

Design and Technology

Upper Secondary Teacher Guide



Papua New Guinea
Department of Education

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Secretary's message

This teacher guide is to be used by teachers when implementing the Upper Secondary Design and Technology subject (Grades 11 and 12) throughout Papua New Guinea. The Design and Technology syllabus framework identifies the learning outcomes and content of the subject as well as assessment requirements. The teacher guide gives practical ideas about ways of implementing the syllabus: suggestions about what to teach, strategies for facilitating learning and teaching, how to assess and suggested assessment tasks.

A variety of suggested learning and teaching activities provides teachers with ideas to motivate students to learn, and make learning relevant, interesting and enjoyable. Teachers should relate learning in Design and Technology to real people, issues and the local environment. Teaching using meaningful contexts and ensuring students participate in appropriate practical activities assists students to gain knowledge and understanding, and demonstrate skills in Design and Technology.

Teachers are encouraged to integrate Design and Technology activities with other subjects, where appropriate, so that students can see the interrelationships between subjects and that the course they are studying provides a holistic education and a pathway for the future.

I commend and approve the Design and Technology Teacher Guide for use in all schools with Grades 11 and 12 students throughout Papua New Guinea.



DR JOSEPH PAGELIO

Secretary for Education

Introduction

The purpose of this teacher guide is to help you to implement the Design and Technology syllabus. It is designed to stimulate you to create exciting and meaningful teaching programs and lessons by enabling you to choose relevant and purposeful activities and teaching activities. It will encourage you to research and look for new and challenging ways of facilitating students' learning in Design and Technology.

The teacher guide supports the syllabus. The syllabus states the learning outcomes for the subject; and outlines the content and skills that students will learn, and suggested assessment tasks.

The teacher guide provides direction for you in using the outcomes approach in your classroom. The outcomes approach requires you to consider assessment early in your planning. This is reflected in the teacher guide.

This teacher guide provides examples of learning and teaching activities, and assessment activities and tasks. It also provides detailed information on criterion-referenced assessment, and the resources needed to teach Design and Technology. The section on recording and reporting shows you how to record students' marks and how to report against the broad learning outcomes.

The outcomes approach

In Papua New Guinea, the Lower Secondary and Upper Secondary syllabuses use an outcomes approach. The major change in the curriculum is the shift to what students know and can do at the end of a learning period, rather than a focus on what the teacher intends to teach.

An outcomes approach identifies the knowledge, skills, attitudes and values that all students should achieve or demonstrate at a particular grade in a particular subject (the learning outcomes). The teacher is responsible for identifying, selecting and using the most appropriate teaching methods and resources to achieve these learning outcomes.

Imagine the student is on a learning journey, heading to a destination. The destination is the learning outcome that is described in the syllabus document. The learning experiences leading to the learning outcome are to be determined by the teacher. The teacher uses curriculum materials, such as syllabus documents and teacher guides, as well as textbooks or electronic media and assessment guidelines, to plan activities that will assist students achieve the learning outcomes. The outcomes approach has two purposes. They are:

- to equip all students with knowledge, understandings, skills, attitudes and values needed for future success
- to implement programs and opportunities that maximise learning.

Three assumptions of outcomes-based education are:

- all students can learn and succeed (but not on the same day or in the same way)
- success breeds further success
- schools can make a difference.

The four principles of the Papua New Guinean outcomes approach are:

1 *Clarity of focus through learning outcomes*

This means that everything teachers do must be clearly focused on what they want students to be able to do successfully. For this to happen, the learning outcomes should be clearly expressed. If students are expected to learn something, teachers must tell them what it is, and create appropriate opportunities for them to learn it and to demonstrate their learning.

2 *High expectations of all students*

This means that teachers reject comparative forms of assessment and embrace criterion-referenced approaches. The 'principle of high expectations' is about insisting that work be at a very high standard before it is accepted as completed, while giving students the time and support they need to reach this standard. At the same time, students begin to realise that they are capable of far more than before and this challenges them to aim even higher.

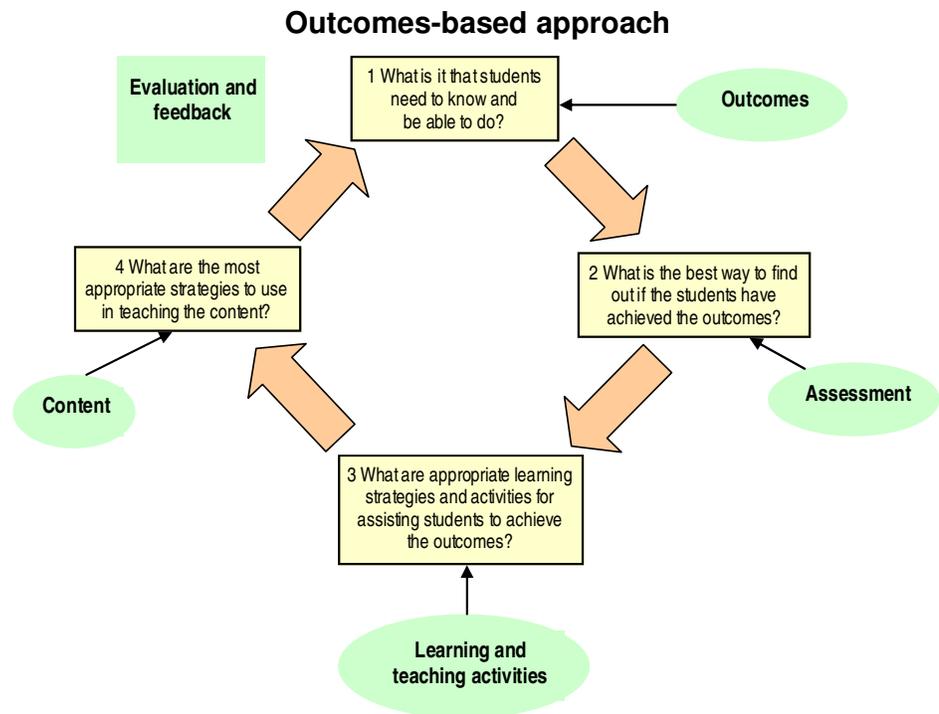
3 *Expanded opportunities to learn*

This is based on the idea that not all students can learn the same thing in the same way in the same time. Some achieve the learning outcomes sooner and others later. However, most students can achieve high standards if they are given appropriate opportunities. Traditional ways of

organising schools do not make it easy for teachers to provide expanded opportunities for all students.

4 *Planning and programming by 'designing down'*

This means that the starting point for planning, programming and assessing must be the learning outcomes—the desired end results. All decisions on inputs and outputs are then traced back from the learning outcomes. The achievement of the outcome is demonstrated by the skills, knowledge and attitudes gained by the student. The syllabuses and/or teacher guides describe some ways in which students can demonstrate the achievement of learning outcomes.



Learning outcomes provide teachers with a much clearer focus on what students should learn. They also give teachers greater flexibility to decide what is the most appropriate way of achieving the learning outcomes and meeting the needs of their students by developing programs to suit local content and involve the community.

The outcomes approach promotes greater accountability in terms of student achievement because the learning outcomes for each grade are public knowledge; that is, they are available to teachers, students, parents and the community. It is not the hours of instruction, the buildings, the equipment or support services that are the most important aspect of the education process but rather, what students know and can do, as they progress through each grade. The outcomes approach means that learning

- has a clearer purpose
- is more interactive—between teacher and students, between students
- has a greater local context than before
- is more closely monitored and acted upon by the teacher
- uses the teacher as a facilitator of learning as well as an imparter of knowledge.

Learning outcomes

The syllabus learning outcomes describe what students know and can do at the end of Grade 12. The level of achievement of the learning outcomes should improve during the two years of Upper Secondary study, and it is at the end of the study that students are given a summative assessment on the level of achievement of the learning outcomes.

The Design and Technology broad learning outcomes listed below identify the knowledge, skills, attitudes and values all students achieve or demonstrate at the end of Grade 12. All unit learning outcomes are based on these broad learning outcomes.

Students can:

1. use the design process to produce appropriate solutions
2. apply safe and appropriate codes and practices in the learning and working environment
3. apply knowledge and understanding of processes through identifying, selecting and using various materials and/or systems
4. demonstrate a range of skills and techniques
5. evaluate the process and product against the design brief
6. communicate ideas and information in a variety of ways.

Learning and teaching

You, as a teacher, must teach the knowledge that is included in the syllabus documents. You have to be able not only to teach what students should know, but also to interpret that knowledge for students in a way that makes it relevant to them, and enables them to begin to acquire skills of analysis and problem solving, which will support learning and teaching. You also need to give students some opportunities to apply their knowledge, to be creative and to solve problems.

Learning and teaching strategies

Students who participate in guided instruction learn more than students who are left to construct their own knowledge (Mayer 2004). You need to employ a variety of learning and teaching approaches because all students do not learn in the same way. The 'auditory learner' prefers to use listening as the main way of learning new material whereas a 'visual learner' prefers to see things written down.

Students should be actively involved in their learning and therefore you need to design appropriate practical activities or experiments, using resources that can be found in your location.

In Grades 11 and 12, students will already have had a wide variety of experiences. You need to make use of your students' experiences when designing and conducting learning in class, so that learning is connected to your students' world. There are many learning and teaching strategies described in the Lower Secondary teacher guides.

The most efficient and long-lasting learning occurs when teachers encourage the development of higher-order thinking and critical analysis skills, which include applying, analysing, evaluating and creating.

Attention should also be paid to developing students' affective and psychomotor skills. To make sure that this happens, you should encourage deep or rich—rather than shallow—coverage of knowledge and understandings.

Developing Design and Technology skills

Students need to develop design and technology skills and techniques. Skills development should happen as a part of students' learning experiences and the learning and practising of skills needs to take place in the context of design and technology. Skills learning tends to be most effective when:

- students go from the known to the unknown
- students understand why it is necessary to master specific skills
- skills are developed sequentially at increasing levels of difficulty
- students identify the components of the skill
- the whole skill and the components of the skills are demonstrated
- there are frequent opportunities for practice and immediate feedback

- the skills being taught are varied in terms of amount and type, according to the needs of students
- the skill is used in a range of contexts.

What do students do in Design and Technology?

Students learn to use the design process to design, make, market and evaluate a product for a purpose.

The design process

'Designing' is about identifying, exploring, developing, applying, communicating and evaluating ideas.

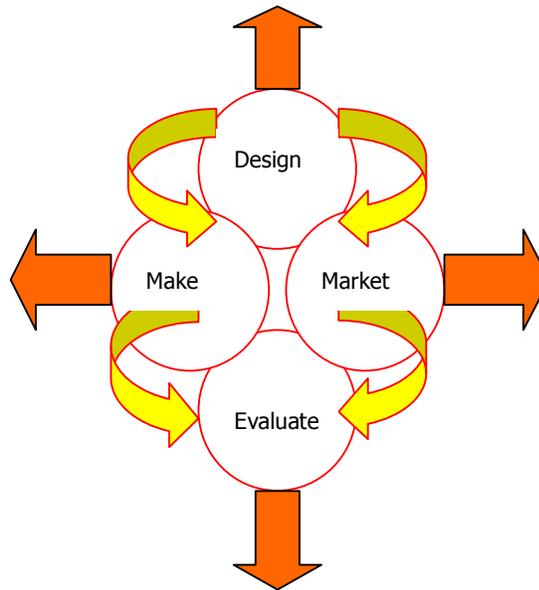
When students design they:

- identify a problem
- clarify or explain the problem
- explore and think of ideas for design solutions
- share ideas with a range of people
- make appropriate design choices in terms of cost and availability of resources
- conduct a needs analysis through questioning (market research)
- model or trial design solutions
- develop and refine ideas

'Making' is about producing and constructing products to meet identified needs.

When students make they:

- work on a design solution individually or cooperatively
- select and work with a range of tools and materials safely and resourcefully
- develop an understanding of the positive and negative consequence that the production, use and disposal of a product could have on a community
- develop a range of skills to work with accuracy to produce a quality product
- adapt ideas and plans in response to specifications and difficulties.



'Marketing' is about advertising, selling and profit.

When students market a product they:

- recognise and meet the needs of the user or buyer
- calculate selling prices and keep a record of sales
- calculate production costs and determine profit
- develop and use competitive marketing strategies
- explore ways to effectively advertise and sell products
- investigate ways to value add to products
- consider alternative ways that a product can be used effectively if it is not marketable

'Evaluating' is about questioning, examining, assessing and reviewing

When students evaluate they:

- review the outcome to check if it successfully meets the needs of the design brief
- reflect on the process of designing, making and marketing to see if aspects of the design process could be modified or improved
- analyse the viability of the product to decide on continuation or possibility of exploring alternative products.

What do teachers of Design and Technology do?

The Design and Technology teacher:

- is interested in and concerned about events and movements in the local, national and global community
- actively seeks to keep informed while also maintaining a critical stance towards sources of information
- takes a principled stand, and supports others who do so, against injustices and inequalities relating to race, gender, class, physical or mental attributes
- informs himself or herself about environmental issues as they impact upon his or her community and on communities and ecological systems globally
- values democratic processes as the best means of bringing about positive change
- engages in some form of social action to support her or his beliefs.

As a teacher, she or he will:

- model democratic values of fairness, justice and equal respect
- use a range of teaching styles that foster both individual development and group cooperation and enable learners to make the best use of their differing learning styles
- encourage her or his learners to adopt a reflecting and questioning position in relation to geographic knowledge
- teach the prescribed curriculum well with an emphasis on infusing issues dealing with human rights, relationships, self-esteem and respect for diversity
- be a critical and thoughtful teacher.

Developing a program

A teaching program outlines the nature and sequence of learning and teaching necessary for students to demonstrate the achievement of the learning outcomes. The content of the syllabus describes the learning context and the knowledge required for the demonstration of each outcome. The relevant learning outcomes for each unit or topic are stated at the beginning of the unit and the requirements of the outcomes are elaborated.

Teachers must develop programs that include appropriate learning activities to enable students to develop the knowledge and skills identified in the outcome statements.

The content prescribed in the units indicates the breadth and depth with which topics should be treated. The sequence of teaching is prescribed by the sequence of content. The learning outcomes and assessment, however, must be central to the planning of the teaching program.

Planning and programming units

The main purpose of planning and programming is to help you to arrange the presentation of the unit in an organised manner. This will help you to know what to teach and when to teach it. It is strongly recommended that

you make plans with the other teachers who teach the same subject. By planning together, you will *all* have better lessons and make better use of your limited resources.

Points to consider when programming

- Which outcomes are students working towards?
- What is the purpose of this unit or topic or learning experience?
- Which learning experiences will assist students to develop their knowledge and understandings, skills, values and attitudes, in Design and Technology?
- What are the indicators of student learning that you would expect to observe?
- How can the learning experiences be sequenced?
- How do the learning experiences in the unit relate to students' existing knowledge and skills?
- How are individual learning needs to be catered for?
- What are the literacy demands of this unit or learning experience?
- What authentic links can be made with the content of other subjects?
- How can school events and practices be incorporated into the program?
- Do the assessment methods address the outcomes and enhance the learning?
- How can the assessment be part of the learning and teaching program?

The planning process

In this teacher guide, ideas for programming and organising have been provided. These have been arranged in steps to help you teach the unit. The steps follow the thinking processes involved in the outcomes approach.

Step 1: Interpreting the learning outcomes

The first step is to read the description in the syllabus. Then study the learning outcomes and what students do to achieve the learning outcomes, in order to determine what students will know and be able to do by the end of the unit.

You need to look at the action verb, concept and context of each learning outcome. This will help you to see what skills and knowledge are embedded in the outcome.

Step 2: Planning for assessment

It is necessary to plan for assessment early to ensure that you teach the content and skills students need to achieve the learning outcomes.

You will have to decide when to schedule assessment tasks to allow yourself time to teach the required content and time for students to develop the necessary skills. You will also need time to mark the task and provide feedback. Practical tasks may, for example, be broken into a series of stages that are marked over several weeks as students progress with making their product. It is not appropriate to leave all the assessment until the end of the unit.

This teacher guide provides performance standards and examples of a marking guide. You should develop marking guides when you are marking tasks to ensure consistency in your assessment. You must also develop

clear and detailed instructions for completing the task and make sure all students know exactly what they have to do.

Step 3: Programming a learning sequence

This step requires you to develop a program outlining a sequence of topics and the amount of time spent on each topic. If the unit involves a project, for example, you may plan to teach some theory at appropriate stages during the project, rather than teaching all the theory before the students start the project.

To develop your program you need to study the topics listed in the syllabus and to think about which learning activities will best provide students with the opportunity to learn the content and practise the appropriate skills, and how long the activities will take. You will have to think about some major activities that last several weeks and smaller activities that may be completed in a single lesson.

Step 4: Elaboration of activities and content

Once you have mapped out your program for the term, you must then develop more detailed plans for each topic in the unit. All units require students to be actively engaged in learning, not just copying from the board. Make sure you develop a range of activities that suit all learning needs—some reading and writing, some speaking and listening, some observing and doing.

Browse through the textbooks and teaching resources you have access to and list the chapters, pages or items that you will use for each topic in your program. The textbooks should also provide you with ideas for activities related to the topic. You may have to collect or develop some resources for yourself.

Once you have sorted out your ideas and information, you can then develop your more detailed weekly program and daily lesson plans.

This teacher guide gives some suggested learning and teaching activities for each unit and some suggested assessment tasks that you might like to use to ensure active learning. It also gives background information on some of the content.

Design and Technology requirements

Students may choose up to two Design and Technology subjects to study. If students study two subjects, each subject must be studied for 240-250 minutes per week. The subjects are: Design and Technology, Practical Skills Technologies, Food Technology and Textile Technology.

Grade	Weeks	Term	Unit	Essential resources for activities and assessment
11.1	10	1	Introduction to Design and Technology <ul style="list-style-type: none"> Occupational health and safety Foundations of technology Technology resources The design process 	Refer to subject area
11.2	10	2	Design and Technology unit <ul style="list-style-type: none"> Design and Technology project (or any Practical Skills Technologies unit or Food Technology unit or Textiles Technology unit)	Refer to subject area
11.3	10	3	Design and Technology unit <ul style="list-style-type: none"> Design and Technology project (or any Practical Skills Technology unit, or Food Technology unit or Textiles Technology unit or TVET Certificate 1 module)	Refer to subject area
11.4	10	4	Design and Technology unit <ul style="list-style-type: none"> Design and Technology project (or any Practical Skills Technologies unit or Food Technology unit or Textiles Technology unit)	Refer to subject area
12.1	10	1	Design and Technology unit <ul style="list-style-type: none"> Design and Technology project (or any Practical Skills Technologies unit or Food Technology unit or Textiles Technology unit)	Refer to subject area
12.2	10	2	Design and Technology unit <ul style="list-style-type: none"> Design and Technology project (or any Practical Skills Technologies unit or Food Technology unit or Textiles Technology unit or TVET Certificate 1 module)	Refer to subject area
12.3	10	3	Design and Technology unit <ul style="list-style-type: none"> Design and Technology project (or any Practical Skills Technologies unit or Food Technology unit or Textiles Technology unit or TVET Certificate 1 module)	Refer to subject area

Assessing Design and Technology

Assessment is an important part of learning and teaching. It is used to:

- evaluate and improve learning and teaching
- report achievement
- provide feedback to students on their progress
- provide feedback to stakeholders.

Criterion-referenced assessment

Assessment in Design and Technology is criterion-referenced and measures students' achievement of the learning outcomes described in the syllabus. In criterion-referenced assessment, particular knowledge, skills or abilities are specified as criteria that must be achieved. The extent to which they are achieved is assessed and facilitated by the teacher.

Criterion-referenced assessment often takes on a problem-centred orientation, rather than a knowledge-based orientation. To achieve an outcome means having to demonstrate the attainment of skills and attitudes, not just write about them. Assessment then becomes more than just a means of judging knowledge and performance—it becomes an integral part of the learning process itself. Criterion-referenced assessment is:

- standards or criterion-referenced; that is, outcomes are judged against pre-defined standards (see below)
- direct and authentic, related directly to the learning situation. This has the potential for motivating learning, since students can see a direct relevance between what is learnt and what is assessed.

Norm-referenced assessment

'Norm-referenced assessment' makes judgements on how well the student did in relation to others who took the test. It is often used in conjunction with a curve of 'normal distribution', which assumes that a few will do exceptionally well and a few will do badly and the majority will peak in the middle, normally judged as average.

Example of a criterion-referenced test

The driving test is the classic example of a criterion-referenced test. The examiner has a list of criteria, each of which must be satisfactorily demonstrated in order to pass; for example, completing a three-point turn without hitting either kerb. The important thing is that failure in one criterion cannot be compensated for by above-average performance in others; nor can a student fail in spite of meeting every criterion (as they can in norm-referenced assessment) simply because everybody else that day surpassed the criteria and was better than him or her. Criterion-referenced assessment has the following characteristics:

- a syllabus that describes what students are expected to learn in terms of aims, outcomes and content

- a syllabus that provides a clear sense of the syllabus standards through its aims, outcomes and content
- tasks designed to produce an image of what students have achieved at that point in the learning and teaching process relative to the outcomes
- standards of performance at different levels: the 'performance standards'
- a report that gives marks referenced to predetermined standards
- assessment tasks that refer to syllabus outcomes, content, assessment components and component weightings
- assessment that is better-integrated with learning and teaching.

Criterion or standards-referenced assessment in Design and Technology

Learning outcomes performance standards					
Learning outcomes	Very high achievement	High achievement	Satisfactory achievement	Low achievement	Below minimum standard
1. Use the design process to produce appropriate solutions	Independently use the design process to design a range of solutions and select and justify the most appropriate option	Independently use the design process to design solutions and select the most appropriate option	Use the design process to produce appropriate solutions	Produce appropriate solutions	Has failed to meet the minimum standard required
2. Apply safe and appropriate codes and practices in the learning and working environment	Independently applies and consistently uses safe and appropriate codes and practices in the learning and working environment	Apply and use safe and appropriate codes and practices in the learning and working environment	Use some safe and appropriate codes and practices in the learning and working environment	Use limited safe and appropriate codes and practices in the learning and working environment	Has failed to meet the minimum standard required
3. Apply knowledge and understanding of processes through identifying, selecting and using various materials and/or systems	Demonstrate extensive knowledge and understanding of a wide range of complex processes through identifying, selecting and using various materials and/or systems	Demonstrate sound knowledge and understanding of, complex processes through identifying, selecting and using various materials and/or systems	Demonstrate knowledge and understanding of, some processes through identifying, selecting and using materials and/or systems	Demonstrate some knowledge by using various materials and/or systems	Has failed to meet the minimum standard required
4. Demonstrate a range of skills and techniques	Independently select and proficiently apply a wide range of relevant skills and techniques to develop and refine original ideas	Independently select and apply a range of relevant skills and techniques	Use a range of skills and techniques to develop original ideas	Use a limited range of skills and techniques to develop ideas with help	Has failed to meet the minimum standard required
5. Evaluate the process and product against the design brief	Demonstrate extensive knowledge and understanding of, and use initiative to evaluate, the process and product against the design brief	Demonstrate broad knowledge and understanding of, and use some initiative to evaluate, the process and product against the design brief	Demonstrate knowledge of, and use some initiative to evaluate, the process and product against the design brief	Use limited initiative to evaluate the process and product against the design brief	Has failed to meet the minimum standard required

6. Communicate ideas and information in a variety of ways	Identify and communicate clearly and concisely ideas and information in a variety of appropriate ways	Identify and communicate clearly ideas and information in a variety of ways	Identify and communicate ideas and information clearly	Communicates in a limited way	Has failed to meet the minimum standard required
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Assessment *for* learning

Assessment *for* learning is often called ‘formative assessment’ and is assessment that gathers data and evidence about student learning during the learning process. It enables you to see where students are having problems and to give immediate feedback, which will help your students learn better. It also helps you plan your program to make student learning, and your teaching, more effective. Often it is informal—students can mark their own work or their friend’s. An example is a quick class quiz to see if students remember the important points of the previous lesson.

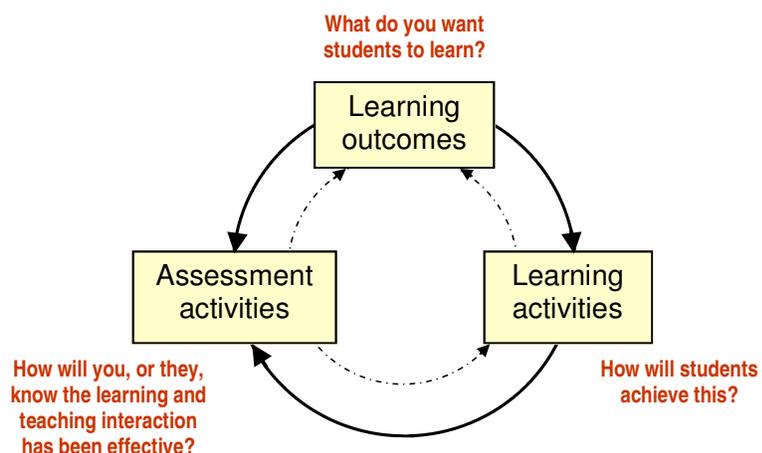
Assessment *of* learning

Assessment *of* learning is often called ‘summative assessment’. Summative assessment is used to obtain evidence and data that shows how much learning has occurred, usually at the end of the term or unit. End-of-year examinations are examples of summative assessment. It is usually done for formal recording and reporting purposes.

Assessing Design and Technology units

In Design and Technology the learning outcomes are assessed using the range of assessment methods specified in the Table of components, weightings and tasks. In deciding what to assess, the starting point is ‘what do you want students to do and/or learn?’ and following from this ‘how will the students engage with the material?’, which in turn leads to the design and development of learning tasks and activities. It is crucial that at this point assessment tasks clearly link back to the learning outcomes and are appropriate for the learning activities. The assessment can be used for formative and summative purposes. Assessment can be represented as:

Assessment process



Once it is clear what needs to be assessed and why, then the form the assessment will take needs to be determined. There are many types of assessment tasks that can be implemented; the factors that will determine choices include:

- the students—how many are there, what is expected of them, how long will the assessment task take?
- the learning outcomes of the subject and how they might be best achieved.

During the year you must set assessment tasks that ensure that all the learning outcomes of the subject have been assessed internally. Each task you set must include assessment criteria that provide clear guidelines to students as to how, and to what extent, the achievement of the learning outcomes may be demonstrated.

Marking guides and assessment criteria help you with the marking process and ensure that your assessment is consistent across classes. It is important that marking guides and assessment criteria are collectively developed.

Students must complete the assessment tasks set. Each task must provide clear guidelines to students for how the task will be completed and how the criteria will be applied. When you set a task, make sure that:

- the requirements of the task are made as clear as possible to the student
- the assessment criteria and performance standards or marking guides are provided to students so that they know what it is that they have to do
- sources or stimulus material used are clear and appropriate to the task
- instructions are clear and concise
- the language level is appropriate for the grade
- it does not contain gender, cultural or any other bias
- materials and equipment needed are available to students
- adequate time is allowed for completion of the task.

Assessment methods

Although assessment components and weightings are stipulated in the syllabus, you decide which assessment method to use when assessing the learning outcomes. You should use a variety of assessment methods to suit the purpose of the assessment. Assessment can be classified into four categories:

- tests
- product or project assessments
- performance assessments
- process skills assessments

Because each has limitations, maintaining a balance of assessment methods is very important.

Tests

A 'test' is a formal and structured assessment of student achievement and progress, which the teacher administers to the class. Tests are an important aspect of the learning and teaching process if they are integrated into the

regular class routine and not treated merely as a summative strategy. Tests allow students to monitor their progress and provide valuable information for you in planning further learning and teaching activities.

Tests will assist student learning if they are clearly linked to the outcomes. Evidence has shown that several short tests are more effective for student progress than one long test. It is extremely important that tests are marked and that students are given feedback on their performance.

There are many different types of tests. Tests should be designed to find out what students know, and also to find out about the development of their thinking processes and skills. Open questions provide more detailed information about achievement than a question to which there is only one answer.

Principles of designing classroom tests

Tests allow a wide variety of ways for students to demonstrate what they know and can do. Therefore:

- students need to understand the purpose and value of the test
- the test must assess intended outcomes
- clear directions must be given for each section of the test
- the questions should vary from simple to complex
- marks should be awarded for each section
- the question types (true or false, fill-in-the-blank, multiple-choice, extended response, short answer, matching) should be varied.

Tests should:

- be easy to read (and have space between questions to facilitate reading and writing)
- reflect an appropriate reading level
- involve a variety of tasks
- make allowance for students with special needs
- give students some choice in the questions they select
- vary the levels of questions to include gathering, processing and applying information
- provide enough time for all students to finish.

Product or project assessments

A 'project' can be an assessment task given to an individual student or a group of students on a topic related to the subject. The project results in a 'product' that is assessed. The project may involve both in-class and out-of-class research and development. The project should be primarily a learning experience, not solely an assessment task. Because a great deal of time and effort goes into producing a quality product from a project assignment task, you should allow class time to work on the project. A product or project:

- allows the students to formulate their own questions and then try to find answers to them
- provides students with opportunities to use their multiple intelligences to create a product
- allows teachers to assign projects at different levels of difficulty to account for individual learning styles and ability levels

- can be motivating to students
- provides an opportunity for positive interaction and collaboration among peers
- provides an alternative for students who have problems reading and writing
- increases the self-esteem of students who would not get recognition on tests or traditional writing assignments
- allows for students to share their learning and accomplishments with other students, classes, parents, or community members
- can achieve essential learning outcomes through application and transfer.

Investigations

An 'investigation' involves students in a study of an issue or a problem. Teachers may guide students through their study of the issue; or individual students, or groups of students, may choose and develop an issue in consultation with the teacher. This assessment component emphasises the student's investigation of the issue in its context, by collecting, analysing, and commenting on secondary data and information. Students should be encouraged to consider and explore a variety of perspectives as they develop and state their position on the issue. Students may present the investigation for assessment in a variety of forms, including one or a combination of the following: a written report, an oral presentation, a website, linked documents, multimedia, a video or audio recording.

Criteria for judging performance

The student's performance in the investigation will be judged by the extent to which the student:

- identifies and describes the issue or problem
- describes and explains the causes and effects
- critically analyses information and outlines possible steps leading to a solution or recommendation.

Portfolios

Portfolios provide evidence for judgments of student achievement in a range of contexts. A portfolio contains a specific collection of student work or evidence. This collection of work should provide a fair, valid and informative picture of the student's accomplishments.

Computer-based tasks

Using computers to administer student assessment can provide flexibility in the time, location or even the questions being asked of students. The most common type of computer-based assessment is based on multiple-choice questions, which can assist teachers to manage large volumes of marking and feedback.

Process skills assessments

This method of the assessment component, the 'process skills assessment', involves assessing students' understanding of concepts based on the

practical skills that can be used, the evaluation of work done, and/or the reporting of information. These skills include, for example:

- interpretation skills
- evaluation skills
- reflection skills
- communication skills (such as writing, speaking and listening).

Types of assessment tasks

Using different assessment tasks is the way to make sure that students are able to demonstrate the range of their abilities in different contexts. Each category has advantages in assessing different learning outcomes. For example, a selected response assessment task, such as a series of multiple-choice questions, is able to assess all areas of mastery of knowledge, but only some kinds of reasoning.

Assessment ideas for individual students or groups

Tests	Products or projects	Performances	Process skills
Essay	Case studies	Activities	Anecdotal records
Multiple-choice	Computer creations	Cooperative learning	Checklist observations
Short answer	Drawings	group activities	for processes
Matching	Graphs, charts, diagrams	Explanations	Conferences: teacher and peer
True or false	Handbooks	Field trips	Debriefing interviews
Practical	How-to books	Presentations	Experiences checklists
	Journals		Journal entries
	Models		regarding processes
	Photographs		Observations
	Portfolios		Process folios
	Product descriptions		Telling how they did something and justifying the approach
	Projects		
	Proposals		
	Student-kept charts		
	Tests		
	Work products		

Feedback

When you assess the task, remember that feedback will help the student understand why he or she received the result and how to do better next time. Feedback should be:

- *constructive*, so students feel encouraged and motivated to improve
- *timely*, so students can use it for subsequent learning
- *prompt*, so students can remember what they did and thought at the time
- *focused on achievement*, not effort. The work, not the student, should be assessed
- *specific to the unit learning outcomes*, so that assessment is clearly linked to learning.

Types of feedback

Feedback can be:

- *informal or indirect*—such as verbal feedback in the classroom to the whole class, or person to person
- *formal or direct*—in writing, such as checklists or written commentary to individual students, in either written or verbal form
- *formative*—given during the topic with the purpose of helping the students know how to improve
- *summative*—given at the end of the topic with the purpose of letting the students know what they have achieved.

Who assesses?

Teacher assessment

Assessment is a continuous process. You should:

- always ask questions that are relevant to the outcomes and content
- use frequent formative tests or quizzes
- check understanding of the previous lesson at the beginning of the next lesson, through questions or a short quiz
- constantly mark or check the students' written exercises, class tests, homework activities and so on
- use appropriate assessment methods to assess the tasks.

Frequency of assessment

You should schedule the specified assessment tasks to fit in with the teaching of the content of the unit that is being assessed. Some assessment tasks might be programmed to be undertaken early in the unit, others at the end of the unit. You should take care not to overload classes with assessment tasks at the end of the term.

Judging student performance

Student achievement is recorded and reported against standards. You must use performance standards or marking guides, examples of which are provided in this teacher guide, when making a decision about the achievement of your students in relation to the learning outcomes. The performance standards describe the level at which the student has to be working to achieve a particular standard or mark.

Students should always have access to a copy of the assessment criteria and the performance standards, so that they know what it is they have to know and be able to do to get a good mark in a particular task. The performance standards will help you in your marking and will help your students improve their performance in the future. They are useful when providing feedback to students, as they explain what it is the student needs to do to improve.

Moderation

To make sure that you are interpreting the performance standards correctly when assessing your students, it is important to undertake Design and

Technology moderation of student work within your school and with teachers of nearby schools.

To moderate student work, a common assessment task must be used and a marking scheme developed so that all students complete the same task under the same conditions, and all teachers use the same marking scheme. Teachers can then compare (moderate) the students' work and come to a common understanding of the performance standards and the requirements for a particular mark or level of achievement.

Moderation enables you to be sure that your understanding of the required standards for levels of achievement is similar to the understanding of other teachers and that you are assessing students at the appropriate level.

Self-assessment and peer assessment

Self-assessment and peer assessment help students to understand more about how to learn. Students should be provided with opportunities to assess their own learning (self-assessment) and the learning of others (peer assessment) according to set criteria. Self-assessment and peer assessment:

- continue the learning cycle by making assessment part of learning
- show students their strengths and areas where they need to improve
- engage students actively in the assessment process
- enable students to be responsible for the learning
- help to build self-esteem through a realistic view of their abilities
- help students understand the assessment criteria and performance standards.

Managing assessment tasks for Design and Technology

Usually, the marking of assessment tasks is done by the teacher. To reduce the amount of work it is necessary to develop a strategic approach to assessment and develop efficiencies in marking.

In Design and Technology there are some assessment tasks that may be new to teachers and students. Below are suggestions on how to manage some of these tasks to minimise marking or presentation time.

Develop efficiency in marking

Clarify assessment criteria

Plan the assessment task carefully, and make sure that all students are informed of the criteria before they begin. Discuss the task and its criteria in class, giving examples of what is required. Distribute a written copy of the instructions and the criteria, or put them on the board. Making the assessment criteria explicit speeds marking and simplifies feedback.

Supply guidelines on what is required for the task

Supplying guidelines reduces the amount of time wasted evaluating student work that is irrelevant.

Use attachment sheets such as marking guides

An assignment attachment sheet, which is returned with the assessed work, rates aspects of the task with a brief comment. Such a system enables each student's work to be marked systematically and quickly. This strategy can be applied to posters, presentations and performances.

Assess in class

Use class time to carry out and to assess tasks. Presentations or projects that are marked by you or the students enable instant developmental evaluation and feedback. Brief assessments of projects, stages of the design process, or practical work take less time to mark and are useful because they give immediate feedback to students on their progress and allow you to mark the project in stages with minimum effort.

Feed back to the whole class

Giving feedback to the whole class can cut down on the amount of individual feedback required. On returning assessed work, emphasise the criteria for judging the work, discuss the characteristics of good and bad answers, and highlight common strengths and weaknesses.

Set group-work alternatives

Assess one performance per group. The student's mark is the group mark, but may include a component based on the contribution of the individual. A strategy for allocating an individual mark includes each member of the group using criteria to evaluate the relative contributions of individuals, with the marks averaged for the individual.

Set clear deadlines

Set aside a time for marking. Be careful about extending this period (by allowing students to hand in work late).

Shift the responsibility

Introduce self-assessment and peer assessment

Develop in students the skills to evaluate their own work and that of their peers. With the students, use the assessment criteria against which work is judged, highlighting strengths and weaknesses. Self-assessment increases the amount of feedback students get. It can supplement or replace teacher assessment.

Treat each task differently

Every piece of work need not be evaluated to the same degree; a mark need not be the outcome in every case; and every piece of student work need not contribute to the final grade. Assessment is designed to enhance the learning and teaching experience for the teacher and the learner, not just to give marks.

Sample assessment tasks for Design and Technology units

All assessment tasks must test whether or not the student has achieved the outcome or outcomes. Each task must have clear and detailed instructions. Students must know exactly what they have to do. You should develop marking guides when you are marking tasks to ensure consistency of your assessment. The following are examples of assessment tasks and a marking guide.

Grade 11

Sample task: Design and make a product

Use the design process to design and make a product in the technology studied. A design portfolio showing all the steps undertaken in the making of the product must also be produced.

Learning outcomes

Students can:

1. use the design process to produce appropriate solutions
2. apply safe and appropriate codes and practices in the learning and working environment
3. apply knowledge and understanding of processes through identifying, selecting and using various materials and/or systems
4. demonstrate a range of skills and techniques
5. evaluate the process and product against the design brief
6. communicate ideas and information in a variety of ways.

Assessment criteria

Students will be assessed on the extent to which they:

- apply safe work practices
- use appropriate materials and processes to make the product
- select and use with skill the tools and techniques to make the product
- produce a product that meets the design brief
- provide evidence in the portfolio of investigation, design ideas, drawings, materials and equipment used and evaluation of process and product.

Task specifications

The design portfolio might include:

- results of investigation
- rough notes and annotated sketches of design ideas
- timelines
- final drawings or plans
- evaluation notes or report.

100 marks

Grade 12

Sample task: Design portfolio

Use the design process to design and make a product in the technology studied. A design portfolio showing the steps undertaken in the making of the product must also be produced.

Learning outcomes

Students can:

1. use the design process to produce appropriate solutions
2. apply safe and appropriate codes and practices in the learning and working environment
3. apply knowledge and understanding of processes through identifying, selecting and using various materials and/or systems
4. demonstrate a range of skills and techniques
5. evaluate the process and product against the design brief
6. communicate ideas and information in a variety of ways.

Assessment criteria

Students will be assessed on the extent to which they:

- apply safe work practices
- use appropriate materials and processes to make the product
- select and use with skill the tools and techniques to make the product
- produce a product that meets the design brief
- provide evidence in the portfolio of investigation, design ideas or drawings, materials and equipment used, and evaluation of the process and product.

Task specifications

The design portfolio might include:

- results of investigation
- rough notes and annotated sketches of design ideas
- timelines
- final drawings or plans
- evaluation notes or report.

100 marks

Example of a marking guide

Marking guide: Design portfolio				20 marks
Criteria	Very high achievement 18–20 marks	High achievement 14–17 marks	Satisfactory achievement 10–13 marks	Low achievement 0–9 marks
Designing and planning	Documentation shows a problem is thoroughly identified with a wide range of possible ideas for outcomes. A timeline is included. Detailed notes and sketches for innovative or original ideas generated. Detailed reasons for final choice of product are given Portfolio includes: <ul style="list-style-type: none"> • content page • heading • excellent presentation and attention to detail 	Documentation shows a problem is clearly identified with a range of possible ideas for outcomes. A timeline is included. Clear notes and sketches for innovative or original ideas generated. Clear reasons for final choice of product are given. Portfolio includes: <ul style="list-style-type: none"> • content page, • heading • very good presentation and attention to detail 	Documentation shows a problem is identified with some possible ideas for outcomes. A timeline is included. Some notes and sketches for ideas generated. Some reasons for final choice of product are given Portfolio includes: <ul style="list-style-type: none"> • content page, • heading • good presentation and attention to detail 	Documentation shows a problem is not clearly identified with a limited range of possible ideas for outcomes. A timeline is included. Few notes and sketches for ideas generated. A few reasons for final choice of product are given Portfolio does not include: <ul style="list-style-type: none"> • content page, • heading • unsatisfactory presentation and attention to detail
Making	Documentation includes <ul style="list-style-type: none"> • an extensive range of processes and materials used to complete the product in detail • all stages of production 	Documentation includes <ul style="list-style-type: none"> • most processes and materials used to complete the product • most stages of production 	Documentation includes <ul style="list-style-type: none"> • some process and materials used to complete the product • some stages of production 	Documentation includes <ul style="list-style-type: none"> • limited process and materials used to complete the product • few stages of production
Evaluation	Documentation clearly reflects an evaluation of the design process, outlining what was successful, what could be improved A detailed evaluation of how the product meets the design brief is included. Extensive documentation of what has been learnt is included in portfolio	Documentation reflects an evaluation of the design process, outlining what was successful, what could be improved An evaluation of how the product meets the design brief is included Very good level of documentation of what has been learnt is included in portfolio	Documentation reflects some evaluation of the design process, outlining what was successful, what could be improved A brief but adequate evaluation of how the product meets the design brief is included. Sound level of documentation of what has been learnt is included in portfolio	Documentation reflects a very limited evaluation of the design process. An inadequate evaluation of how the product meets the design brief is included. Very limited level of documentation of what has been learnt is included in portfolio

Learning activities and assessment tasks: Practical Skills Technologies

Examples of Practical Skills Technologies units with suggested learning activities and assessment tasks are provided in the following sections. The Practical Skills Technologies learning outcomes must be taught and assessed in any unit that is selected.

Learning outcomes

Students can:

1. use the design process to produce appropriate solutions
2. apply safe and appropriate codes and practices in the learning and working environment
3. apply knowledge and understanding of processes through identifying, selecting and using various materials and/or systems
4. demonstrate a range of skills and techniques
5. evaluate the process and product against the design brief
6. communicate ideas and information in a variety of ways.

Practical Skills Technologies unit: Building Construction

Building Construction provides students with opportunities to design a variety of buildings to house people, vehicles, animals or plants to meet community needs. They are able to put ideas into practice through practical projects. The knowledge and skills gained can be applied not only to creating new buildings, but also to maintenance of existing buildings. Building Construction can be studied for one term, a year or two years, depending on the complexity of the project that the student undertakes.

Instead of Building Construction, students could undertake TVET Building Construction modules if the school is registered as a provider of the course or if the student can undertake the modules in a nearby TVET institution.

To achieve the Practical Skills Technologies learning outcomes, students:

- investigate types of buildings and their functions in the community
- draw and read building plans
- use the design process to produce building plans
- apply knowledge and understanding through identifying, selecting, and using various materials and systems:
 - prepare building sites
 - select and use tools and materials appropriately
 - lay foundations of buildings
 - accurately mix and lay concrete

- apply joining, assembling and bracing skills to construct quality buildings
- apply finishes: clear plastic and pigmented finishes, surface preparation, cleaning agents, brush and roller methods
- demonstrate a range of operational skills and techniques
- construct a building
- apply safe and appropriate rules and practices in the classroom, workshop or worksite
- evaluate the appropriateness of materials or systems used to construct a building.

Content

Students acquire knowledge and skills through the learning of this content.

Knowledge

- building conventions, architectural drawings, designing a building, design drawings, building regulations
- types of buildings and their components, structure, floors, walls, roofs, steps, doors, windows, ceiling, cladding, roof frame, roof pitches, roof trusses, framework
- structural and specification for major building parts (bearers, joists, beams, rafters, roof trusses)
- storage and preservation of building materials
- types and functions of various joints used in timber construction
- wind and cyclone technology
- quantity estimation and costing procedures

Materials

- materials: types, uses, availability, cost; for example, for timber, bricks, fibro, plywood, concrete, steel, roofing iron, glass, nails, bolts and nuts, screws, strap braces, cleaning agents
- hardwood and softwood for construction

Tools

The function, selection and correct use of a range of contemporary tools:

- tools, types, uses, availability, cost, safe handling, storage, care, maintenance; for example, for hand tools, hammers, saws, plane, chisel, adhesives, abrasives, squares, levels, screw drivers, bench vice, power tools, electric drill, jointer, belt sander
- construction equipment and tools like hose level, spirit level, builders square, building tape, bricklayers line, concrete mixer

Techniques

- profiling techniques
- levelling, squaring, joining, assembling, bracing
- footing and concreting, construction techniques

- fastening, holding down, wind and cyclone technology
- cladding, flooring, painting
- replacing and maintenance techniques
- safety on a building site and working with building tools

Design project

Use the design process to construct a building or model and produce a design portfolio showing all the steps undertaken in the construction.

Suggested learning experiences in building technology

- Survey home owners to investigate maintenance needs of buildings in your locality and skills, tools and materials needed to carry out the work
- Compare types of houses in your locality and reasons for similarities and differences. Identify advantages and disadvantages for tenants
- Produce and interpret working plans and sketches for buildings
- Develop a sequenced production plan and timeline to build a small building, such as a genset house or chicken house
- Safely use materials, tools and equipment to carry out a building maintenance task such as changing screen wire on windows, changing door locks, repairing stairs, replacing hinges or knobs or doors, replacing floors, repairing furniture, replacing louvre frames and louvres, changing door locks. Mix, pour and finish concrete jobs, make concrete blocks
- Construct a flow chart to show processes
- Demonstrate appropriate skills to paint or repaint walls or ceilings and the appropriate use and care of equipment
- Present a folio that documents processes in the production of a designed product or maintenance task
- Prepare a design brief, develop drawings and construct a model house
- Use resources effectively and safely to construct a building for a plant nursery and seedling boxes
- Do a case study of a building innovation in your locality indicating design factors and influences
- Design and make furniture for a home, office, school or church
- Develop a pamphlet on safety procedures on building sites

Suggested assessment tasks

Task: Research

Investigate a range of factors that influence building styles, fittings and furnishings and clarify the purpose for collecting and analysing information relating to the issue.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to designs for building projects

20 marks

Task: Practical

Use the design process to design a building or building maintenance project. Evidence will include a design portfolio and the actual product. The design portfolio might include:

- results of investigation and timelines
- annotated sketches of design ideas
- final drawings or plans
- evaluation notes or a report.

The practical product will be assessed on appropriate uses of materials, tools and techniques and management skills to produce a high quality major design project. The product reflects a sound understanding of design theory and factors affecting design.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can provide evidence in the portfolio of annotated sketches of design ideas, sketches of possible solutions and indicating final choice to make, final working drawings, list of materials and equipment used, and evaluation of the process and success of the completed product.

60 marks

Task: Test

A short written test based on the topics covered in the unit.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of tools, materials, skills and processes used in designing a building or building maintenance project.

20 marks

Total: 100 marks

Practical Skills Technologies unit: Concrete Technology

Students develop knowledge and skills to use concrete appropriately in the community, as in footpaths, paving bricks, house bricks, concrete blocks and concrete foundations of buildings, methods of repair and maintenance of cement products. Students learn about and use materials, tools and equipment to make, repair and maintain concrete products.

To achieve the Practical Skills Technologies learning outcomes, students:

- investigate uses of concrete in the community

- initiate plans and apply appropriate techniques to design and make a concrete product
- select and use appropriate hand tools for cementing
- analyse the components of concrete and mix concrete with accurate ratio of materials
- work safely and competently with concreting materials and equipment
- demonstrate practical skills in making, laying and finishing of concrete
- demonstrate care and cleaning of tools and equipment used
- finish concrete surfaces: brushed finish, wood-float finish, exposed aggregated finish, steel trowel finish.

Content

Students acquire knowledge and skills through the learning of this content.

Materials

- materials for concreting, such as cement, sand, gravel, water, broken bricks, crushed hard stone, river gravel, rough and smooth aggregates

Tools

- tools and equipment: types, uses, availability, cost, safe handling, storage, care, maintenance; for example, for spades and shovels, wheelbarrow, string-line, nails, claw hammers, sledge hammers, line and spirit levels, clear hose for water, level, crosscut saw, square

Techniques

- mixing ratio
- planning site, preparation, forming, and reinforcing tools: bush-knives, spades and shovels, wheelbarrow, string-line, nails, claw hammers, sledge hammers, line and spirit levels, hose for water, level, crosscut saw, square
- levelling, mixing and finishing tools: trowel, float (metal or wood), edging tool, broom and brush, bucket, spades and shovels, straight edge (timber for screening), cement mixer, mixing platform
- power tools (portable): circular saw, electric drill, and electric jointer
- safety when working with cement and concreting tools

Design project

Use the design process to make concrete products or use concrete in a project, and produce a design portfolio showing all the steps undertaken.

Suggested learning experiences in concrete technology

- Devise plans to construct a concrete footpath or driveway
- Investigate methods of making and laying paving bricks of different shapes and preparing sites for paved areas
- Design and construct concrete gutters where ground drainage is needed

- Demonstrate the safe, competent and accurate use of concrete materials, tools and equipment
- Construct a flow chart to show processes in laying the concrete foundations for a building; for example, pig pen or house
- Develop a production plan to make concrete blocks or house bricks
- Take measurements and estimate materials needed and cost to concrete a basketball court

Suggested assessment tasks

Task: Research

Investigate the layout of concrete walkways or pathways and suggest factors that influenced decisions in their construction.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information and construction of recommendations that could lead to designs for further concreting projects

20 marks

Task: Practical

Use the design process to design and complete a concreting project. Evidence will include a design portfolio and the actual product. The design portfolio might include:

- results of investigation and timelines
- annotated sketches of design ideas
- final drawings or plans
- evaluation notes on both the product and processes.

Assessment criteria

The practical concreting product will be assessed on appropriate uses of materials, tools and techniques and management skills to produce a high quality major design project. Students provide evidence in the portfolio of annotated sketches of design ideas and possible solutions, indicating final choice to make, final working drawings, list of materials and equipment used and evaluation of the process and success of the completed product.

60 marks

Task: Test

A short written test based on the topics covered in the unit.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of tools, materials, skills, and processes used in the design of a concreting project.

20 marks

Total: 100 marks

Practical Skills Technologies unit: Electrical Technology

Electrical technology enables students to explore electrical circuits. The unit focuses on the principles and characteristics of circuit functions and operations. The practical component involves actual circuit construction. Students use the basic electrical items to design appropriate electrical circuit. Safety precautions and dangers of working with electricity are stressed.

To achieve the Practical Skills Technologies learning outcomes, students:

- identify resources and a range of tools, equipment and materials required for electrical projects
- initiate plans and apply appropriate techniques and processes to design and make an electrical circuit
- work safely and competently with materials and equipment, including connecting electrical circuits correctly.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Knowledge

- electricity, methods of producing electricity, types of electrical systems and symbols, conventional electron current flow, common electrical faults
- electrons, theory of an atom, types and function of semiconductors and resistors, atomic structure of materials, such as copper
- batteries: purpose, construction and components, type of connections, charging
- uses of meters, types of electrical meters, terms and definitions, multi-testers, ac and dc currents, application of Ohm's Law

Materials

- solder, bulbs, electrical wires, connectors and fittings
- control devices, such as fuses and switches
- insulation tapes, crocodile clips

Tools

- screwdrivers, pliers, side cutters, soldering iron
- hand tools: non-cutting, safety aspects and application, open spanners, ring spanners, combination spanner, shifting spanners, sockets and accessories
- hand tools: cutting, safety aspects and application, files, chisels, pliers, tin snips, drills

Design project

Use the design process to use electrical components in a project, and produce a design portfolio showing all the steps undertaken in the project.

Suggested learning experiences in electrical technology

- Apply electrical technology to a practical situation
- Replace a starter and fluorescent tube, and other types of light bulbs
- Investigate types of bulbs and light fittings used in hotels, offices, homes, security lights, street lights, automatic light switches (light-dependent resistor)
- Explain how a light switch works
- Make an electric circuit
- Design circuits for rooms and homes
- Attach a three-point plug to an electric cord
- Examine a worn and frayed electric cord and consider how it could be insulated
- Have a qualified electrician as a guest speaker to talk about installing power points (general purpose output) for electric plugs and associated safety issues
- Evaluate electrical household appliances and their contribution to quality of life; for example, jug, toaster, television set, radio, iron, washing machine, refrigerator, wok, frying pan, stereo system
- Identify and assess useful troubleshooting skills for the average handyman or woman when problems occur with electrical items
- Compare two similar products; for example, acoustic and electric guitars, hand and electric drills, handsaws and a jigsaw; consider appeal to users and quality

Suggested assessment tasks

Task: Research

- Conduct a survey of a range of available electric light products and discuss implications for design briefs.
- Compare design elements of electrical appliances in the home and how they suit their intended functions.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to designs for electrical circuit projects

20 marks

Task: Practical

Use the design process to design and make an electrical circuit. Evidence will include a design portfolio and the actual product. The design portfolio might include:

- results of investigation and timelines
- annotated sketches of design ideas
- final drawings or plans
- evaluation notes on both the product and processes.

Assessment criteria

The practical electric circuit product will be assessed on the safe and appropriate uses of materials, tools and techniques and management skills to produce a high quality major design project.

Students provide evidence in the portfolio of annotated sketches of design ideas, sketches of possible solutions and indicating final choice to make, final working drawings, list of materials and equipment used, and evaluation of the process and success of the completed product.

60 marks

Task: Test

A short written test based on the topics covered in the unit.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of tools, materials, skills, and processes used in the design of an electrical technology project.

20 marks

Total: 100 marks

Practical Skills Technologies unit: Metal Technology

In Metal Technology, students can use the design process to make a product using metal. The unit focuses on methods in bench metalwork and sheet metalwork involving use of metals and materials, hand tools, equipment, metalworking machines and finishes.

Access to appropriate hand tools to safely cut, bend and join metal is required.

To achieve the Practical Skills learning outcomes, students:

- design and make an item in response to the design brief
- apply ergonomics standards in the design and construction of the item
- apply the concepts of aesthetics and functional use in the design
- calculate the cost of constructing the item
- apply the appropriate standards of workmanship, care and safety in the construction of the item
- select and use metals in the development of the design project
- select and correctly use appropriate hand and machine tools to make a metal product
- cut, shape and finish metals.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Materials

- characteristics and properties of metals including alloys and sheet metals: galvabond, zinc anneal, zinc alum, marvi plate
- a range of appropriate fittings and hardware

Tools

Function, selection and correct use of a range of contemporary tools for:

- layout: scribe, divider, trammel, centre punch
- cutting: straight tin snips, curved tin snips, universal snips, aviation snips, hacksaw
- measuring and marking out: steel rule, engineer's tri squares, combination square, combination set, vernier caliper
- stakes and uses: funnel stakes, creasing iron, half-moon stake, round bottom stakes
- bending and joining
- drilling and folding: pan break, rollers, guillotine
- edge treatments and finishing

Techniques

- cutting, shaping, joining and finishing metals
 - measuring and marking out, staking, bending and joining, drilling and folding, edging

Design project

Use the design process to make or adapt a metal item or product, and produce a portfolio showing all the steps undertaken in the project.

Suggested learning experiences in metal technology

- Use the design process to design and make a product in metal
- Replace louvre frames in a building
- Make metal items for the kitchen: cake tins, bun trays, griller, tongs, egg slicer, grater, sieve, bottle opener
- Make a metal cooking appliance; for example, drum over, barbecue stand, rotary pig-roasting spit, sawdust stove
- Make a metal product for the home; for example, stand for a plastic rubbish bin, candle holder, shoe rack, storage hook, hanging hook
- Make a metal personal item; for example, metal walking frame for the old, injured or disabled, shoe scraper (blade to scrape clay or mud from bottom of shoes before entering a building)
- Make metal components for playground equipment; for example, 'monkey bars', slide, swing stand

- Install security bars on a building, security fence
- Make a fishing spear gun, fishing hooks

Suggested assessment tasks

Task: Research

- Investigate a range of factors that influence the application of metal technology in the community and suggest how the analysis of that information could inform metal projects to be undertaken.
- Compare qualities of a metal water tank and a non-metal water tank (plastic) and implications for installation and maintenance tasks.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to designs for metal technology projects

20 marks

Task: Practical

Use the design process to design and make a product in metal. Evidence will include a design portfolio and the actual product. The design portfolio might include:

- results of investigation and timelines
- annotated sketches of design ideas
- final drawings or plans
- evaluation notes or a report.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can provide evidence in the portfolio of annotated sketches of design ideas, sketches of possible solutions and indicating final choice to make, final working drawings, list of materials and equipment used, and evaluation of the process and success of the completed metal product.

60 marks

Task: Test

A short written test based on the topics covered in the metal technology unit. The test is assessed by the extent to which the student can demonstrate knowledge of tools, materials, skills, and processes used in the design of a project involving metal technology.

20 marks

Total: 100 marks

Practical Skills Technologies unit: Rural Technology

This unit introduces students to the technologies used in agricultural and rural contexts. Students design and make a product that can be used in rural or agricultural environments, taking into account environmental and sustainability constraints. Students are involved in creatively manipulating materials through safely using tools and machines. They experience the challenges of following a design brief with emphasis on design factors and standards in achieving desirable and marketable outcomes.

To achieve the Practical Skills learning outcomes, students:

- express awareness and demonstrate understanding of the interrelationship between agriculture (rural) technology, society and the environment
- apply and demonstrate the technological processes
- demonstrate understanding of knowledge, principles and concepts of rural technology
- apply the principles, practices and skills used in rural technology by organising and managing activities responsibly and effectively
- investigate uses of different rural technologies to produce a product
- design a product
- produce a product
- evaluate a product
- market a product if appropriate.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Materials

- materials for special purposes in agriculture
- structures
 - basic foundation, support and wall framing, floors, roof structures
 - fencing: types of fences
 - structures for animal production

Tools and equipment

- basic tools, animal-drawn equipment, mechanical equipment, pneumatic and hydraulic tools, specialised tools

Design project

Use the design process to make or adapt an item or product, and produce a portfolio showing all the steps undertaken in the project.

Practical Skills Technologies unit: Plumbing Technology

Plumbing technology provides students with experiences to explore and work with water supply systems and basic sanitation systems. Students construct plumbing systems or repair and maintain existing systems.

To achieve the Practical Skills learning outcomes, students:

- demonstrate knowledge and understanding of the appropriate use of plumbing equipment and processes
- apply plumbing techniques safely and competently
- investigate uses of plumbing technologies to produce or maintain a product
- design a product or a solution to a problem
- produce a product or maintain a system
- evaluate a product or the maintenance of a system
- market a product if appropriate
- utilise the knowledge and skills that allow for cutting, gluing, filling and so on in the plumbing industry
- follow up and evaluate the outcomes making suggestions for improvement for a future plumbing activity of a similar nature.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Safety in workshops

- roles and responsibilities
- protective clothing and equipment
- responding to welding hazards: gas welding hazards, explosive hazards, soldering hazards, electrical hazards, and hazards with surrounding jointing liquids
- basic first aid and emergencies
- fire extinguishers

Tools

- hand-held tools: plumbing hand-held tools, electrical hand-held tools, pneumatic hand tools

Use of workshop equipment

- check before using equipment
- changing cutting blades, wheels and drill bits
- use of equipment

Techniques

- install PVC tubing and piping: plan the work, install tubing and piping, inspect and test work

Design project

Use the design process for a project using plumbing components and produce a design portfolio showing all the steps undertaken in the project.

Suggested learning experiences in plumbing technology

- Research and prepare a report on a water supply and sanitation system in a home or building in your community
- Demonstrate safe and appropriate use of plumbing materials, tools and skills to change tap washers and replace taps
- Demonstrate safe and appropriate use of plumbing materials, tools and skills to change repair or replace roof gutters and down pipes
- Demonstrate safe and appropriate use of plumbing materials, tools and skills to change repair or replace leaking or broken pipes
- Develop a production plan to install fittings in a bathroom including hand-basin and taps, shower fittings and taps
- Devise plans to install a toilet: water tank (cistern), bowl and pipes
- Demonstrate skills and competent use of appropriate tools to unblock pipes; for example, from sinks, toilets or showers
- Demonstrate skills to clean traps (water traps, grease traps) for effective drainage
- Interview a qualified plumber and record significant aspects of his or her training, skills and toolkit
- Investigate typical maintenance jobs done by plumbers and the nature and functions of tools used
- Develop plans to repair a water tank in your community

Suggested assessment tasks**Task: Research**

Compare water supply and sanitation systems in two different contexts; for example, urban and rural, settlement or high covenant. Use the comparison to explain implications for plumbers.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to designs for plumbing projects

20 marks

Task: Practical

Demonstrate safe and appropriate use of plumbing materials, tools and skills to do minor maintenance tasks; for example, to change tap washers and replace taps, repair or replace roof gutters and down pipes, repair water tanks, unblock pipes, clean traps or replace shower heads.

Students keep a portfolio showing steps undertaken in doing a plumbing activity. The portfolio might contain:

- results of investigations
- notes and sketches of plumbing works
- samples of drawings or sketches
- evaluation, notes, report.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can provide evidence in the portfolio of annotated sketches of design ideas, sketches of possible solutions and indicating final choice to make, final working drawings, list of materials and equipment used, and evaluation of the process and success of the completed plumbing activities.

60 marks

Task: Test

Students answer a number of short-answer questions that test their level of understanding of the concepts covered in the plumbing unit.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of tools, materials, skills and processes used in the design of a project involving plumbing technology.

20 marks

Total: 100 marks

Practical Skills Technologies unit: Village Technology

Village Technology involves materials found in the local environment, such as coconut, bamboo, bark, pandanus, cane and fibres; or modern materials that can be recycled. With imagination and applying innovative traditional skills, items can be made for personal or community use or to generate an income. Consideration should be given to developing items that appeal to the tourist market or that give a uniquely Papua New Guinean image to items for the home. Schools could develop units such as:

Weaving
Fibre Craft
Cane Craft
Bamboo Craft
Pandanus Craft
Handicraft.

These units provide students with the opportunity to use basic hand tools and equipment to manipulate plant parts and combine them with other materials to produce useful and/or marketable articles or artefacts. Students work through the design process to produce a product made from materials found in the local community.

To achieve the Practical Skills learning outcomes, students:

- investigate uses of different village technologies to produce a product
- select and use a wide range of materials
- select and safely use tools and equipment for a design project
- identify how materials have been used in innovative and non-traditional ways
- experiment with combinations of materials, considering their characteristics and properties
- explore ways in which tools can be safely used to achieve new results
- design a product
- produce a product
- evaluate a product
- market a product if appropriate.

Content

Students acquire knowledge and skills through the learning and teaching of this content. Safety must be taught in context and proper equipment and protective clothing used where necessary.

Materials

- characteristics and properties of a wide range of materials such as: bamboo, pandanus, coconut, cane, vines, tree bark, wood, palms, pitpit, pigs tusks, seashells, hard plant seeds, animal teeth and feathers

Tools

- selection of specific tools related to materials appropriate to a design project, such as small knife, bush knife, broken glass, gauge, stripper
- the function and safe use of a range of contemporary tools used for measuring, marking out, cutting, making and construction

Techniques

- traditional and non-traditional techniques used for:
 - cutting, harvesting, and selection of materials
 - shaping a variety of materials
 - joining different materials
 - finishing and storing materials

Design project

Use the design process to make an item or product using a village technology and produce a portfolio showing all the steps undertaken.

Suggested learning experiences in village technology

- Design and make a basket, bag or bilum with a Papua New Guinean image, from local material

- Design and make a drum oven or sawdust stove from local materials
- Design and make items from tapa cloth; for example, hat, bag, writing folder, fan, lampshade
- Design and make items from bamboo; for example, tongs, pencil holder, drinking mug, cooking tube, knife, picture or mirror frame, wall hanging, room divider
- Design and make items from coconut fibre or shell; for example, brushes, bowls, drinking cups, buttons, earrings, bangles, hair clips
- Design and make items from pandanus; for example, mats, fans, baskets
- Design and make items from clay; for example, bowls, pot plants, drinking mugs, vases, ashtrays, artefacts
- Design and make items from pitpit; for example, tray, picture or mirror frame, bowl
- Design and make items from bush timber; for example, carved table tops, carved crocodile or other animal, tables, chairs, stools, board for coconut scraper, model canoe
- Produce a concept map to show information a designer needs to collect to design an item for a tourist market made from traditional material
- Develop a production plan to make cane chairs
- Demonstrate the correct, safe and accurate use of tools and skills used in village technology activities
- Identify factors establishing the purpose and appeal of village technology products, including function, aesthetics, finish, cost, appeal and popularity
- Discuss the values of promoting village technology
- Investigate and prepare a report on village technology items seen in homes, churches or hotels or sold in local markets

Suggested assessment tasks

Task: Research

Investigate the popularity of tourist products with a Papua New Guinean identity that appeal to visitors and implications for products that could be sold in markets or tourist shops or purchased as gifts:

- research processes used in your locality to create products with applied village technology
- research improvised equipment that Papua New Guineans make from local materials that benefit their families or the community.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to designs for village technology projects

20 marks

Task: Practical

Use the design process to design and make items that involve village technology and locally available resources. These can be for home use, as gifts or to generate an income. Students provide evidence in the portfolio of annotated sketches of design ideas, sketches of possible solutions and indicating final choice to make, final working drawings, list of materials and equipment used, and evaluation of the process and success of the completed product.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student:

- applies safe work codes and practices
- applies knowledge and understanding of village technologies by
 - selecting and using appropriate materials and processes to make the product
 - selecting and using with skill appropriate tools and techniques to make the product
 - producing a product which meets the design brief.

60 marks

Task: Test

A short written test based on topics covered in the village technology unit.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of tools, materials, skills, and processes used in the design of a village technology project.

20 marks

Total: 100 marks

Practical Skills Technologies unit: Welding Technology

Welding technology gives students the opportunity to do metal fabrication with welded joints. Students are involved in creatively manipulating materials through the safe use of metalworking tools and machines. Students will experience challenges through successfully following a design brief, with emphasis on design factors and standards in achieving desirable and marketable outcomes.

Safety gear to use when welding includes safety goggles, welding helmets with face visors, welding aprons, welding hand gloves, shoe spats. These are essential to prevent personal injury.

To achieve the Practical Skills learning outcomes, students:

- design a product
- produce a product

- evaluate a product
- market a product if appropriate
- define, state and list the methods of welding
- identify tools, equipment and machines and explain uses in welding
- name the types of welding joints and explain their applications
- demonstrate skills in welding various joints to industry standards.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Safety

- general safety
- hazards found in gas welding

Tools

Oxygen and fuel gas equipment

- parts and function of equipment
- equipment use: set up, use and shut down
- care and storage of equipment after use

Techniques

Arc welding

- setting up equipment
- preparing of joints
- selection of welding electrodes and current range
- completing the weld

Welding pressures

- correct welding tip and sizes, oxyacetylene pressures, use of filler rods or flux combination

Assembling and disassembling of equipment

- cutting operation carried out safely
- assemble and disassemble procedure
- perform long and short-term shutdown procedures
- change gas cylinders

Joint assemblies

- correct assembling and gaps for welding, use appropriate welding techniques

Joint preparations

- identify from engineering drawing, clean prepared joint for welding, use correct tool for preparing welding joints

Design project

Use the design process to make, adapt or maintain an item or product using welding and produce a portfolio showing all steps undertaken in the project.

Suggested learning experiences in welding technology

- Design and make a fireplace suitable for outdoor cooking in a rural context
- Create an annotated pictorial poster of welding safety gear and purpose of each item
- Identify materials, tools and equipment used in welding and explain function of each
- Prepare a design brief and apply welding techniques to create an item associated with sport; for example, a basketball ring, goal post for soccer
- Investigate uses of welding to repair items such as spades, metal frames of school desks
- Establish relevant evaluation criteria that could be used to evaluate the quality of workmanship used in welding joints
- Produce a concept map that shows information a designer needs to collect about a design situation; for example, to design a household item such as an oven tray, candle holder, pot stand, cooking rack or griller
- Demonstrate correct, safe and accurate use of welding materials, equipment and safety gear
- Develop a production plan to make a barbecue plate or barbecue from a large fuel drum
- Design and make a rotary pig roasting spit
- Investigate uses of welding in the community

Suggested assessment tasks

Task: Research

Investigate application of welding technology in the community: who the welders are; what materials, tools and equipment are involved; what protective gear is worn to prevent injury; how welding is done. Collect and analyse information. Consider practicalities of undertaking welding activities.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to designs for electrical circuit projects

20 marks

Task: Practical

Use the design process to design and make a product requiring welding. Evidence will include a design portfolio and the actual product. Students provide evidence in the portfolio of annotated sketches of design ideas, sketches of possible solutions and indicating final choice to make, final working drawings, list of materials and equipment used, and evaluation of

the process and success of the completed product. The design portfolio might include:

- results of investigation and timelines
- annotated sketches of design ideas
- final drawings or plans
- evaluation notes on both the product and processes.

Assessment criteria

The practical project will be assessed by the extent to which the student can demonstrate the safe and appropriate use of tools, materials, skills, and processes used in the design of a welded project.

60 marks

Task: Test

A short written test based on topics covered in the welding technology unit.

20 marks

Total: 100 marks

Practical Skills Technologies unit: Working with Wood

Working with Wood gives students the opportunity to apply the design process in planning, making, marketing and evaluating a product in wood. The unit further develops skills and processes used in construction of large or small, complex or simple wooden items. It involves students in creative manipulation of materials through safe use of woodworking tools and machines. Students will follow a design brief with emphasis on design factors and standards in achieving desirable and marketable outcomes.

To achieve the Practical Skills learning outcomes, students:

- design and make an item of furniture
- calculate the cost of constructing an item of furniture
- reproduce shapes to nominated scales
- produce freehand sketches of items of furniture or simple furniture components
- draw a full-size set out of a project to given specifications
- demonstrate a knowledge of terminology, equipment and geometrical shapes used in technical drawings
- interpret and sketch orthogonal drawings
- apply the appropriate standards of workmanship, care and safety in the construction of an item of furniture
- maintain tools in good working condition
- apply ergonomics standards and the concepts of aesthetics and functional use in the design and construction of the item of furniture
- evaluate the item of furniture
- market the item of furniture if appropriate.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Materials

- characteristics and properties of timber
- timber products in Papua New Guinea: types of timber, structure, defects
- conversion of timber: seasoning of timber, preservation of timber
- allied materials: plastics, fabrics
- nails, screws and adhesives
- furniture fittings and hardware: hinges, handles, catches and locks

Tools

- the function of specific tools related to furniture making such as: geometrical tools, cutting tools, abrading tools, percussion tools, driving tools, holding tools, power tools, arts of specific tools and machines
- the selection and correct use of a range of contemporary tools used for marking out and measuring: pencil, marking knife, marking gauge

Coatings and finishes

- protective, decorative

Techniques

- traditional and non-traditional techniques used for: cutting, harvesting, selection of materials, storing materials; shaping a variety of materials; joining different materials; finishing

Design project

Use the design process to make or adapt an item of furniture from wood and produce a portfolio showing all the steps undertaken in the project.

Suggested learning experiences in wood technology

- Use the design process to design and make a product in wood
- Make a wood item for school: ruler, pencil case, set square, protractor
- Make a furniture item; for example, table, chairs, stool, cabinet, drawers, bed, classroom desks
- Make a personal item; for example, walking stick, walking frame
- Make a wooden artefact; for example, carved bowl, crocodile, canoe
- Make a kitchen item from carved wood; such as coffee-mug holder, bowl, chopping board, egg cups, rolling pin, wooden spoon, ladle, hotpot stand
- Make wood items for the workshop; for example, trestle, step ladder, work bench, mallet, bench hook, floater to smooth concrete
- Make wood items for the playground; for example, slide, see-saw, swing frame, climbing frame, cricket bat, cricket wickets, softball bat, distance measuring wheel

- Make home items; for example, picture frame, trinket box, bookshelves
- Make wood items for the garden such as seedling box, nursery shelving

Suggested assessment tasks

Task: Research

Design a questionnaire and survey people's use of wood in a built environment. Clarify the purpose of collecting and analysing the information. Use the data to consider wood construction or maintenance activities to undertake for personal benefit or to generate an income.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to designs for wood projects

20 marks

Task: Design and make a product

Use the design process to design and make a product in wood. Produce a design portfolio showing the steps undertaken in the making of the product. The design portfolio might include:

- results of investigation, annotated sketches of design ideas, timelines, final drawings or plans, evaluation notes or report.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student:

- applies safe work practices
- uses appropriate materials and processes to make the product
- selects and uses with skill tools and techniques to make the product
- produces a wooden product which meets the design brief.

The product is assessed on appropriate use of materials, tools, techniques and management skills to produce a high quality major design project. It reflects sound understanding of design theory and factors affecting design.

60 marks

Task: Test

A short written test based on the topics covered in the wood technology unit.

Assessment criteria

The learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of tools, materials, skills, and processes used in the design of a wood technology project.

20 marks

Total: 100 marks

Practical Skills Technologies unit: Marine Transport Technology

Marine Transport Technology enables learners to develop knowledge and skills to make, maintain and operate safely a range of small vessels on the open seas and/or rivers. Learners will also be able to use and maintain a range of power systems. Learners will acquire skills and knowledge to use materials, tools and equipment to make, maintain and operate small vessels up to ten metres in length.

To achieve the Practical Skills Technologies learning outcomes, students:

- use the design process to construct and operate a small vessel
- apply safe and appropriate codes such as 'Safety of lives at sea' (SOLAS) in workplace and operating environment
- apply knowledge and understanding through identifying, selecting and using various materials to build a small vessel
- apply knowledge and understanding through identifying and selecting a system to power a small vessel
- demonstrate a range of operational skills and techniques to build, maintain and operate a small vessel
- evaluate whether the vessel meets the design brief
- evaluate whether the materials used to construct the vessel are suitable and meet the design brief
- evaluate if the propulsion system meets the design brief
- create working drawing required for the construction of the vessel
- write an operating manual for the vessel
- produce safety placards using an appropriate media.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Knowledge

- boat-building conventions, naval architectural drawings, designing a vessel, design drawings, sailing and navigation regulations
- types of vessels and their components, structure, decks, hulls, hatches, portholes (windows), hull construction, outriggers, hull cladding, boat frames, roof, propulsion systems.
- 'Safety of lives at sea' (SOLAS), safety on a worksite and working with tools

Materials

- materials types, uses, availability and cost; for example, for timber, epoxy resins, plastics and fibreglass, marine grade plywood, concrete, steel, roofing , glass, nails, screws, cleaning agents, traditional vines, ropes

- tool types, uses, availability, cost, safe handling, storage, care and maintenance; for example, for hand tools, hammers, saws, plane, chisel, adhesives, abrasives, squares, levels, screw drivers, bench vice, power tools, electric drill, jointer, belt sander, axes, adzes

Techniques

- joining, assembling, finishing, paddling, rowing, steering, operating machines

Skills

Skills taught and learnt might include students being able to:

- draft boat plans
- select and use tools and materials appropriately and economically
- lay keels of vessels
- apply joining and assembling skills to construct quality vessels
- apply finishes, clear plastic and pigmented finishes, surface preparation, cleaning agents, brush and roller methods
- operate vessels safely on rivers and seas.

Design project

Use the design process to design and construct a small vessel and produce a portfolio showing all the steps undertaken in the project.

Marine craft

Human-powered vessel

- Traditional human-powered vessel types
 - rafts
 - single hulled dugout canoes
 - single hulled dugout canoes with one or two outriggers
 - double hulled canoes
- Imported human-powered vessel types
 - surf skis
 - river and sea kayaks
 - row boats
 - inflated rafts

Wind-powered vessel

- Traditional wind-powered vessel types
 - sea-going sailing canoes
 - racing canoes (Central province)
 - sailing canoes (Manus province, Western province)
- Imported wind powered vessel types
 - Hobie Cats
 - sailing (18 foot) skiffs

- small yachts (less than 10 metres between perpendiculars)
- wind surfer

Engine-powered vessel

- Outboard mounted engine vessels
- Inboard mounted engine vessels
 - propulsion system
 - propellers
 - water jets
- alternative power sources
 - external combustion (steam engines)
 - biofuel engines (coconut and oil palm)
 - solar powered electrical

Suggested learning experiences

- Use the design process to design and make a human powered vessel using traditional methods
- Apply safe workplaces codes and practices
- Apply water safety codes and practices such as SOLAS
- Apply traditional knowledge and understanding of processes through identifying, selecting, and using various indigenous materials and systems
- Demonstrate a range of traditional operational skills and techniques
- Evaluate the operational effectiveness of the vessel made by traditional methods and techniques
- Gather information from knowledgeable persons about the design, manufacture and operation of traditionally made human-powered vessels
- Record information gathered in an appropriate written and electronic medium

Suggested assessment tasks**Task: Research**

Research the people's use of marine transport in their environment. Clarify the purpose of collecting and analysing the information. Use the data to consider vessel construction or maintenance activities to undertake for personal benefit or to generate an income.

Assessment criteria

- Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to designs for vessels.

20 marks

Task: Design and make a product

Use the design process to design and make a traditional human-powered vessel. Produce a design portfolio showing the steps undertaken in the making of the product. The design portfolio might include:

- results of investigation
- annotated sketches of design ideas
- timelines
- final drawings or plans
- evaluation notes or report.

Assessment criteria

- apply safe work practices
- use appropriate materials and processes to make the product
- select and use with skill tools and techniques to make the product
- produce a vessel which meets the design brief.

The practical product will be assessed on appropriate uses of materials, tools and techniques and management skills to produce a high quality major design project. The product reflects a sound understanding of design theory and factors affecting design.

60 marks

Task: Written report

A written report based on the topics covered in the marine technology unit.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of tools, materials, skills, and processes used in the design of a marine transport project.

20 marks

100 marks

Practical Skills Technologies unit: Technical Drawing

Technical drawing provides students with opportunities to design and draw a range of technical drawings, based on building construction. To select the unit, students must have completed Lower Secondary Syllabus, Technical Drawing or Core unit 1 at Grade 9.1. By completing the unit learners can apply relevant drafting skills for projects. The knowledge and skills gained can be applied not only to draw plans but also to understand buildings to a wider extent.

To achieve the Practical Skills Technologies learning outcomes, students:

- apply appropriate rules and practices in the classroom and follow safety instructions on site
- investigate types of buildings and their functions for tenants

- demonstrate sketching skills by drawing various views of a building when sitting in front of it
- demonstrate measuring, articulation and recording capacity
- make use of measurements taken to design plans
- use the design process to produce building plans
- demonstrate a range of skills and techniques when drawing scale sketches and drafting
- evaluate all stages of the process and overall.

Content

Students acquire knowledge and quality skills through the learning of this content.

Knowledge

- building conventions, observation and on scale sketching, measuring, recording, scale drawing, design floor plan, section and end elevations of a existing building
- extract information of plan, convert to scale

Materials

- orthographic plan of an existing house on school premises to extract information
- tape measure, building tape, spirit level, timber strips; A4 paper to investigate and take measurements of a existing buildings
- drawing board, T-square and set of set squares, ruler and so on

Techniques

- freehand sketching, various measuring and survey methods, apply T-square and set square combination on board to draw

Skills

Skills taught and learnt might include students being able to:

- sketch
- observe
- survey
- read building measurements
- use a range of measuring methods for non-accessible parts
- record measurements on dimension lines on site
 - converting measurements taken into scale 1:100
 - applying drawing equipment by drawing on scale sketch
 - drawing and reading floor plans, including wall, doors, windows
 - selecting and using drawing equipment appropriately
 - producing equal drawn lines and accurate angle

Suggested learning experiences in building technology or technical drawing

- Relate existing buildings to architectural drawing, by interpreting given plans against actual buildings (use a simple design)
- Compare building against sketch if recognisable and in acceptable proportion (self-assessment and by third person)
- Selecting measuring points and producing accurate measurements when working in groups
- Articulate and communicate taken measurements to fellow students and recording it to prepared sketches on dimension lines
- Analysing taken measurements. Individual students articulating recorded measurements and comparing group results. Evaluate measuring process and methods
- Convert freehand sketch into on scale sketch by using standard rulers
- Reduce and enlarge measurements when drawing at a ratio of 1:100
- Design equal heavy lines when drawing a range of vertical, horizontal and inclining lines
- Produce vertical characters when drawing letters into the title block
- Interpret sectional details and basic specifications when drawing floor plan and elevations (example: housing stumps, bearers, windows, doors, steps, roof type)
- Complete a drawing using basic technical drawing equipment and apply skills, within a provided time frame
- Correctly interpret produced drawing and convert on scale measurements into actual measurements
- Present a folio that documents processes to produce and design sketches and drawings, including notes and if possible photos of building
- Prepare a design brief, measuring and develop drawings

Suggested assessment tasks

Task: Research

Investigate a range of factors that influence technical drawings, and clarify the purpose for collecting and analysing information relating to the issue.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to develop technical drawings

20 marks

Task: Practical

Use the design process to develop a set of technical drawings. Evidence will include a design portfolio and the actual products. The design portfolio might include:

- results of investigation and timelines
- relevant information and measurements

- annotated sketches of design ideas
- final drawings and their presentation
- evaluation notes or a report.

The sketches and drawings will be assessed on appropriate uses of techniques and skills to produce a set of quality drawings. The products are reflecting a reliable understanding of design factors affecting designing building plans.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can provide evidence in the portfolio of: annotated sketches of design ideas, sketches of possible solutions and indicating final choice to make, final drawings, list of equipment used, and evaluation of the process and success of the completed product within the given time frame.

60 marks

Task: Test

A short written test based on the topics covered in the unit.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of drawing equipment, and knowledge of scale by converting a number of measurements.

20 marks

Total: 100 marks

Practical Skills Technologies unit: Architectural Technical Drawing

Technical drawing provides students with opportunities to design and draw a range of technical drawings, based on building construction. To select the unit, students must have completed Lower Secondary Syllabus, Technical Drawing or Core unit 1 at Grade 9.1. By completing the unit learners can apply relevant design and drawing skills to architectural projects. The knowledge and skills gained can be applied not only to draw plans but also to understand buildings to a wider extent.

To achieve the Practical Skills learning outcomes, students:

- apply appropriate rules and practices in the classroom and follow safety instructions on site
- investigate types of buildings and their functions for tenants
- demonstrate sketching skills by drawing various views
- demonstrate measuring, articulation and recording capacity
- make use of taken measurements to design plans
- apply sound knowledge when developing arrangement of rooms
- use the design process to produce building plans

- demonstrate a range of skills and techniques when designing a residential house including floor plan, section and elevations
- evaluate the process during stages and overall

Content

Students acquire knowledge and quality skills through the learning of this content.

Knowledge

Building conventions, observation and on scale sketching, measuring, recording, arrangement of rooms, spacing, identify advantages against disadvantages, convert and select scale for drawings and details, drawing symbols, knowledge on floor plan, section and elevations

Materials

- a range of housing plans to demonstrate outcomes, to extract information, redesign sections
- commercial plan of prefabricated residential building not on scale to analyse and convert into a readable scale
- interior catalogues
- measurement products for dimensioning of rooms
 - tape measure, building tape, spirit level, timber strips; A4 paper to investigate and take measurements of a existing buildings
 - drawing board, T-square and set of set squares, ruler, scale ruler

Techniques

- freehand sketching, various measuring and survey methods
- apply T-square and set square combination on board to draw sectional , horizontal and vertical projections, first and third angle projections, scale drawing and applications techniques
- plan-reading procedures

Skills

Skills taught and learnt might include:

- sketching
- observing
- surveying
- using a range of measuring methods
- recording of measurements on dimension lines on site
- converting taken measurements into scale 1:100
- applying drawing equipment by drawing on scale sketch
- drawing and reading floor plans, including wall, doors, windows
- selecting and using drawing equipment appropriately
- producing equal drawn lines and accurate angle
- analysing existing buildings and plans

- converting non scale to readable scale drawings
- interior design in relation to room sizing and spacing.

Suggested learning experiences in architectural technical drawing

- Relate existing buildings to architectural drawing, by interpreting given plan against actual building (use a simple design)
- Compare building against sketch if recognisable and in acceptable proportion (self-assessment and by third person)
- Selecting measuring points and producing accurate measurements when working in groups
- Articulate and communicate taken measurements to fellow students and recording them to prepared sketches on dimension lines
- Analysing taken measurements. Individual students articulating recorded measurements and comparing group results. Evaluate measuring process and methods
- Convert freehand sketch into on scale sketch by using standard rulers
- Reducing and enlarging measurements by applying of scale ratios such as 1:100, 1:50, 1:25, 1:20, 1:2 on drawing projects
- Design equal heavy lines when drawing a range of vertical, horizontal and inclining lines
- Produce vertical characters when drawing letters into the title block
- Interpret sectional details and basic specifications when drawing floor plan and elevations (example: housing stumps, bearers, windows, doors, steps, roof type)
- Correctly interpret produced drawing and convert on scale measurements into actual measurements
- Complete a range of drawing using basic technical drawing equipment and apply skills, within a provided time frame (this includes the design of footing and floor plans and floor framing plan, sections including specified and appropriate construction details, elevations including relevant ground level, details, orthographic projections including floor plan, two to three elevations, section and location plan)
- Producing a final assignment, designing a low set residential house of 140m² on scale 1:50, based on own ideas and using the design process; consisting of floor plan and at least two elevations and one section
- Present a folio that documents processes to produce and design sketches and drawings, including notes and if possible photos of building
- Prepare a design brief, measure and develop drawings

Suggested assessment tasks

Task: Research

Investigate a range of factors that influence technical drawings, and clarify the purpose for collecting and analysing information relating to the issue.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to develop technical drawings

20 marks per term

Task: Practical

Use the design process to develop a set of technical drawings. Evidence will include a design portfolio and the actual products. The design portfolio might include:

- results of investigation and timelines
- relevant information and measurements
- annotated sketches of design ideas
- final drawings and their presentation
- evaluation notes or a report.

The sketches and drawings will be assessed on appropriate uses of techniques and skills to produce a set of quality drawings. The products reflect a reliable understanding of design factors affecting designing building plans.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can provide evidence in the portfolio of annotated sketches of design ideas and possible solutions, indicating final choice to make, final drawings, list of equipment used, and evaluation of the process and success of completed product within the time frame.

Each major drawing is assessed by a set of criteria:

- overall appearance: reflects the first impression, layout, overall design
- lines: reflects to what extent the lines are drawn equal
- angles: reflects to what extent the angles are relating
- measurements: to what extent reflecting the given task
- details: reflects to what extent selected parts are designed; for example, bottom plate in a sectional drawing, door and window frames, overhang of roofing
- completed in a given time frame
- attendance demonstrating commitment

60 marks

Task: Test

A short written test based on the topics covered in the unit.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of drawing equipment, knowledge of scale by converting a number of measurements.

20 marks per term

Practical Skills Technologies unit: Land Transport Technology

Land transport technology provides students with opportunities to develop knowledge and skills to design make, maintain and operate safely a range of light vehicles to meet community needs. They are able to put ideas into practice through practical projects. The knowledge and skills gained can be applied not only to creating new vehicles, but also to maintenance of existing vehicles.

To achieve the Practical Skills Technologies learning outcomes, students:

- investigate types of human, animal and engine-powered vehicles and their functions in the community
- use the design process to produce vehicle plans
- apply knowledge and understanding through identifying, selecting, and using various materials and systems
- demonstrate a range of operational skills and techniques
- apply safe and appropriate rules and practices in the classroom or workshop or worksite
- evaluate the appropriateness of materials or systems used to construct, make and operate a vehicle.

Content

Students acquire knowledge and quality skills through the learning of this content.

Knowledge

- mechanical and working drawings, designing a vehicle, design drawings, road safety regulations
- types of vehicles and their components, construction methods, power sources, transmission, wheels and tyres

Materials

- materials types, uses, availability, cost; for example, sheet metals, bolts, nuts, mechanical components
- tool types, uses, availability, cost, safe handling, storage, care, maintenance; for example, for hand tools, hammers, mallets, spanners, adhesives, abrasives, squares, levels, screw drivers, bench vice, power tools, electric drill, belt sander
- safety in a workplace and working with tools

Techniques

- joining, assembling, finishing

Skills

Skills taught and learnt might include students being able to:

- draw and read plans

- prepare building sites
- select and use tools and materials appropriately and economically
- make components for vehicles
- apply joining and assembling skills to construct quality vehicles
- apply finishes, clear plastic and pigmented finishes, surface preparation, cleaning agents, brush and air spray methods

Suggested learning experiences in Land Transport Technology

- Survey vehicle owners to investigate maintenance needs of vehicles in your locality and skills, tools and materials that would be needed to carry out the work
- Compare types of vehicles in your locality and reasons for similarities and differences
- Produce and interpret working plans and sketches for vehicles
- Develop a sequenced production plan and timeline to build either a human, animal or mechanically powered vehicle
- Safely use materials, tools and equipment to carry out vehicle maintenance task; for example, changing component parts
- Construct a flow chart to show processes
- Demonstrate appropriate skills to apply protective coatings and the appropriate use and care of equipment
- Present a folio that documents processes in the production of a designed product or maintenance task
- Prepare a design brief, develop drawings and construct a model of vehicle or a light vehicle
- Use resources effectively and safely to construct a human, animal or mechanically powered vehicle
- Do a case study of an innovation in vehicle use and construction in your locality indicating design factors and influences
- Design and make a model of a vehicle or a light vehicle
- Develop a pamphlet on safety procedures to do with road rules

Suggested assessment tasks

Task: Research

Investigate a range of alternate fuels to be used in vehicles and how these impact on the size and ability of the vehicles to operate effectively.

Collect and analyse information relating to the issue.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to designs for building projects

20 marks

Task: Practical

Use the design process to design a vehicle or vehicle maintenance project. Evidence will include a design portfolio and the actual product.

The design portfolio might include:

- results of investigation and timelines
- annotated sketches of design ideas
- final drawings or plans
- evaluation notes or a report.

The practical product will be assessed on appropriate uses of materials, tools and techniques and management skills to produce a high quality major design project. The product reflects a sound understanding of design theory and factors affecting design.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can provide evidence in the portfolio of annotated sketches of design ideas, sketches of possible solutions and indicating final choice to make, final working drawings, list of materials and equipment used, and evaluation of the process and success of the completed product.

60 marks

Task: Essay

A written essay based on the topics covered in the unit.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of tools, materials, skills, and processes used in the design of a land transport project.

20 marks

Total: 100 marks

Practical Skills Technologies unit: Woodcarving Technology

Wood carving is a traditional craft, which can be produced with great imagination and creativity. Particular styles of wood carving have developed reflecting the culture and the characteristics of particular countries. Papua New Guinea has wood resources and many of its societies have fine wood artefacts that depict knowledge about carving. Wood Carving Technology gives students the opportunity to apply the design process in planning, making, marketing and evaluating a product in wood. The unit further develops skills and processes used in the construction of wooden items. It involves students in the creative manipulation of materials through the safe use of woodworking tools and machines. Students will experience challenges through successfully following a design brief with emphasis on design factors and standards in achieving desirable and marketable outcomes.

To achieve the Practical Skills Technologies learning outcomes, students:

- make appropriate carvings
- design appropriate carvings
- apply and demonstrate woodwork safety procedures in the workplace
- demonstrate knowledge and skills with the use of hand tools and equipment
- apply evaluation process in all stages of the product
- apply the appropriate process of calculating costs and selling price of the product

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Aspects of learning

- characteristics and properties of timber
- timber products in Papua New Guinea: types of timber, structure, defects
- conversion of timber: seasoning of timber, preservation of timber
- furniture styles: traditional, provincial, contemporary
- general basic artefacts: appropriate and more appealing

Tools

- the function of specific tools related to wood carving such as: geometrical tools, cutting tools, abrading tools, percussion tools, driving tools, holding tools, power tools, arts of specific tools and machines
- the selection and correct use of a range of contemporary tools used for marking out and measuring: pencil, marking knife, marking gauge

Coatings and finishes

- protective; decorative (polishing and stains)

Knowledge

- quality of timber, techniques of carving

Techniques

- traditional and modern techniques used for: cutting, harvesting, selection of materials, storing materials; shaping a variety of materials; joining different materials; finishing

Skills taught and learnt

- reproduce shapes to nominated scales
- produce freehand sketches of items of furniture or simple furniture components
- draw a full size set out of a project to given specifications

- demonstrate a knowledge of terminology, equipment and geometrical shapes used in technical drawings
- interpret and sketch orthogonal drawings
- strength testing of joints and materials
- joining and assembly processes
- maintenance of tools in good working condition
- safe and competent use of tools
- finishing techniques

Suggested learning experiences in wood carving technology

- Use the design process to design and make a product in wood
- Make an appropriate wood item for sale and own use
- Make a furniture item; for example, tables, chairs
- Make a wooden artefact of choice; for example, sports shield, candle holders, bowls
- Make kitchen item from carved wood: a coffee-mug holder, bowl, chopping board, egg cups, rolling pin, wooden spoon, ladle, hotpot stand
- Make home items; for example, picture frame, trinket box, bookshelves

Suggested assessment tasks

Task: Research

Design a questionnaire and survey local needs and the popularity of tourist products. Clarify the purpose of collecting and analysing the information. Use the data to consider carved wood construction or maintenance activities to undertake for personal benefit or to generate an income.

Assessment criteria

- identification of issue and research task
- collection of relevant information
- analysis of information
- construction of recommendations that could lead to designs for carved wood projects

20 marks

Task: Design and make a product

Use the design process to design and make a carved product in wood. Produce a design portfolio showing the steps undertaken in the making of the product. The design portfolio might include:

- results of investigation
- annotated sketches of design ideas
- final drawings or plans
- evaluation notes or report.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can:

- apply safe work practices
- use appropriate materials and processes to make the product
- select and use with skill tools and techniques to make the product
- produce a wooden product which meets the design brief.

Product is assessed on appropriate use of materials, tools, techniques and management skills to produce a high quality major design project. It reflects sound understanding of design theory and factors affecting design.

60 marks

Task: Test

A short written test based on the topics covered in this unit.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of tools, materials, skills and processes used in the design of a carved wood technology project.

20 marks

Total: 100 marks

Practical Skills Technologies unit: Solar and Hydro Technology

This unit enables students to explore and value renewable energy and its advantages for the community, particularly in rural areas, and focuses on principles, characteristics and functions of relevant components and operations. The practical component involves accurate construction of circuits to generate and/or store power in batteries for consumption. Students use basic electrical items and tools to design appropriate solutions. Safety precautions and dangers of working with electricity are stressed.

To achieve the Practical Skills Technologies learning outcomes, students:

- identify resources and a range of components, tools, equipment and materials required for electrical-related projects
- initiate plans and apply appropriate techniques and processes to generate and store power
- apply quality measures when connecting circuits and components
- evaluate the appropriateness of the application
- work safely and competently with materials and equipment.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Knowledge

- electricity, methods of producing electricity, types of electrical systems and symbols, conventional electron current flow, common electrical faults
- solar energy and generating
- hydro power generating, flowing or gravity water supply
- electronic theory components involved (regulators, inverters and so on)
- battery and type of power-storing options, purpose, construction and components, type of connections, charging and maintain
- uses of meters, types of electrical meters, terms or definitions, multi-testers, ac/dc currents, application of Ohm's Law

Materials

- solar panels, charger regulators, inverters, alternators
- poly or PVC pipes,
- solder, bulbs, electrical wires, connectors and fittings
- control devices such as fuses and switches
- insulation tapes, crocodile clips

Tools

- screw drivers, pliers, side cutters, soldering iron
- hand tools: non-cutting, safety aspects or application, open spanners, ring spanners, combination spanner, shifting spanners, sockets or accessories
- hand tools: cutting, safety aspects and application, files, chisels, pliers, tin snips, drills

Skills

Skills taught and learnt might include students being able to:

- select correct components
- connect electrical circuits correctly
- demonstrate safe working practices

Suggested learning experiences

- apply small-scale solar and/or hydro technology to a practical situation
- read, understand and implement supplier instructions
- design and make circuit to its standard requirements
- selection of appropriate wire to connect solar panels or alternators
- identify, select and maintain batteries
- monitoring equipment regulators and service or replace devices

- have a qualified technician as a guest speaker to talk about installing safety issues, or excursion to a relevant supplier
- identify and assess useful troubleshooting skills for the average handyman or woman when problems occur with involved items
- investigate renewable energy options, compare and consider appeal to users and quality

Suggested assessment tasks

Task: Research

- Conduct a survey of a range of available appliances which can be connected to solar or light hydro systems and discuss implications for design briefs; and/or
- Research and discuss renewable energy in general.

Assessment criteria

Identification of issue and research task, collection of relevant information, analysis of information, and construction of recommendations that could lead to designs for solar or hydro-generated power projects

20 marks

Task: Practical

Use the design process to design and make an electrical circuit. Evidence will include a design portfolio and the actual product. The design portfolio might include:

- results of investigation and timelines
- annotated sketches of design ideas
- final drawings or plans
- evaluation notes on both the product and processes.

Assessment criteria

The practical solar-powered product will be assessed on the safe and appropriate uses of components, tools and techniques and management skills to produce a high quality project. Students provide evidence in the portfolio of annotated sketches of design ideas and possible solutions, indicating final choice to make, final working drawings, list of materials and equipment used and evaluation of process and success of the product.

60 marks

Task: Test

A short written test based on the topics covered in the unit.

Assessment criteria

The Practical Skills Technologies learning outcomes will be assessed by the extent to which the student can demonstrate knowledge of tools, materials, skills, and processes used in the design of a solar technology project.

20 marks (total: 100 marks)

Practical Skills Technologies unit: Small Engine Mechanics

The knowledge and skills gained through this unit will not only enable the learners to perform general service maintenance and installations but will also equip them with basic matriculation to enter advanced technical studies.

To achieve the Practical Skills Technologies learning outcomes, students:

- apply safe and appropriate codes of practice in the workplaces
- diagnose and evaluate appropriate method of or solutions to repair and maintain an item
- identify the systems on small engines and machines
- identify and name the main components of light engines
- apply the appropriate standard of workmanship
- demonstrate correct use of tools for the jobs.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Materials

- small four-stroke engines (running)
- two-stroke engines
- cylinder blocks and engine parts
- mechanics tools and measuring tools

Skills

Skills taught and learnt might include:

- periodic maintenance checks and schedules
- service procedures and methods
- engine operation
- diagnostic and troubleshooting faults
- cost and quality control

Suggested learning experiences in Small Engine Mechanics

- correct service methods and skills
- fully explain operation and job of parts
- maintain and control quality of machines and parts

Suggested assessment tasks

Task: Inspection troubleshooting reports

Compile inspection troubleshooting reports, determine type of repair maintenance required, suggest and analyse how repair service maintenance could be performed.

Assessment criteria

- demonstrate diagnostic testing
- apply safe practices and perform troubleshooting methods
- perform service and preventive maintenance in a sequenced manner
- develop periodic maintenance schedules and maintenance records

80 marks

Task: Report

A written report based on the topics covered in this unit.

Assessment criteria

The Practical Skills learning outcomes will be assessed by the extent to which the student provides evidence of or demonstrates knowledge of tools, materials, skills, and processes used.

20 marks

Total: 100 marks

Learning activities and assessment tasks: Food Technology

Examples of Food Technology units with suggested learning activities and assessment tasks are provided in the following sections.

The Food Technology learning outcomes must be taught and assessed in any unit that is selected:

Learning outcomes

Students can:

1. use the design process to produce appropriate solutions
2. apply safe and hygienic practices when handling food
3. apply knowledge and understanding of processes through identifying, selecting and using various foods, equipment and systems
4. demonstrate a range of skills and techniques
5. evaluate the process and product against the design brief
6. communicate ideas and information in a variety of ways.
7. demonstrate knowledge and understanding of food technology principles.

Planning and Preparation of Food

Suggested learning and assessment tasks

- Analyse hygienic and safe work practices in food preparation and processing shows on television.
- Working in teams, use the internet to research a recent newspaper article that highlights an incident of food poisoning and present the key findings to the class.
- Store a selection of fresh foods in a range of ways for a period of time and observe the results; identify causes of food spoilage for each food; record optimal methods of storage.
- Identify storage techniques that enhance the ripening process and improve the quality of foods such as unripe bananas, green mangoes, green tomatoes.
- Identify and discuss the advantages or disadvantages of different chopping surfaces in providing hygienic food preparation; develop recommendations for most hygienic surface type for food preparation.
- Complete a practical activity to evaluate the safety, effectiveness and efficiency of various cutting tools and small electric appliances.
- Work in small teams to develop a series of posters or small instructional leaflets that identify potential hazards, and recommendations for health and safety procedures and hygienic practices for younger students.

- Identify and explain the hygiene and safety risk points for food spoilage when transporting, storing, preparing and serving a key food; for example, meat or poultry or eggs; discuss strategies to eliminate risks.
- Design a checklist for the production of a selected food product using key foods. The checklist must include the selection and safe use of appropriate tools and equipment, safe food storage and appropriate standards for cleaning.

Food Availability and Selection

Suggested learning and assessment tasks

- Work in small teams and select a new food product; brainstorm the reasons for the development of the product selected, including any social and environmental pressures, changes in manufacturing or packaging technology, consumer demand.
- Review advertisements and identify the types of product development used in the products advertised.
- Research the development of a food product; for example, high-fibre bread or margarine.
- Use a range of rating systems to evaluate the sensory properties of two brands of similar products such as two types of icecream.
- Assess the packaging systems used to package a particular food; for example, chocolate biscuits; identify the materials used, the advantages and disadvantages of the packaging system, and identify the technique used to detect evidence of tampering.
- Prepare a packaging 'showcase' of various types of food packaging; identify the purpose of each packaging type; for example safety, preservation, containment, transportation.
- Visit a supermarket and identify a range of food packaging.
- Assignment on factors that have contributed to food product development:
 - review a range of television and print commercials; identify the target market for a product and the strategies used to promote the product
 - work in small teams to select a new food product; identify the target market and suggest appropriate marketing strategies for the product; provide reasons for the strategies suggested
 - work in small teams to develop a promotional strategy for a primary producer promoting a key food, for example, a fruit or vegetable.

Food Technology unit: Baking

The baking unit provides students with the opportunity to acquire the knowledge and skills to plan and make a range of baked products for personal consumption or to generate an income. The unit will focus on types of baked foods (sweet and savoury), surveying customer preferences, innovation, ingredient mixing techniques and decorative finishes.

To achieve the Food Technology learning outcomes, students:

- design and identify recipes for a variety of baked food products
- plan, design and calculate costs for baked food items for personal consumption or to sell
- make or produce the baked products applying appropriate techniques competently to achieve a quality product
- evaluate the outcome, making suggestions for improvement for future baking projects.

Content

Students acquire knowledge and skills through the learning and teaching of this content. Students investigate and implement practical ways to design, prepare and present a variety of baked food items for personal consumption or to generate an income.

Types of baked food products

Cakes

- small cakes, large cakes, cakes for special occasions, cassava and banana cake, sago, banana and coconut cake, fruit cakes, sponge cakes, Swiss rolls, lamingtons

Biscuits

- scones, doughnuts, iced buns, cream buns, éclairs, hot cross buns

Bread

- bread rolls, loaves of bread, plait, knot, crescent, breadsticks, white or wholemeal bread, walnut bread, fruit bread

Pastry

- shortcrust, flaky, choux, pies, sausage rolls, apple turnover, Cornish pasties, pizza, coconut pie, pumpkin pie

Equipment

- ovens (gas, electric, kerosene, drum, Dutch, hot-stone)
- cake tins, muffin trays, oven trays
- measuring cups, measuring spoons, measuring jugs
- mixing bowls
- electric beaters, rotary hand beater, wooden spoon

- greaseproof paper, aluminium foil
- wire cooling racks
- icing bags and nozzles

Techniques

- rubbing-in, creaming, melt and mix, beating, kneading, proving, knocking, shaping, glazing, baking, icing

Safety and equipment

- safety in handling sharp utensils
- safety around fires, stoves or hot pots
- safety in using electrical appliances
- accidents and first aid

Common ingredients in baked products

- flour, yeast, sugar, eggs, milk, margarine

Food technology project

Use the design process to make food products, and produce a portfolio showing all the steps undertaken in the making of the products.

Suggested learning and assessment tasks

- investigate types of food products sold in bakeries and ingredients and recipes for baked food items
- bake a variety of goods
- experiment with spoilage of baked goods
- follow measuring and recipe instructions for a baked food product
- demonstrate competent skills involved in baking
- safely and competently use baking equipment
- evaluate skills, costs, nutritional value and consumer satisfaction of baked food products

Food Technology unit: Food Catering for Special Events

Food catering provides students with the opportunity to acquire knowledge and skills to cater for special events and to plan a variety of menus to suit different people, venues and occasions. It will focus on planning, nutrition, hygiene, food selection, preparation choices, presentation and budgeting, to meet client needs and to gain consumer satisfaction.

To achieve the Food Technology learning outcomes, students:

- investigate steps required to cater for an event

- plan or design and calculate costs for a suitable menu to meet needs of people and the significance of the occasion being catered for
- cater for an event
- market or deliver the products to the required venue
- evaluate the outcome, making suggestions for improvement for a future event of a similar nature.

Content

Students acquire knowledge and skills through the learning and teaching of this content. Students investigate and implement practical ways to produce and prepare food to cater for a special family or community event within a given budget.

Special events

- catering for school meetings, birthdays, church events, fathers' day, mothers' day, end-of-term parties, weddings, funerals, baptism, anniversaries, opening of a new building, and so on
- purpose and significance
- number and ages of persons involved
- request details: budget, venue, dates, time of day; formal or casual

Menus

- breakfast, morning tea, lunch, afternoon tea or dinner
- buffet or sit-down or finger food arrangements
- hot or cold drinks
- appetisers, soups, salads, meat dishes, vegetables, desserts, fruit, cakes

Equipment

- cutlery, crockery or disposable plates, glasses or paper cups
- furniture at venue
- stoves
- knives, graters, spoons, chopping boards
- washing up, drying up
- rubbish disposal

Techniques

- planning, budgeting, organisation
- task allocation: cutting, measuring, preparation, processing, cooking, boiling, steaming, grilling, smoking, baking, frying, mumu, toasting sandwiches
- presenting food for visual appeal: garnishing
- setting tables

Safety and equipment

- safety in handling sharp utensils

- safety around fires, stoves or hot pots
- safety in using electrical appliances
- use of fire extinguishers
- accidents and first aid
- protective clothing: apron, potholders

Food technology project

Use the design process to make food products, and produce a portfolio showing all the steps undertaken in the making of the products. Evaluate the project.

Suggested learning and assessment tasks

- Investigate steps required to cater for an event
- Follow recipes to make the food items (safely, hygienically; nutritious and attractive) within a time frame; selecting a variety of appropriate food, utensils and appliances to prepare quality food items for design project
- Market products in a variety of ways
- Set up a small catering business
- Deliver products to the required venue, with appropriate follow-up with cleaning and disposal after the event ends
- Evaluate the outcome, making suggestions for improvement for a future event of a similar nature.

Criteria for evaluation

- response of guests; whether all food was eaten
- if preparation and delivery went smoothly
- if cost was within budget
- whether food was easy to serve and eat
- if food was prepared in a safe and hygienic manner

Food Technology unit: Food to Sell

This unit provides students with the opportunity to acquire knowledge and skills to plan a variety of nutritious food items to sell to suit different people, ages and venues. It will focus on surveying food preferences of people, prices and affordability, creative use of local foods, nutrition, hygiene, food selection, preparation choices, presentation and budgeting, to meet customer needs and to gain consumer satisfaction.

To achieve the Food Technology learning outcomes, students:

- design a project to make food items to sell to a targeted group at a specified time and place
- plan or design, and calculate costs for, suitable food items to meet needs of people that could be sold at local venues

- make or produce nutritious and attractive products (safely and hygienically) within a time frame
- market products at a variety of venues
- evaluate the outcome, making suggestions for improvement for future food selling attempts.

Content

Students acquire knowledge and skills through learning and teaching of this content. Students investigate and implement practical ways to prepare and package nutritious food hygienically and attractively to generate an income.

Opportunities

- food selling venues: markets, morning tea and lunch school breaks, roadside stalls, Saturday morning fund raising, advertised specialties

Food items

- iceblocks, steak sandwiches, sausage in bread with fried onions and tomato sauce, sandwiches, stick-food, hard boiled eggs, smoked fish, dough-balls, doughnuts, roasted peanuts, cassava cakes, buns, bread, pizza, stew and rice, roasted chicken wings or chicken legs, corn, fresh fruit (such as banana, mangoes, guavas) and so on

Equipment

- packaging material (aluminium foil, plastic wrap, leaf-wraps, plastic plates, paper)
- stoves, knives, graters, bowls, spoons, chopping boards, baking trays
- washing up, drying up, rubbish disposal

Techniques

- a range of processes to suit a range of budgets
- cutting, measuring, preparation
- processing: cooking, boiling, steaming, grilling, smoking, baking, frying, mumu; toasted sandwiches
- hygienic packaging
- presenting food for visual appeal

Safety and equipment

- safety in handling sharp utensils
- safety around fires, stoves or hot pots
- safety in using electrical appliances
- accidents and first aid

Food technology project

Use the design process to make food products, and produce a portfolio showing all the steps undertaken in the making of the products.

Suggested learning and assessment tasks

- Investigate types of food sold in shops, markets and roadside stalls and survey customer preferences.
- Investigate food preferences and prices affordable for fast foods.
- Make or produce nutritious and attractive products (safely and hygienically) within a time frame.
- Select variety of appropriate food, utensils and appliances to prepare quality food items for the design project.
- Market or deliver products at various venues, with appropriate bookkeeping; follow up cleaning and waste disposal after selling ends.
- Evaluate outcome, suggesting improvements for future food selling.

Food Technology unit: Catering for Special Food Needs

This unit provides students with the opportunity to acquire knowledge and skills to design menus and prepare meals to cater for people with special food needs or preferences. The unit focuses on the knowledge and skills required to meet nutritional requirements in the preparation of meal plans, diets and menus for people with special food needs or preferences.

To achieve the Food Technology learning outcomes, students:

- identify nutritional values of foods available in their locality
- analyse dietary and cultural requirements for a category of persons with special food needs or preferences
- design a menu and meal plan to satisfy needs
- use equipment in a safe and hygienic manner
- evaluate the project outcome and suggest variations
- coordinate the development of multiple and diverse menus.

Content

Students acquire knowledge and skills through the learning and teaching of this content. They investigate and implement practical ways to design menus and prepare meals to cater for those with special food needs or preferences.

Categories of people with special food needs

- vegetarians, vegans, sick people, pregnant and lactating women, babies or infants, athletes, labourers, school children, overweight or obese people, malnourished children, the aged

Food composition for Papua New Guinea

- nutrients, food sources: protein, fats, carbohydrates, vitamins, minerals
- starchy staples (banana, breadfruit, cassava, sago, sweet potato, yam, taro)
- cereal, cereal products (biscuit, bread, cake, pastry, flour, rice, pasta)

- green leaves (aibika, cabbage, lettuce, pumpkin tips, spinach, watercress)
- other vegetables (broccoli, Brussels sprouts, carrot, cauliflower, corn, choko, cucumber, eggplant, mushrooms, onion, pitpit, tomato, zucchini)
- fruits (apple, avocado, custard apple, granadilla, guava, lemon, mango, watermelon, orange, mandarin, passionfruit, pineapple, banana, pomelo, soursop, strawberry, tree tomato)
- nuts, seeds (betel nut, coconut, pandanus nut, peanut, pumpkin seeds)
- legumes (beans, peas, soya beans, winged beans)
- fish (cod, carp, mackerel, reef fish, shark, tuna, sardines)
- seafood (clam, cockles, crab, fish roe, lobster, mussel, octopus, turtle)
- meat and poultry (beef, chicken, duck, sausages, goat, lamb, pork)
- milk and milk products (cheese, cream, milk, yoghurt)
- eggs (chicken, duck, turtle)
- fats and oils (beef dripping, butter, margarine, coconut oil, palm oil, vegetable oil)
- herbs, spices, sauces (garlic, ginger, soy sauce, curry powder, vinegar)

Dietary planning

- consideration of age requirements, lifestyle, food preferences, restrictions or allergies
- varying nutritional and energy requirements due to physical condition
- cultural or religious needs
- assessment of nutritional status and needs: food sources to meet needs
- menus and meal plans
- consequences of failing to achieve dietary requirements (age, gender, body build, type of activity, health of people)

Techniques

- customer feedback questionnaires; interviews with customer and health support personnel; use of nutrition guides

Food technology project

Use the design process to make food products, and produce a portfolio showing all the steps undertaken in the making of the products.

Suggested learning and assessment tasks

- Provide dietary advice to people with specific dietary needs.
- Identify nutritional values of foods available in their locality.
- Design a menu and meal plan to satisfy needs.
- Prepare meals, snacks and drinks to meet special dietary needs.
- Evaluate menu and meal plans for people with special dietary needs.
- Obtain ingredients and recipes and prepare food items to sell, using equipment in a safe and hygienic manner.
- Coordinate the development of multiple and diverse menus.

Learning activities and assessment tasks: Textiles Technology

Examples of Textiles Technology units and suggested learning activities and assessment tasks are provided in the following sections. The Textiles Technology learning outcomes must be taught and assessed in any unit that is selected:

Learning outcomes

Students can:

1. use the design process to produce appropriate solutions
2. apply safe and appropriate codes and practices in the learning and working environment
3. apply knowledge and understanding of processes through identifying, selecting and using various textiles, equipment and systems
4. demonstrate a range of skills and techniques
5. evaluate the process and product against the design brief
6. communicate ideas and information in a variety of ways
7. demonstrate knowledge and understanding of textiles technology principles

Textiles Technology unit: Hats and Bags

This unit provides students with the opportunity to acquire knowledge and skills to plan, design and make fabric clothing accessories such as hats and bags for males and females for a variety of ages and situations. The focus of the unit is on drafting or making patterns that are useful in real-life contexts.

To achieve the Textiles Technology learning outcomes, students:

- investigate types and parts of hats (brim, crown, shade) and types and parts of bags that are worn by community members, pictured in magazines or sold in shops or markets
- plan, design and calculate materials needed and costs to make a hat or bag
- evaluate the outcome, making suggestions for improvement or variations for future clothing accessory projects

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Types of accessories

Clothing accessories from fabric might include:

- sports hats, hats for church, school hats, bridal veils, graduation cap, baby's bonnet, book bags, school bags, shoulder bags, money purses, shopping bags, leggings, armbands, hair ribbons, hair scrunchies, scarves

Equipment

- drawing materials, tape measure, scissors, pins, needles, thread, unpicker, tracing wheel
- sewing machine, pattern pieces, electric iron and ironing board

Skills and techniques

- taking body measurements (head circumference, shoulder to hip)
- making patterns, labelling and cutting from paper and fabric
- fabric choice
- measuring
- economical layout of patterns on fabric
- pinning, cutting, stitches (machining, tacking, hemming)
- seams (open, flat, French)
- fastenings (zippers, buttons and button holes, tape ties, press studs, hook and eye)
- finishes (pockets, braid, ribbon, embroidery), fitting

Safety using equipment

- safety in handling sharp equipment (needles, pins, scissors)
- appropriate care and safety in using sewing machines and electric iron
- possible accidents and first aid

Textiles technology project

Use the design process to make textile products, and produce a portfolio showing all the steps undertaken in the making of the products.

Suggested learning and assessment tasks

- Initiate plans and apply appropriate techniques and processes to design and make clothing accessories such as hats and bags.
- Demonstrate competent skills involved in sewing.
- Safely and competently use sewing equipment.
- Plan, design and calculate materials needed and costs to make a hat or bag.
- Make a variety of hats or bags using appropriate techniques and equipment for different occasions.
- Evaluate design, comfort, usefulness, techniques used and wearer satisfaction of clothing accessory products.
- Evaluate the outcome, making suggestions for improvement or variations for future clothing accessory projects.

Textiles Technology unit: Designing and Making a Uniform

This unit provides students with the opportunity to acquire knowledge and skills to design and make a uniform for a realistic Papua New Guinean situation. The unit will focus on situations in which uniforms are worn, male and female wear, distinctive features of uniforms, issues of practicality and fashion.

To achieve the Textiles Technology learning outcomes, students:

- initiate plans and apply appropriate techniques and processes to design and make uniforms for designated purposes and Papua New Guinean contexts
- make a uniform (prepare patterns and construct the garment) with a distinctive look relevant for the planned situation for wearing
- evaluate the outcome, making suggestions for improvement for a future uniform-making project.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Situations where uniforms are worn

- sport teams, school students, hotel employees, airlines employees (pilots, air crew, ground-staff, mechanics), company employees, police, army, prison warders, shop employees, nurses, musical bands

Styles of uniforms

- shirts and trousers, blouses and skirts, jacket and skirt, shirt and lap-laps, work overalls of various styles; for example, collar or non-collar, long or short sleeve, tuck-in or overhanging blouse or shirt
- distinctive finishes such as embroidered or appliquéd logos, fabric colour, design on fabric
- accessories; for example, ties, scarf, belts, footwear, hats

Equipment

- drawing materials
- tape measure, scissors, pins, needles, thread, sewing machine, unpicker, tracing wheel
- pattern pieces, electric iron and ironing board

Techniques and skills

- fabric choice
- measuring
- economical layout of patterns on fabric
- pinning, cutting, stitches (machining, tacking, hemming)
- seams (open, flat, French)
- disposal of fullness (darts, gathering, pleats)

- setting in sleeves
- fastenings (zippers, buttons and button holes, tape ties, press studs, hook and eye)
- finishes (pockets, braid, ribbon, embroidery)
- fitting

Safety using equipment

- safety in handling sharp equipment (needles, pins, scissors)
- appropriate care and safety in using sewing machines and electric iron
- possible accidents and first aid

Textiles technology project

Use the design process to make a uniform and produce a portfolio showing all the steps undertaken in the making of the products.

Suggested learning and assessment tasks

- Make a uniform (prepare patterns and construct the garment) with a distinctive look relevant for the planned situation for wearing.
- Model the wearing of the garment for feedback from others.
- Identify jobs or activities for which uniforms are worn, describe how each uniform looks and provide reasons why uniforms are worn.
- Compare and contrast features of uniforms, for both males and females.
- Analyse how uniforms satisfy certain physical, organisational, psychological and social needs.
- Design and make uniforms for designated purposes and Papua New Guinean contexts.
- Investigate uniform styles (males and females).

Textiles Technology unit: A Garment Pattern Collection

This unit provides students with the opportunity to acquire knowledge and skills to develop a collection of patterns for a range of garments suitable for males and females of different ages and occasions to be worn. The focus of the unit is on drafting or making patterns that are useful in real-life contexts.

To achieve the Textiles Technology learning outcomes, students:

- initiate plans and apply appropriate techniques and processes to design and make garment patterns
- identify pattern pieces needed for various garment designs or styles
- investigate pattern pieces needed to make a range of garments and styles
- safely and competently use equipment to make patterns
- evaluate the outcome, making suggestions for further additions to the collection of garment patterns

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Types of garments

- patterns for garments: shirts, shorts, trousers, shirts, blouses, lap-laps and dresses, special occasion outfits, sports and school uniforms
- patterns for: various styles and sizes; males and females; different ages; different types of activities

Types of pattern pieces

- front and back bodice for shirt or blouse
- front and back straight skirt
- front and back trousers or shorts
- sleeve (long or short)
- collar, semi-circular or circular skirts
- facings
- yokes

Equipment

- tape measure, ruler, pencils, square, markers, tracing wheel; clean paper; scissors, glue, stapler and staples

Techniques and skills

- taking body measurements (neck, shoulder, armhole, bust or chest, neck to waist, waist, hips, skirt length, trouser length)
- following drafting instructions
- calculating measurements and transfer to paper
- labelling pattern pieces and cut
- storing pieces together in a labelled packet with garment illustration and size indicated
- unpicking seams of a garment and transferring outlines of garment pieces onto paper

Textiles technology project

Use the design process to make textile products using patterns and produce a portfolio showing all the steps undertaken in the making of the products.

Suggested learning and assessment tasks

- Investigate pattern pieces needed to make a range of garments and styles.
- Take body measurements needed to make garment patterns.
- Follow instructions to draft patterns.
- Label and package patterns.

- Make patterns by unpicking seams of a garment and transferring outline to paper and cutting.
- Safely and competently use equipment to make patterns.
- Follow instructions (oral and written) to draft pattern pieces.

Textiles Technology unit: Home or Office Furnishings

This unit on home or office furnishings provides students with the opportunity to acquire knowledge and skills to identify fabrics and a range of sewing tools and equipment to design and create functional or aesthetic items for homes and offices. The focus will be on fabric choices, quality products and design features that make the items appeal to a Papua New Guinean or tourist market.

To achieve the Textiles Technology learning outcomes, students:

- investigate and identify functional or aesthetic home and office furnishings
- initiate plans and apply appropriate techniques and processes to design and make, and market furnishings for home or office situations
- select fabric and use appropriate techniques and equipment safely and competently to construct quality items for personal use or to sell
- evaluate the finished products and make suggestions for improvement or innovation.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Types of home or office furnishings

- cushions and cushion covers
- curtains
- pillows and pillow cases, bed sheets, bed covers
- table cloths, table mats, serviettes
- tea towels, face cloths, pot holders, bowl carriers
- blinds, lamp shades
- food covers

Equipment

- tape measure, scissors, pins, needles, thread, unpicker, tracing wheel
- sewing machine, pattern pieces, electric iron and ironing board
- fabric types: cotton, rayon, silk, polyester, acrylic, linen, nylon
- weaves: plain, twill, pile
- fabric structure: selvedge, warp, weft threads

Techniques and skills

- measuring
- economical use of fabric
- pinning, cutting
- stitches (machining, tacking, hemming, backstitch)
- seams (open, flat, French)
- disposal of fullness (gathering, pleating)
- fastenings (zippers, buttons and button holes, tape ties, press studs, hook and eye)
- finishes (braid, ribbon, embroidery, appliqué, bias binding)
- embroidery stitches (stem, satin, feather, cross, herring bone, chain, blanket)

Safety using equipment

- safety in handling sharp equipment (needles, pins, scissors)
- appropriate care, maintenance and safety in using sewing machines (oil, needle replacement), and electric iron
- possible accidents and first aid

Textiles technology project

Use the design process to make textile home or office furnishings and produce a portfolio showing all the steps undertaken in the making of the products.

Suggested learning experiences

- prepare designs and patterns for making home or office furnishings
- make or produce the product (careful and quality construction processes) within a time frame; selecting fabric and sewing equipment to prepare quality items for the home or office furnishing design project
- market the home or office furnishing items (if selling) and calculate costs and profit
- investigate office and home uses of fabric items, types of curtains, types of home and office furnishings and fabric items, what is commercially available in shops, what items might appeal to tourists, fabric types and designs, and affordability

Suggested assessment tasks

Use the design process to make textile home or office furnishings and produce a portfolio showing all the steps undertaken in the making of the products.

Textiles Technology unit: Garment Making

Garment making provides students with the opportunity to acquire knowledge and skills to identify fabrics and a range of sewing tools and equipment to design and make a garment for personal wear or to generate an income. It will focus on fashion, patterns, operating a sewing machine, fabric colour or design, finishing decorations, and garment construction processes.

To achieve the Textiles Technology learning outcomes, students:

- initiate plans and apply appropriate techniques and processes to design and make and market a garment for family wear or to generate an income
- plan or design different types of garments for people of different gender, ages and occasions for wearing
- take body measurements, prepare patterns, cut from fabric and construct using techniques and equipment safely and competently
- evaluate the finished garments and make suggestions for improvement or innovation.

Content

Students acquire knowledge and skills through the learning and teaching of this content.

Types of garments

- tailor-made shirts, shorts, trousers, shirts, blouses, lap-laps and dresses
- garments of various styles and sizes for males and females of different ages for different types of activities
- clothes for men, women, boys, girls, infants, babies, special occasions (weddings, graduation, church)

Equipment

- tape measure, scissors, pins, needles, thread, unpicker, tracing wheel, sewing machine, threads, pattern pieces
- electric iron and ironing board
- fabric (cotton, rayon, colour, design, cost, length required)

Techniques

- dyeing or screen printing fabric
- measuring
- economical layout of patterns on fabric
- pinning, cutting, stitches (machining, tacking, hemming)
- seams (open, flat, French)
- disposal of fullness (darts, gathering, pleats)
- setting in sleeves

- fastenings (zippers, buttons and button holes, tape ties, press studs, hook and eye)
- finishes (pockets, braid, bias binding ribbon, embroidery)
- fitting

Safety using equipment

- safety in handling sharp equipment (needles, pins, scissors)
- appropriate care and safety in using sewing machines and electric iron
- possible accidents and first aid

Textiles technology project

Use the design process to make garments, and produce a portfolio showing all the steps undertaken in the making of the products.

Suggested learning and assessment tasks

- Investigate fabric types and designs, clothing fashion styles, people's clothing needs and affordability.
- Design garments to be made for personal or family members or to sell.
- Make or produce the product (careful and quality garment construction processes) within a time frame; select patterns, fabric and sewing equipment to prepare quality clothing items for the design project.
- Market the garments (if selling) and calculate costs and profit.
- Evaluate the outcome, making suggestions for improvement for a future garment-making project.

Recording and reporting

All schools must meet the requirements for maintaining and submitting student records as specified in the *Grade 12 Assessment, Examination and Certification Handbook*.

Recording and reporting student achievement

When recording and reporting student achievement you must record the achievement of the students in each unit and then, at the end of the year, make a final judgement about the overall achievement, or progress towards achievement, of the learning outcomes.

To help you do this, descriptions of the levels of achievement of the learning outcomes are provided in the 'Learning outcome performance standards' table.

When reporting to parents, the school will determine the method of recording and reporting. In an outcomes-based system, student results should be reported as levels of achievement rather than marks.

Levels of achievement

The level of achievement of the learning outcomes is determined by the students' performance in the assessment tasks. Marks are given for each assessment task, with a total of 100 marks for each 10-week unit, or 50 marks for each 5-week unit.

The marks show the students' level of achievement in the unit, and hence their progress towards achievement of the learning outcomes. There are five levels of achievement:

- Very high achievement
- High achievement
- Satisfactory achievement
- Low achievement
- Below minimum standard

A **very high achievement** means overall that the student has an extensive knowledge and understanding of the content and can readily apply this knowledge. In addition, the student has achieved a very high level of competence in the processes and skills and can apply these skills to new situations.

A **high achievement** means overall that the student has a thorough knowledge and understanding of the content and a high level of competence in the processes and skills. In addition, the student is able to apply this knowledge and these skills to most situations.

A **satisfactory achievement** means overall that the student has a sound knowledge and understanding of the main areas of content and has achieved an adequate level of competence in the processes and skills.

A **low achievement** means overall that the student has a basic knowledge and some understanding of the content and has achieved a limited or very limited level of competence in the processes and skills.

Below the minimum standard means that the student has provided insufficient evidence to demonstrate achievement of the learning outcomes.

Achievement level					
Total marks	Very high achievement	High achievement	Satisfactory achievement	Low achievement	Below minimum standard
600	540–600	420–539	300–419	120–299	0–119
500	450–500	350–449	250–349	100–249	0–99
400	360–400	280–359	200–279	80–199	0–79
300	270–300	210–269	150–209	60–149	0–59
200	180–200	140–179	100–139	40–99	0–39
100	90–100	70–89	50–69	20–49	0–19
60	54–60	42–53	30–41	12–29	0–11
50	45–50	35–44	25–34	10–24	0–9
40	36–40	28–35	20–27	8–19	0–7

Sample format for recording Design and Technology assessment task results over two years

Student name:

Grade 11 assessment task results			
Unit	Assessment task	Mark	Student mark
11.1	Test Research Design Project	100: these marks would be the adjustment period	
11.2	Test Research Design Project	100	
11.3	Test Research Design Project	100	
11.4	Test Research Design Project	100	
	Total marks Grade 11	300	

Student name:

Grade 12 assessment task results			
Unit	Assessment task	Marks	Student mark
12.1	Test Research Design Project	100	
12.2	Test Research Design Project	100	
12.3	Test Research Design Project	100	
	Total marks Grade 11	300	
	Total marks Grade 11 and 12	600	

Learning outcomes and levels of achievement

Levels of achievement in Grade 11 and Grade 12 are recorded and reported against the learning outcomes. The performance standards for the levels of achievement are described on pages 12 and 13.

Steps for awarding final student level of achievement

1. Assess unit tasks using unit performance standards and assessment criteria.
2. Record results for each task in each unit.
3. Add marks to achieve a unit result and term result.
4. Add term marks to get a year result.
5. Determine the overall achievement using the achievement level grid.
6. Report results using the learning and teaching learning outcome performance standards.

The following is an example of reporting using the learning outcomes performance standards descriptors.

Using the learning outcomes performance standards descriptors

Student Subject School-based assessment	Lena Design and Technology High achievement
This means Lena:	
Independently uses the design process to design solutions and select the most appropriate option	
Independently applies and consistently uses safe and appropriate codes and practices in the learning and working environment	
Demonstrates extensive knowledge and understanding of a wide range of complex processes through identifying, selecting and using various materials and/or systems	
Independently selects and proficiently applies a wide range of relevant skills and techniques to develop and refine original ideas wide range of ideas, documents and designs in a variety of contexts	
Demonstrates extensive knowledge and understanding of, and uses initiative to evaluate the process and product against the design brief	
Identify and communicates extensively ideas and information in a variety of ways	

Resources

General guidelines for selecting and using resources

How effective a resource is depends on whether it is suitable for the knowledge or skill to be learned and the attitude of the students. Classroom organisation is the key to using resources successfully. You need to:

- prepare thoroughly. Make sure that you are familiar with the resource so that you use it with confidence and assurance. If equipment is involved, check that it is in working order, make sure that you know how to operate it and that it is available when you need it.
- use the resource at the right place and time—it should fit in with the flow and sequence of the lesson and serve a definite teaching purpose.
- (if the resource is radio, film, video or television), introduce the program by outlining the content. You might also set some questions to guide listening or viewing. Follow up after using the resource, by discussing and drawing appropriate conclusions.

Useful resource books

Compton, L and Warren, C 2004, *Food: Food Technology, Book 1*, Oxford University Press, Australia.

Compton, L and Warren, C 2004, *Food: Food Technology, Book 2*, Oxford University Press, Australia.

Glaister, R 2005, *Catering towards a Career*, Pearson Education, Australia.

Hart, B et al. 2005, *Basic Building and Construction Skills*, Pearson Education, Australia.

Heath, G, McKenzie, H and Tully, L 2001, *Food Solutions: Food and Technology, units 1 and 2*, Pearson Education, Australia.

Heath, G, McKenzie, H and Tully, L 2001, *Food Solutions: Food and Technology, units 3 and 4*, Pearson Education, Australia.

Norman, PA 1999, *Home Economics for Papua New Guinea 2*, Longman, South Melbourne.

Panousieris, R 1993, *Technology in Action*, Heinemann Education, Melbourne.

Quilang, MT 1975, *Handicraft Handbook*, Papua New Guinea.

Ridgewell, T 2004, *Textiles and Design in Action*, Pearson Education, Australia.

Sepanem, G 2003, *Textiles and Sew On: An Introduction to Textiles Studies for Secondary Studies*, Oxford University Press, Australia.

Wilson, RC 1997, *Basic Technical Drawing: A Graphic Approach*, 3rd edn, Australia.

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- Baker G and Bowen T, (2005) *First Byte, Using Information and Communication Technology*, Oxford University Press, Australia.
- Compton, L and Warren, C 2004, *Food: Food Technology, Book 1*, Oxford University Press, Australia.
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- Heath, G, McKenzie, H and Tully, L 2001, *Food Solutions: Food and Technology, units 1 and 2*, Pearson Education, Australia.
- Heath, G, McKenzie, H and Tully, L 2001, *Food Solutions: Food and Technology, units 3 and 4*, Pearson Education, Australia.
- Mayer, R 2004, 'Should there be a three-strikes rule against pure discovery learning? The case for guided methods of instruction', *American Psychologist*, vol 59, no. 1, pp. 14–19.
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- Quilang, MT 1975, *Handicraft Handbook*, Papua New Guinea.
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- Seppanem, G 2003, *Textiles and Sew On: An Introduction to Textiles Studies for Secondary Studies*, Oxford University Press, Australia.
- Wilson, RC 1997, *Basic Technical Drawing: A Graphic Approach*, 3rd edn, Australia.

Glossary for assessment

Syllabus outcomes, criteria and performance standards, and examination questions all have key words that state what students are expected to be able to do. A glossary of key words has been developed to help provide a common language and consistent meaning in the syllabus and teacher guide documents.

Using the glossary will help teachers and students understand what is expected in response to examinations and assessment tasks.

Glossary of key words for assessment

Account	Account for: state reasons for, report on. Give an account of: narrate a series of events or transactions
Analyse	Identify components and the relationship between them; draw out and relate implications
Apply	Use, utilise, employ in a particular situation
Appreciate	Make a judgement about the value of
Assess	Make a judgement of value, quality, outcomes, results or size
Calculate	Ascertain or determine from given facts, figures or information
Clarify	Make clear or plain
Classify	Arrange or include in classes or categories
Compare	Show how things are similar or different
Construct	Make; build; put together (items or arguments)
Contrast	Show how things are different or opposite
Critically (analyse, evaluate)	Add a degree or level of accuracy, depth, knowledge and understanding, logic, questioning, reflection and quality to (analysis or evaluation)
Deduce	Draw conclusions
Define	State meaning and identify essential qualities
Demonstrate	Show by example
Describe	Provide characteristics and features
Discuss	Identify issues and provide points for and/or against
Distinguish	Recognise or note or indicate as being distinct or different from; to note differences between
Evaluate	Make a judgement based on criteria; determine the value of
Examine	Inquire into
Explain	Relate cause and effect; make the relationships between things evident; provide why and/or how
Extract	Choose relevant and/or appropriate details
Extrapolate	Infer from what is known
Identify	Recognise and name
Interpret	Draw meaning from
Investigate	Plan, inquire into and draw conclusions about

Justify	Support an argument or conclusion
Outline	Sketch in general terms; indicate the main features of
Predict	Suggest what may happen based on available information
Propose	Put forward (for example, a point of view, idea, argument, suggestion) for consideration or action
Recall	Present remembered ideas, facts or experiences
Recommend	Provide reasons in favour
Recount	Retell a series of events
Summarise	Express, concisely, the relevant details
Synthesise	Putting together various elements to make a whole

Glossary for Design and Technology

Adjust	Put into the correct order or arrange
Competent	Having the necessary ability, skill and knowledge
Contemporary	Present time or modern
Context	Explains the content and the purpose of the task or project
Conversion	Something being changed or converted
Design brief	Outlines the task or project that student's will be expected to complete
Design portfolio	Systemically way of keeping records that reflects student's learning
Dimension	Measurement of any sort
Embellish	Making it beautiful by adding ornaments
Ergonomic	Study of work and working conditions in order to improve people's efficiency
Fundamental	Forming the basis or foundation
Hygiene	Practice of cleanliness as a way of maintaining good health to prevent disease
Isometric drawing	One drawing that lets you see the project from the front, end and plan (three views)
Justify	Support an argument or conclusion
Modify	To change
Module	A small unit that is separately made and put together to construct a building or a piece of furniture
Multi-national	large Company that does business in many countries
Nutrient	Providing nourishment or goodness
Orthographic drawing	Detailed drawings completed using tools such as rulers and set squares
Polymer	Natural or artificial compound made up of large molecules which are themselves made from combinations of small molecules
Portable	Can easily be carried around
Preserving	Putting aside for later use
Progressive	On-going
Prototype	Small model that looks the same as the design for the project
Regulation	Set of rules or laws
Specification	Outlines directions
Technology	Resources and tools which are used appropriately and skilfully to improve the quality of life