.tecsoc.org/innovate www.techreview.com/articles www.robotslife.com • present research findings to the class.	Identification of robot applications by students reveals their knowledge of robot technology. Investigation results demonstrates student ability to research using ICT Student presentation demonstrates their understanding of innovations and their impact on society and the environment	Teacher gives oral feedback on discussion. Teacher gives oral feedback during investigations. Teacher gives written feedback on presentation.
• ethical and responsible design	• identify ethical, social , environmental and sustainability considerations relevant to each design project	**Students** • view video such as *Bicentennial Man* and discuss ethical issues regarding robotics • visit a site such as www.thetech.org/exhibits/online robotics/ethics/index/html and prepare a report on ethics and robotics in the 21st century.	Discussion and written response demonstrates students' understanding of ethical considerations.	Teacher gives written feedback on students' response.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• needs and opportunities in the areas of study – Built Environments – Products – **Information and Communications**	• identify needs and opportunities that require solutions in the areas of study	**Students** • brainstorm ideas on robots by discussing how robots help humans, why robots might be used instead of humans and what robots do in factories • visit www.brainpop.com and view the technology movie *Robots* and activities such as the quiz • develop ideas and identify a need or opportunity for the development of the design project.	Student brainstorming and discussion demonstrate their understanding of robots and their use. Student use of websites reveals their skill in using the internet. Student identification of an opportunity for their project shows their ability to synthesise ideas and select one of interest.	Teacher observation and oral feedback during discussion on robots. Teacher observation and oral feedback identify opportunity for the design project.
• developing criteria for success as a tool for assessing design development and production	• apply criteria for success in decision-making during the development of each design project	**Students** • negotiate, develop and record the criteria for success that meets the needs and constraints of the design project. The criteria should complete the sentence: A robot that dances a routine in a video clip will …	Student criteria for success statement demonstrates student understanding of the needs and constraints of the project.	Teacher observation and oral feedback provide criteria for success.
• factors affecting design – function – aesthetics – human form – scale – ergonomics – legislation including OHS – cost – socio-cultural – resource availability – physical and material properties – safety	• describe the factors affecting design in the development of each design project	**Teacher** • explains the factors affecting the design of a robot such as the relationship between the robot design (form) and the robot action (function), the resources available to complete the activity, size and scale of the robot, and the performing area and safety issues. **Students** • identify the factors affecting the design of robots for the design project • outline the steps that will need to be followed to design, produce and evaluate the design project.	Student documentation demonstrates their understanding of the function and purpose of the design project.	Teacher written feedback on documentation.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• resource availability including – time – money – materials, tools and techniques – human resources including skills and expertise • design processes including – analysing needs, problems and opportunities – establishing criteria for success – researching – generating creative ideas – communicating ideas – experimenting and testing ideas – risk management – managing resources – producing design solutions – evaluating ideas and solutions	• identify resource availability and apply realistic limitations to the design project • establish a design process that responds to the need and opportunity • apply a design process when developing quality solutions for each design project	**Teacher** • demonstrates the use of diagrams and tables as ways to plan design activities and focus on the design process. **Students** • construct and document in the design folio a plan identifying resources to be used and the steps in the design processes.	Plan in student design folio shows their understanding of managing time and their ability to set realistic limitations. Student documentation of the design process reveals students skill in ICT use for folio development.	Teacher observation and oral and written feedback of plan and design folio development.
• methods used to generate creative design ideas including – mind mapping – brainstorming – sketching and drawing – modelling – experimenting and testing • use of a design folio to record and reflect on design ideas and decisions	• use a variety of methods to generate creative design ideas for each design project • use a design folio to record and reflect on design ideas and decisions	**Class** • forms groups and views a selection of dance video clips noting the synchronisation of dance movements and music. **Students** • work collaboratively and brainstorm ideas for the music, dance movements and routine to be used for the video clip • record these as a mind map in the design folio.	The mind map demonstrates student ability to identify the coordination of music and dance movements in selected music video clips.	Teacher observation and oral feedback on collaborative work and mind maps.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• communication methods including – drawings, sketches and models – written reports – oral presentations – digital presentations	• sketch, draw and model to aid design development	**Students** • draw and sketch initial concepts for the robot design • record ideas for the programming sequence for the robot movements in a flow or sequence diagram.	Student sketches and drawings of the robot design demonstrate how the features (form: size and scale) relate or match with the robot action (function) which is documented in a flow or sequence diagram.	Teacher gives written feedback on robot design and the robot action.
• experimentation and testing of design ideas • component categories for hardware including; input devices, processors and output devices • robots and other mechatronic devices, sensors, actuators such as motors, switches, lights • programmable logic controllers (PLCs) and associated hardware • management techniques including action, time and budget planning	• apply the results of experimentation to designing and making when developing each design project • recognise, connect and use input and output devices to construct systems including sensors, switches, wiring, lights and motors for a design project • develop and apply action, time and budget plans in design projects	**Students** • use experimentation and testing to optimise design ideas • produce and document in the design folio a step-by-step assembly and component diagram for the construction sequence of the robot • identify the parts used in robotics: plates, beam, bricks, sensor, actuators, data loggers, cables, connector pegs, input/output device (IR transmitter) ***(Assessment for learning activity 3: Action and Component Plan for Dancing Robot)*** • develop a step-by-step assembly and component diagram for the assembly sequence of the robot • select the correct robotic kit pieces considering function, size, shape and length.	The step-by-step sequence of operation diagram shows student ability to identify appropriate components for the assembly process. As they work students demonstrate their ability to collaborate and communicate information to their peers.	Teacher provides written feedback on their ability to recognise the correct control components suitable for a robot; to develop a sequenced action plan which is communicated appropriately to their peers.
• relationship of experimentation to success criteria • ongoing evaluation of design ideas and decisions	• identify, interpret and evaluate data from a variety of sources • use criteria for success to reflect on the design process used and the solutions	**Students** • reflect on and judge the effectiveness of the proposed solution using the results of experimentation and the criteria for success, eg aesthetics, usefulness and suitability • make revisions to design ideas.	Student judgements indicate their level of understanding of the relationship between experimentation and criteria for success.	Teacher observation and oral feedback on student judgements.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• risk management strategies • the safe and responsible use of materials, tools and techniques in each design project	• manage risk when developing design projects • use tools, materials and techniques in a responsible and safe manner in each design project	**Students** • identify and manage risk when working with control components that are fragile by nature • use tools, materials and techniques in a responsible and safe manner as they build the robot.	Students demonstrate their understanding of risk management strategies as they safely use tools, materials and techniques.	Teacher observation and oral feedback when students handle components and work with tools, materials and techniques.
• maintenance of tools and equipment	• maintain tools and equipment including computer equipment	**Teacher** • demonstrates and class discusses maintenance, appropriate use and storage of tools and equipment. **Students** • maintain materials and equipment during the building and testing of the robot.	Oral response and student demonstration show their understanding of the correct methods of maintaining tools and equipment.	Teacher observation and oral feedback as students maintain equipment.
• management techniques including action, time and budget planning	• develop and apply action and time plans in design projects	**Students** • develop a time and action plan for the production of the design project and document in the design folio.	Students' written plan reveals their knowledge of management processes.	Teacher provides written feedback on the management plan.
• construction steps that contribute to a quality solution • the nature of work of designers as individuals and collaborators • connecting interdependent devices	• apply a design process that responds to needs and opportunities for each design project • apply group work and collaborative strategies to project development • connect interdependent devices for the purposes of a design solution	**Students** • form groups where members take responsibility for a task including robot assembly, assembly documentation, robot programming, program documentation, and coordination for robot construction and programming • coordinate and instruct team members in the installation and use of interdependent devices to assist or facilitate robot assembly and programming.	Student interaction in group situations indicates their ability to work collaboratively when assembling the robot. Student connection and use of independent devices demonstrate their skill when using control components.	Teacher observation of student collaboration. Teacher observation and oral feedback as students assemble and program the robot.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• data types, formats and information as inputs of design and production • program design • compiling programs • industrial production methods • specific tools relating to control technologies • the function, selection and correct use of a range of contemporary tools including – simple programming languages – simple programs that meet identified needs – construction tools	• identify and select appropriate data for use in a design project • select and use appropriate program development techniques and structures for an identified need • select and correctly use tools appropriate for the construction, maintenance and management of systems for a design project	**Teacher** • introduces software and the use of programming icons appropriate for the dancing robot. **Students** • use a computer application to program the robot and identify the tasks to perform a dance routine • brainstorm the icons that could be used to program the robots to do a variety of tasks • download the program and make the robot complete a series of tasks such as travelling forward, spinning, reversing, repeating tasks using the touch sensors • operate the RCX (the robot brain) using the 'Run' and 'Program' features • experiment with the speed the robot moves at various power levels in time to the selected music.	Student ability to program robot to dance to a selected piece of music demonstrates their skill in using specific control tools and techniques.	Teacher observation and oral feedback while students programming and robot dancing.
• testing systems in the working environment • modelling and prototyping systems • the function, selection and correct use of a range of contemporary tools including – simple testing tools including multimeter	• test function of solutions for a design project • troubleshoot problems with systems • select and correctly use tools appropriate for the construction, maintenance and management of systems for a design project	**Students** • optimise their solution by troubleshooting problems, improving overall robot design for function and coordinating robot movement with the selected music.	Student ability to improve the robot design shows their understanding of testing systems and troubleshooting.	Teacher observation and oral feedback during testing of solutions.

Students learn about:	**Students learn to:**	**Integrated learning experiences, instruction and assessment**	**Evidence of learning**	**Feedback**
• a range of media such as video, animation, audio • software including desktop publishing, presentation, video editing, draw and paint, word processing, web design • the function and correct use of input and output tools used for – capturing images such as digital cameras, video cameras, scanners – storing • collecting information from primary and secondary sources including digitising sound, text, graphics • organising information for an appropriate audience • planning including storyboards, scripts • storing and retrieving	• select and use appropriate data types for particular purposes • select and use appropriate computer hardware and software in the development of a design project • select and use techniques appropriate for the purposes of a design project	**Teacher** • discusses the steps to be followed to produce a video of the dancing robot • discusses the function and correct use of input and output tools • demonstrates the correct use of the video camera. **Students** • develop a plan for the group to work together to produce the video • collect and organise the information required for the video • use storyboards to document each of the steps to produce the video • video the dancing robot • complete the editing process of the video incorporating the selected music using appropriate computer editing software.	Preparation of storyboard shows student skill in illustrating and documenting the process of realisation. The movie presentation demonstrates student ability to incorporate images collected throughout the process, programming, optimisation and presentation.	Teacher written feedback of storyboards and documentation. Teacher observation and oral feedback as students develop their movie presentation.
• displaying the final product • final evaluation considering – design processes used – design solutions – reflection on learning	• select and use techniques appropriate for the purposes of a design project • evaluate prior to, during and at completion of design solution • self-assess and peer-assess design solutions	**Teacher** • evaluates student design project using criteria for assessment. **Students** • evaluate the design project against the criteria for success determined earlier in the project • view class video clips and self and peer assess the results using the assessment criteria.	Teacher and students observe and assess the finished design project using the assessment criteria.	Peer, self and teacher written assessment and feedback of the dancing robot and the video presentation.

5.2.1 Sample assessment for learning activity 3: Action and Component Plan for Dancing Robot

Context
In this unit of work students have experimented with a range of control components that could be used when developing a robot. Students are working on a group project that requires collaboration. This activity is designed for students to demonstrate their understanding of the components required to assemble a robot and the sequence to be followed.

Outcomes
A student:
4.2.2 selects, analyses, presents and applies research and experimentation from a variety of sources
4.3.1 applies a broad range of contemporary and appropriate tools, materials and techniques with competence in the development of design projects
4.5.1 applies management processes to successfully complete design projects.

Description of activity
Students use results of experimentation and testing to develop and produce a step-by-step action and component plan to assemble a robot. Students select and communicate their action and component plan in a way that is appropriate for use by group members. The suggested duration of this assessment for learning activity is 2–3 lessons (80 minutes).

Criteria for assessing learning
(These criteria would normally be communicated to students with the activity.)

Students will be assessed on their ability to:
- identify appropriate control components required for the assembly of a robot
- generate an action plan suitable for the assembly of a robot
- develop a component plan that communicates appropriately to a specified audience.

Guidelines for marking
The following guidelines for marking show one approach to assigning a value to a student's work. Other approaches may be used that better suit the reporting process of the school. Categories, marks, grades, visual representations or individual comments/notations may all be useful.

Marks	A student in this range:
8–10 (High)	• identifies the appropriate control components for the assembly of a robot • generates a comprehensive action and component plan that is accurate and detailed • effectively communicates a plan that is clear and logical in its presentation and appropriate to the audience
4–7 (Satisfactory)	• identifies some appropriate control components for the assembly of a robot • generates a sound action and component plan displaying some accuracy and detail • communicates a plan that is clear in its presentation and appropriate to the audience
1–3 (Progressing)	• identifies a limited number of control components for the assembly of a robot • generates a basic action and component plan that displays limited accuracy and detail • communicates a simple plan that is presented in an elementary way.

Feedback

The teacher will provide written feedback to students. Comments will inform them about such things as:

- recognising the correct components of control technology suitable for a robot
- sequencing an action plan suitable for the assembly of a robot
- developing a component plan
- communicating a plan for a specified audience such as peers.

Future directions

Through this activity students have identified the control component required to assemble a robot and developed an action and component plan that can be followed by themselves and their peers. Evidence collected through this activity would inform the teacher whether particular students need further learning experience to consolidate their knowledge, skills and understanding. The learning from this activity can be applied in further unit activities when planning to produce the video.