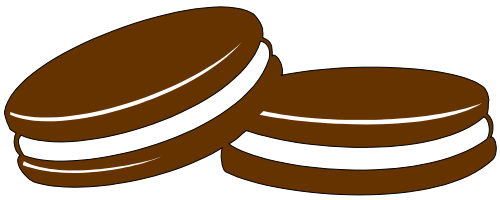
Technology Illustrative Learning Programme

Grade 8

Module 1

Working Together



Framework and Guidelines for Educators

A. Introduction

What is this document?

This document is a module of teaching and learning material. It provides you with a *framework* or outline of activities and *guidelines* to help you use these activities and to adapt them to suit the needs of your learners. It is one of a series of modules that each provide material for a few weeks of the year. Our work is *illustrative* in that it is intended to show what you could do to meet the requirements of Curriculum 2005 in your own classrooms. We have not developed enough modules for the whole year, as we want to encourage you to take on this development task. In this sense, then, our modules form only part of a Learning Programme for the year. The plan for the Learning Programme is shown in a separate document

The modules in the series have been developed as part of a project set up by the by the Gauteng Department of Education (GDE) and the Gauteng Institute of Curriculum Development (GICD) in partnership. During 1999 the project focused on providing Grade 7 educators with teaching and learning materials to support them in the implementation of Curriculum 2005. The project has now entered a second phase, during which similar materials are being produced for both Grade 4 and Grade 8 educators.

Structure of the modules

- Each module is developed around a Phase Organiser and a Programme Organiser.

- Some of the modules are divided into *units*. A unit is simply an organisational tool to give the material conceptual clarity.

- Each unit (or whole module, where units have not been used) contains a series of suggested *activities.*

- Each activity is given a number and a title. In addition, we have provided suggestions about the length of each activity, the resources needed and how the class might be organised.

- Each activity is described around three key questions:

  What are the outcomes for this activity?
  Learners will be able to…

  This is the point at which the outcomes contained in the Policy Document become real for your learners. It is here that you focus on the Specific Outcomes (SOs) and Assessment Criteria (ACs) you have chosen for this Programme Organiser. In answering the question *'What are the outcomes for this activity?'* and in completing the statement *Learners will be able to…* you ensure that your learners are progressing towards the achievement of some of the selected Specific Outcomes and Assessment Criteria.

  To make the link between Specific Outcomes and the activity outcomes clear, we have stated which SOs and ACs are linked to each activity.

What will be done to achieve this learning?

In answering this question you decide how to structure and manage the learning experience to help the learners achieve the activity outcomes. You consider what opportunities you can provide for the learners to learn, practise and finally demonstrate the knowledge, skills, values and attitudes contained in these outcomes. The learners' engagement with the activities provides evidence of their attainment of the activity outcomes and their progress toward the Specific Outcomes.

How will learning be assessed?

Curriculum 2005, in line with Outcomes Based Education, challenges us to rethink our assessment practices. Assessment is no longer a 'tag on' at the end of a section of work, but rather an integral part of all teaching and learning. For this reason, you will notice that the above question is asked and answered when the activity is being planned, rather than after the teaching and learning has happened. By following this practice, you will be integrating the assessment of your learners into a teaching/learning/assessment cycle.

We have tried to make explicit the following:

- exactly which outcomes will be focussed on for assessment
  (This because not all the activity outcomes need receive equal attention in the assessment process. Part of your planning should include which will be focused on.)
- what evidence the learners will provide to show that they have achieved the intended outcomes
  (e.g. participation in group discussion; answers on a worksheet; a drawing; answers in class discussion etc)
- the criteria for judging learners' performance
- by whom and how the evidence is assessed
  (This should include information on: who is doing the assessment – peer, selves, teacher, combination; and how it is being done – reading answers, observing group processes, looking at drawing, marking a worksheet…)
- how the assessment is recorded (noting if no formal record need be made)
  (We have focused on recording the assessment for each activity and not on cumulative recording keeping.)
- how assessment information could be used in planning the next lesson or in intervening if problems are apparent.

Sometime we have shown key aspects of these considerations in a table with these headings:

Outcome(s) being assessed	**Evidence**	**Criteria**	**By whom and how is the evidence assessed?**	**Recording**

The structure used to develop the activities for this series is given in the following template or model. It is offered as an aid when you do your own planning. Please remember to keep in mind both the Phase Organiser and the Programme Organiser when planning your own activities.

Activity … (Number): … (Title)

Duration: …
Class organisation: …
Resources: …

What are the outcomes for this activity?
Learners will be able to:
……
……
The above activity outcome(s) are linked to the following SOs and ACs:
Specific Outcomes: …
Assessment Criteria: …

What will be done to achieve this learning?
1. ……
2. ……

How will the learner's achievement be assessed?
……..

How do these documents relate to your school's curriculum plans?

As part of the macro-planning process, your school will have chosen its own Programme Organisers to meet the needs of your school community. It is therefore likely that this material will not match those Programme Organisers. You might, however, be able to adapt some of the material for use in your chosen Programme Organisers, or you might wish to negotiate with colleagues to modify you plans to include some of these modules.

B. Overview of this module

The following overview not only provides information about the material contained in this module, but also outlines the process of developing it. It is hoped that the record of the process will assist you and your colleagues if you choose to develop your own material.

Revisiting the Phase and Grade Plans
Our first step in planning the module was to refer to our Phase and Grade Plan. It was in the drawing up of these plans that we had decided on the Programme Organiser *Working Together*. This same planning will have been done in your school, with decisions about Programme Organisers having been made to suit your school and the community it serves. If you use the material in this module, you will need to see how best to fit it into your school-based Phase and Grade Plans.

Collecting ideas for the material
The Technology team held a discussion and decided on mass production as our interpretation of the Programme Organiser. We felt that mass production was an example of teamwork, where each step in the process depended on the step before it. Teamwork is one interpretation of working together.

We decided that we should include at least the following points:
- What is mass production?
- All production processes, regardless of product, go through common steps.
- Safety issues around production
- Calculating how much raw material is needed.
- Scaling patterns or recipes up or down.
- Calculations of costs and profit.

The team decided to focus on food production, but we were concerned that some people might see this as a 'female' module. To get around this problem, we decided to use a woodworking process (making chairs) as a case study for introducing the idea of a production line, but to make the capability task revolve around a food product.

Our original ideas went through a number of changes before we arrived at what is in this module. In the teaching and learning situation, no plan should ever be so firmly in place that there is no room for adaptation and change. Technology is a dynamic Learning Area where the needs of the learners are constantly being responded to. An unexpected opportunity for teaching should never be lost in a Technology classroom because of a predetermined, inflexible plan.

Deciding on the rationale and purpose of this module
This is a food technology module that investigates mass production of a product. Food processing forms part of SO2 and the Materials & Processing strand of the Progress Maps. Food technology is often incorrectly perceived as being the same as Home Economics. In this module learners have to apply the technological process of investigate, design, make and evaluate to design a system for producing large numbers of biscuits.

Learners begin by investigating a chair factory to identify the various stages in a production process. They apply these stages to the production of food. Learners will design an efficient production process for the mass production of biscuits for a fund raising project. They will scale up a recipe, record the process in a flowchart, include quality control and forefront safety and hygiene issues.

Relating this module to the Policy Document
Once we had a broad idea of how we, as Technology educators, would interpret the Programme Organiser *Working together,* we were ready to decide on the Specific Outcomes (SOs) and Assessment Criteria (ACs) we would use to guide the development of our activities. It is necessary to keep these selected SOs and ACs in mind as each activity must engage learners in a learning experience which gives them the opportunity to produce evidence of their progress towards these broad outcomes.

The focus specific outcome for Technology is always SO1, as all Technology learning opportunities should work through the technological process. SO1 is usually located (and assessed) within the Capability Task, as it is in this module. Other SOs are addressed and assessed during the Case Study & four Resource Tasks.

We also considered the links to SOs and ACs in other Learning Areas that enhance the achievement of the Technology SOs. We consulted with colleagues from other Learning Areas to ensure that we chose the correct SOs from those Learning Areas.

Here is a record of the Phase Organisers, SOs and ACs we used in this module.

As you adapt or replace the activities, you will need to adjust this record.

Phase Organiser: Personal Development

Programme Organiser: Working together

Specific outcomes from the Technology Learning Area:

SO 1: Understand and apply the Technological Process to solve problems and to satisfy needs and wants

AC 1: Problems needs and wants are identified and explained.
AC 2: A range of possible and relevant solutions are considered.
AC 3: An informed choice is made.
AC 4: A design is developed.
AC 5: Solutions are realised according to design.
AC 6: Realised solution is evaluated.
AC 7: Process is recorded and communicated.

SO 2: Apply a range of technological knowledge and skills ethically and responsibly

AC 1: Knowledge and understanding of:
- System and control is reflected
- Communication is reflected
- Structures are reflected
- Processing is reflected

NOTE: We only use the underlined area of SO2 AC1, not the whole AC.

AC 2: Knowledge and understanding of:
- Safety
- Information
- Materials and
- Energy as they manifest in System and Control

NOTE: We only use the underlined areas of SO2 AC2, not the whole AC.

AC 3: A range of hand and power tools and equipment are used.
AC 5: Responsible behaviour is demonstrated

SO 3: Access, process and use data for technological purposes

AC 1: Various types of data are accessed

AC 2: Various types of data are processed
AC 3: Various types of data are used

SO 4: Select and evaluate products and systems
AC 2: Products and systems are effectively evaluated

Specific outcomes from other Learning Areas

As we developed this module, it was clear that there were overlaps with other Learning Areas. We have therefore also recorded the SOs and ACs from those Learning Areas where they enhance the achievement of the Technology Specific Outcomes. They are not for assessment. As you adapt this material, you might want to consult your colleagues about how best you can work together in an integrated way. You will then need to adjust this list.

Economic and Management Sciences
SO3: Demonstrate the principles of supply and demand and the practices of production
AC 3: Determination of the costs of production is demonstrated

Language Literacy and Communication
SO 4: Learners access, process and use information from a variety of sources and situations
AC 6: Organisational skills are applied

Mathematical Literacy and MMS
SO 1: Demonstrate understanding about ways of working with numbers
AC 4: Performance of operations accurately
AC 5: Evidence of knowledge of percent, rate and ratio

Human and Social Sciences
SO 8: Analyse forms and processes of organisations
AC 2: Characteristics of organisations are analysed by:
- accessing information
- determining characteristics
- explaining significance of characteristics

Further SOs *(to be filled in as you change or adapt the material)*

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Links to the Technology Progress Maps and Expected Levels of Performance:

As we prepared our work, we consulted both the Senior Phase ELPs (Expected Levels of Performance) and the Progress Maps in order to check whether the activities we wanted to do were appropriate to learners in Grade 8.

1. The ELPs for Senior Phase Technology

We read through the ELPs and found that the content we wanted to include formed part of Phase Statements 1 and 2. We have included the Phase Statements and what we thought were the relevant parts of the ELPs for Grade 8 in the following table. *We were therefore satisfied that the technology content of the module would contribute to the learners achieving the Expected Levels of Perfomance.*

	Phase Statement	Relevant part of the ELPs for Grade 8
1	Learners are expected to investigate and identify technological problems, needs and want by using a variety of techniques. This process should include a clearly defined design brief. Learners are expected to design possible solutions that are based on specifications outlined in the design brief. Learners develop and realise the solution according to acceptable sequence of manufacturing procedures and document the process in a portfolio.	It is expected that the learners: – Use given techniques to investigate and identify needs and opportunities to solve technological problems. – Write own design brief with assistance. – Develop specifications for the design with assistance e.g. cost, materials, processes, etc. – Determine at least two possible solutions. – Justify the choice of the most suitable design. – Determine the sequence of manufacture outlining in detail the processes, equipment, tools and materials required with assistance. – Evaluate the solution against given specifications. – Show evidence of records of the entire process.
2	Learners are expected to use technological knowledge and skills ethically and responsibly by using tools, materials and processes to create and realise products and systems that solve specific problems and identify career opportunities in the world of work.	It is expected that learners: – Demonstrate the responsible, safe and skilful use of hand and power tools when processing materials with little assistance.

2. The Technology Progress Maps

We then consulted the Progress Maps. Levels 5 and 6 in the Progress Maps give you an idea of the concepts that should be covered by the learners as they move through the Senior Phase.

The Progress Maps identify 8 strands. Strands are broad groupings of concepts and skills, attitudes and values that develop as the learner improves in the Learning Area. They are linked to clusters of Specific Outcomes which are conceptually linked.

The 8 strands in the Technology Progress Maps are:

- Technological Process
- Systems and Control
- Materials and Processing
- Structures
- Energy
- Communication
- Critical Consumer
- Technology and Society

This module contains material from the strands and substrands listed in the following table.

Table showing links to Technology Progress Map

Strands	Substrands	Level	Activities
Technological Process	Investigate Design & Plan Make Evaluate	5	Capability task
Materials & Processing	Food	5	Case study, Resource tasks 1, 2, 4
Communication		5	Resource tasks 1, 2, 3, 4
Critical Consumer		5	Case study, Resource task 4

Considering the possible knowledge, skills, values and attitudes to be incorporated into the module

We thought about the key skills, knowledge, values and attitudes which might arise from the Programme Organiser and from the SOs and ACs on which the activities would be based. We started off listing a few. As the module developed we added more to the list. So, this list in not an unchangeable plan which had to be strictly adhered to, but rather a record of our thinking which we would refine as we developed the material.

The figure on the next page is a summary of the knowledge, skills, values and attitudes which were finally incorporated into the module.

As you develop new activities you will need to review and possibly add to or change the following list.

Deciding on the length of this module

We decided to develop this module to cover three weeks of a term, or 7,5 hours. We calculated the time like this: In the Policy Document of October 1997, Technology is given 10 % of notional time per week. We worked on a 25-hour week, so this works out to 2,5 hours per week for Technology. By multiplying this 2,5 hours per week by 3, we arrived at 7,5 hours. . We recommend that there be 1x1 hour and 1x1½ hour periods per week. The material in this module should be more than enough to cover this time. The following is a guide on how you can manage the module:

Period	Suggested duration	Activity	
1	½ hour	1	Introduce Capability task – Making more
	1 hour	2	Case study 1 – The chair factory
2	1 hour	3	Resource Task 1 – Scaling up
3	1½ hour	4	Resource Task 2 – Mixing it up
4	1 hour	5	Resource Task 3 – Flowing along
5	1 hour	6	Resource Task 4 – Getting the price right
	½ hour	1	Start Capability Task
6	1 hour	1	Capability Task

Please do not feel that you must get through it all in three weeks. It is offered to you as a guide, but the intention is that you will take charge of what is here and adjust it to the needs of your learners and your school situation. We have suggested a number of extension activities that would increase the amount of time needed for the module.

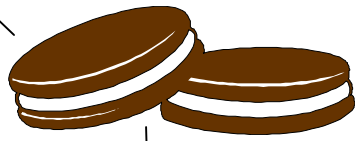
Summary of skills, knowledge, value and attitudes incorporated into this module

This module provides opportunities for learners to know:

- what flow charts are and how they are used
- stages of industrial processes
- how to scale up recipes
- how to calculate costs of raw materials
- what quality control is
- .....
- .....
- .....
- .....

This module provides opportunities for learners to acquire the skill of:

- working in teams
- food processing techniques
- production line design
- identification of stages of industrial process and apply to other industries
- efficient use of resources (human, time, equipment, raw materials, etc.)
- .....
- .....
- .....



This module promotes the following values and attitudes:

- understanding the need to protect public health
- entrepreneurial attitudes
- understanding the need for quality control
- demonstrating responsible behaviour
- understanding the need for value for money
- .....
- .....
- .....

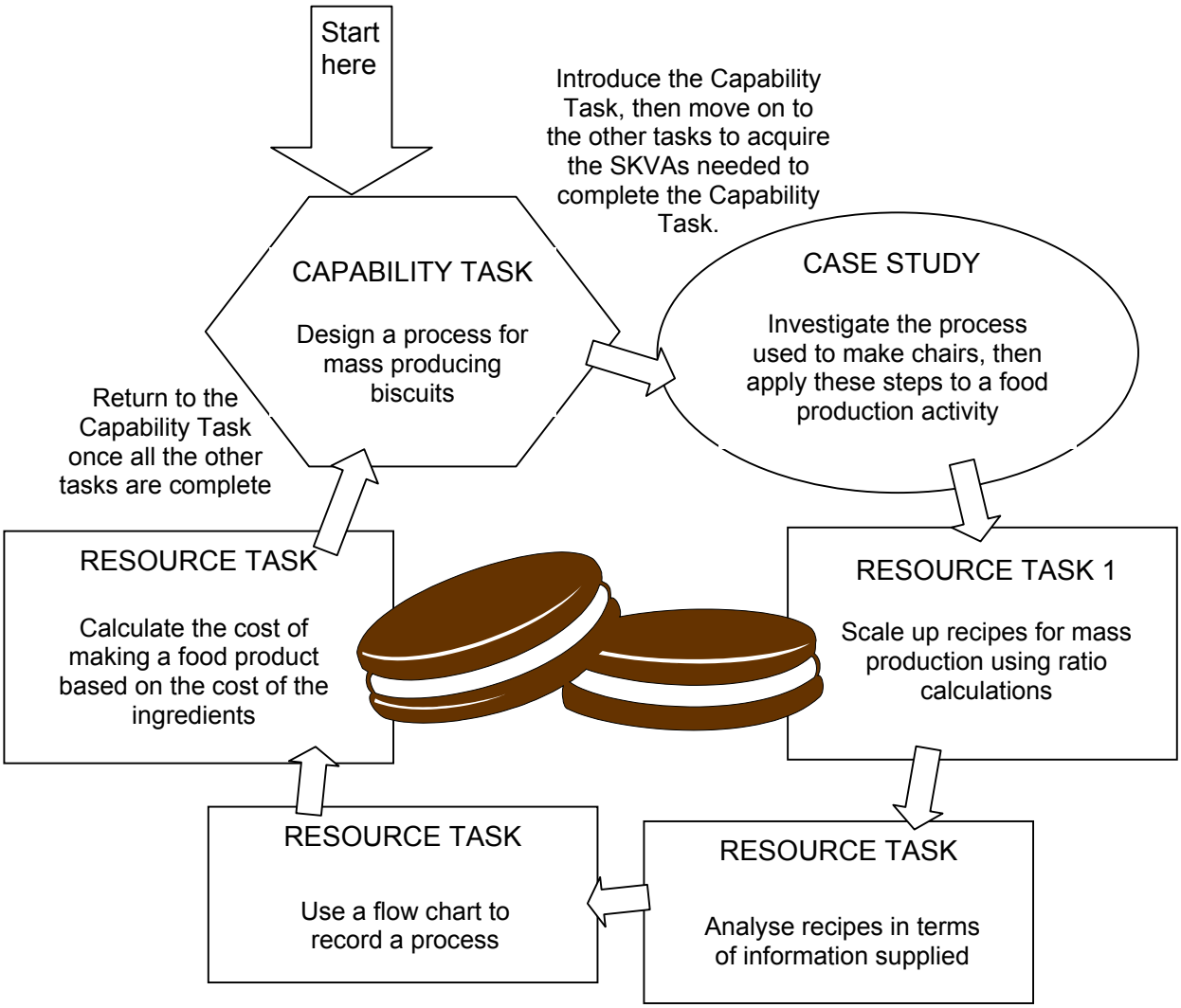
Structuring this module
This module has been organised into six activities. Because Technology is still such a new Learning Area, we decided to fully develop the activities to give you as much guidance as possible. We have included ideas for how you can extend the module, but have given no assistance in these areas.

Technology uses three types of task, case studies, resource tasks and capability tasks. An explanation of each of these task is shown in the table below. We've shown how the activities in this module relate to these types of task:

Type of task	How used in *Working Together*
Case study task	
These are investigations that aim to link learning obtained in schools with the world of work in the wider community. They include: – visits to local businesses and industry – entrepreneurial activities – the investigation of indigenous technologies and technological inventions from other times They provide an opportunity for examining the social and ethical issues related to the development of technology.	Learners read about a factory that produces chairs to find out about the stages of an industrialised process. Although visiting a factory would be best, we realise that this is difficult for some schools. That is why we have included a written version so that learners do no lose out on this part of the module.
Resource tasks	
These are short, practical, focussed activities designed to teach a particular piece of knowledge, making skill or to examine a particular piece of technology in a manner that will increase skill and understanding to the learner.	There are four resource tasks in this module: – one concentrates on the calculations needed for scaling up recipes for mass production – the next concentrates on food preparation skills – the third is about flow charts as a method of presenting information – the last one is about calculating costs The skills acquired in these four tasks will be needed when the learner does the capability task.
Capability tasks	
These are longer, more open tasks requiring designing, developing and evaluation (the technological process). Capability tasks are designed to reveal learner understanding acquired through resource tasks and case studies.	In this module the capability task involves designing a process for mass producing biscuits. Learners will have to apply the knowledge they have learnt in the case study and four resource tasks.

The structure of the module is shown in the following picture.

Structure of this module



Recording all the main decisions

We finally recorded all our main decisions in a summary table to help us keep track of our progress through the module.

You will need to adjust and complete this table as you shape the module for your learners.

Activity	SOs and ACs	What are the outcomes for the activity (Performance Indicators)?	What will be done to achieve this learning?	How will learning be assessed?
1. Capability task Making more	TECH SO1: AC1-7	**Learners will be able to:** Design a process for mass producing biscuits	**Learners will:** Apply the knowledge and skills achieved in the other activities to design and implement a process for mass producing biscuits.	**What:** Learners' ability to use the technological process to design a mass production process **Who:** By the teacher **How:** Learners complete a portfolio recording the steps taken to achieve the product. (See page 15 for more details on a Technology portfolio.)
2. Case study The chair factory	TECH SO2: AC1,2 TECH SO4: AC2 HSS SO8: AC2	**Learners will be able to:** - identify and understand the stages of an industrial process - apply this knowledge to food production	**Learners will:** - read about how chairs are made in a furniture factory to identify the stages of the process - make a poster about stages in an industrial process - recognise these stages in a food production activity	**What:** Understanding of stages of an industrial process **Who:** Group-group peer assessment guided by teacher **How:** Individuals complete a worksheet for teacher assessment. Groups report the findings of discussion to the whole class for peer assessment.
3. Resource task 1 Scaling up	TECH SO3: AC2 MLMMS SO1: AC4,5	**Learners will be able to:** - scale up a recipe for mass production	**Learners will:** - investigate ratio and proportion - apply this to a range of recipes	**What:** Understanding of ratio and accuracy of calculations. **Who:** Peers – within groups **How:** Learners work individually and discuss their work in their group. The group decides on a method that they report back to the whole class, highlighting any problems they experienced.

Activity	SOs and ACs	What are the outcomes for the activity (Performance Indicators)?	What will be done to achieve this learning?	How will learning be assessed?
4. Resource task 2 Mixing it up	TECH SO2: AC2,3,5 TECH SO3: AC1,2	**Learners will be able to:** - understand the information available in recipes - demonstrate safe, hygienic food preparation skills	**Learners will:** - discuss the concept of hygiene and its importance in food preparation - investigate recipes in terms of information included - sort out scrambled instructions - use simple process skills to make a food product	**What:** - poster about hygiene issues - analysis of recipes - unscrambled instructions - processing skills **Who:** - Peers – within groups - Teacher **How:** - groups assess each others' posters and analysis of recipes - teacher assesses unscrambled instructions and processing skills
5. Resource task 3 Flowing along	TECH SO3: AC1,2,3 LLC SO4: AC6	**Learners will be able to:** Outline a process using a flow chart.	**Learners will:** - Investigate the meaning of flow chart symbols. - Describe an everyday event or process using a flow chart.	**What:** Manipulation of data from text to flow chart **Who:** Teacher **How:** Compare flow chart to given recipe
6. Resource task 4 Getting the price right	TECH SO3: AC2,3 MLMMS SO1: AC4,5 EMS SO3: AC3	**Learners will be able to:** Calculate the cost of making a product based on the cost of the ingredients	**Learners will:** - calculate the cost of making a food product from the recipe and the price of the ingredients - calculate a selling price including profit	**What:** Calculations of cost **Who:** Teacher **How:** Groups discuss the process but individuals submit calculations

Assessment in Technology

Assessment in the Technology Learning Programme follows the principles of Outcomes Based Assessment. Technology engages learners in a significant amount of practical activity. This means that you need to apply a range of appropriate assessment methods in an attempt to track and record evidence of learning.

In **resource** and **case study** tasks this would include evidence of:
- concept development
- physical and conceptual skills
- values and attitudes.

In many cases knowledge, skills and values will be developed through engagement in or by reflecting on the outcomes of these tasks.

Where knowledge and skill is acquired **in the course of engaging in a task** (e.g. where learners use wire to build a single crank on a shaft or use a glue gun) educators will need to consider some or all of the following assessment methods:
- observation and recording of selected learners' performance
- analysis of any resulting artefacts
- analysis of learners reflection on their own performance in the task
- analysis of learners reflection on others performance in the task

A useful tool for recording **observations** in the classroom is an annotated class list like the one shown below.

Week beginning: ……

ANNOTATED CLASS LIST

Learner's name	Comments (both good and bad)	Action reqd	Action taken
Learner 1	*Doesn't seem to understand the concept of ratio*	✓	*Given extra examples to do*
Learner 2	*Contributed well to the group task*		
Learner 3			
Learner 4	*Lets everyone else do the work – need to keep an eye on this learner*	✓	
etc.			

An annotated class list is a class list on which you write comments. You will probably find that it is impractical for you to record comments on every single learner every day. So, the strategy focuses only on recording SIGNIFICANT events, such as:
- uncommon learner behaviour
- a lack of understanding of a concept
- a sudden or gradual understanding of a concept

When identifying a significant effect, you need to ask yourself the question: "Will knowing this change my subsequent teaching of that learner or that lesson?"

Where knowledge or skills are acquired **after engaging in a task** or in more formal learning contexts (for example where learners reflect on and discuss issues emerging from their engagement with a task or observe a demonstration or listen to a presentation), you will need to consider some or all of the following assessment methods:
- formal tests
- completed worksheets or other text based material

- analysis of group discussions presented in oral and / or written form

The size of your class is going to determine how you get your learners to **present** their work. If your class is small, you should have enough time for each group to present their work to the rest of the class. If your class is large, this will take up too much time.

Here are some suggestions as to how the work can be marked:
- Each group takes it in turn to stand in front of the class and present their work. The rest of the class marks their work according to the assessment criteria decided on beforehand.
- All the groups stick their work up on the wall of the classroom (or any other appropriate room, or even in the corridor). One member of each group remains with their work to answer any questions that may arise, and the rest of the members of the class move around the room, looking at all the displayed work, and marking it.
- You could put three groups together and get them to mark each other's work. In this way, each group only has to mark two other pieces of work.

In addition, the **process skills** required to complete capability tasks also require that educators structure activities so that they allow learners to develop clear evidence of these skills for assessment purposes.

The **portfolio** of evidence developed from the capability task described on the next page is an example of how such evidence can be acquired. It provides a collection of material (evidence) which educators are able to use as a basis for assessing learners' understanding of the technological process in terms of the assessment criteria of TECH SO1.

The portfolio is a record of how the learners arrived at their final product in the capability task. It should show evidence of the learner's:
- knowledge and understanding of materials, processes and techniques (acquired through case studies and resource tasks)
- ability to express and develop design ideas by talking, drawing and working with materials
- ability to consider technical or aesthetic factors when designing, such as properties of materials, joining methods, texture and colour
- confidence in investigating, experimenting, resolving difficulties when they arise
- competence in applying knowledge from other subjects, such as scientific principles
- skills in handling and using tools and equipment with appropriate care and accuracy (acquired through resource tasks)
- ability to plan work and think ahead

The portfolio should include the following:
- identification of the need/problem (the design brief)
- a range of ideas/designs, however rough (including drawings, flow charts, graphs)
- a record of steps taken in researching the project (including questionnaires)
- skills practised in resource tasks
- final project product
- project presentation
- self-assessment by learner
- peer assessment (if appropriate)

There should be a balance of self-, peer- and teacher-assessment. Learners should be encouraged to be independent and provide feedback sessions on their own assessment if necessary.

Activity 1: Capability Task – Making more

Suggested duration

The Capability Task should take 2 hours to complete – a ½ hour introduction at the beginning of the module, then 1½ hours at the end of the module to actually complete the task.

Resources needed

- For designing and planning the production line: recipes, paper, pens, calculators.
- For making the biscuits: ingredients, measuring, mixing and cooking equipment.

NOTES:

- *Making the biscuits is an expanded opportunity.*
- *A useful Internet site for biscuit recipes is* http://www.cookierecipe.com

Class organisation

Learners should work in groups. Each learner should submit a portfolio (see notes on previous page about portfolios).

What are the outcomes for this activity? (Performance Indicators)

Learners will design and implement a process for mass producing biscuits using the technological process (TECH SO1: AC1-7)

NOTE: Making biscuits is not an outcome of this task as it is written and should not be assessed.

What will be done to achieve learning?

Learners will:

- apply the knowledge and skills achieved in the case study and resource tasks that follow to design and implement a process for mass producing biscuits
- decide on a price for the biscuits

The task should be introduced in a context e.g.:

> Your school needs to raise funds to build a technology laboratory. Your class decides to make and sell biscuits to raise funds. Design a process for making large numbers of biscuits to be sold.

Discuss the problem with the class. You might like to brainstorm some solutions with the whole class during this introduction.

You might like to develop a worksheet for this. This would form part of the portfolio that the learners submit.

Explain that the learners will do five tasks to develop skills and knowledge that will help them complete the Capability Task. They should be encouraged to make notes in their portfolio as they work through these other tasks. They will have time at the end of the module to complete the Capability Task and their portfolios.

You might need to explain what the Technological Process is. The notes in Appendix 1 will help you, or you might like to look at the GICD Grade 7 Technology ILP – *What is Technology Anyway?*

The technology portfolio that each learner submits should record or document the design process that the learner went through while completing the capability task. The portfolio can also provide evidence that learners have gained the skills and knowledge covered in the Case Study and Resource Tasks.

For you to be able to assess all of this, learners need to include evidence of at least the following in their portfolio:

- The design brief, identifying the problem or need (covered in Capability Task).
- Choosing a recipe and explaining (justifying) their choice.
- Analysing the recipe, identifying ingredients, equipment, times, etc. (covered in Resource Task 2).
- Scaling the recipe up for mass production (covered in Resource Task 1)
- Calculating the cost and the selling price for the biscuits (covered in Resource Task 4).
- Using the stages of an industrial process identified in the Case Study to plan their process. A table like the following one might help:

Stages of an industrial process	What will happen in my production line
-	-

- Identification of safety and hygiene procedures (covered in Case Study and Resource Task 2)
- Drawing a flow chart of the process (covered in Resource Task 3).
- Trying the process out (covered in Resource Task 2).
- Evaluating the process and suggesting improvements.

Expanded opportunities

- Assess the quality of the biscuits as well as the mass production process.
- Conduct market research with potential customers to find out what kind of biscuits they would buy and for how much. Learners would need to design a questionnaire for this.
- Each group makes a different type of biscuit and the whole class conducts a taste test. The 'best' biscuit is the one that is mass produced and sold. The Natural Sciences Grade 8 Module *Working Together* includes an activity on consumer testing that you could use.
- Design packaging for the biscuits, including costs and how it will affect the selling price.

How will the learner's achievement be assessed?

Note that the focus for assessment is the design of the PROCESS of mass producing biscuits, not the biscuits themselves. Refer back to the assessment notes in the Overview for more detail on portfolios. More detail on criteria for assessing specific items in the portfolio are included in the relevant Resource Task e.g. criteria for assessing flow charts are given in Resource Task 3.

Outcomes being assessed	Evidence	Criteria	How evidence is collected	Recording
Learners will design and implement a process for mass producing biscuits using the technological process	Portfolio recording each stage of the technological process	- Inclusion of design brief - Justified selection of recipe - Stages of production correctly identified - Safety and hygiene procedures identified - Correct flow chart of the process - Accurate calculation of costs and selling price - Production process critically evaluated	Learners work on their portfolios throughout the module, handing it to the teacher for assessment after completing the capability task.	Teacher records the learner's achievement in terms of: - the designed production line - recording of the process

Activity 2: Case Study – The chair factory

Suggested duration
The Case Study should take 1 hour to complete.

Resources needed
Learner's worksheet (included)

Class organisation
Individuals (Making Chairs worksheet)
Groups (maximum 5 learners) for food production section.

What are the outcomes for this activity? (Performance Indicators)
Learners will:
- identify and understand the stages of an industrial process (TECH SO4 AC2)
- apply this knowledge to food production (TECH SO2 AC1,2)

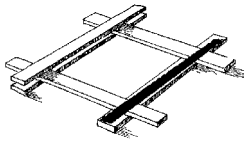
What will be done to achieve learning?
Learners will:
- read about how chairs are made in a furniture factory to identify the stages of an industrial process
- recognise these stages in a food production activity

Making Chairs

Give the learners the worksheet on making chairs. The worksheet looks at the stages in the process of making chairs. It also highlights safety equipment and practices. Each learner should submit a worksheet for assessment.

Some possible answers to the questions on the worksheet:

1. Gloves, overalls and heavy boots are safety equipment that are worn to protect the wearer.
2. The next piece of wood will go above the one closest to the man's foot (shown as a dark line in the picture on the right). Packing the wood this way means that the pile will be stable and not likely to fall over.



3. Ear muffs protect the operator from the noise produced by the saw.
   Safety glasses protect the operator from getting sawdust and small pieces of wood in his or her eyes.
   Dust masks keep fine sawdust from being inhaled and / or swallowed.
   Gloves protect the hands from splinters.
   Safety shoes protect the feet.
   Overalls protect the clothing beneath them.
   Hair is tied back to prevent it getting caught in machinery.
4. The man assembling the chairs is wearing safety boots. The men doing the finishing task are wearing safety glasses and dust masks.
5. QC inspectors do random checks on the process to ensure that the correct procedures are being followed.
6. Hand tools include scissors, clamps, files and hammers.
   Power tools include all the saws, the spray painting equipment and the drill.
7. The stages that they identify should be:
   - order received
   - buying of raw materials

- preparation
- processing
- assembly
- finishing
- packing
- delivery
- quality control (permeates all stages)

8. The seats are made at the same time as the chairs.

NOTE: This process is discussed again in Resource Task 3, when the learners investigate flow charts.

Most of the stages identified here occur in all industrial processes, regardless of what the product is that is being produced. Some products do not require assembly.

Food production

Discuss the production of a food product and let the learners identify the various stages of the process. Here is an example of a bakery:

- order received (for a number of loaves)
- buying (flour and yeast)
- preparation (measuring of flour and yeast)
- processing (mixing, kneading, rising, baking)
- assembly (nothing)
- finishing (bread could be sliced by a machine)
- packing (into plastic packets)
- delivery (to shops)
- quality control (will take place at each step)

You might like to give the learners a worksheet to record their decisions. This could include a table like the one below:

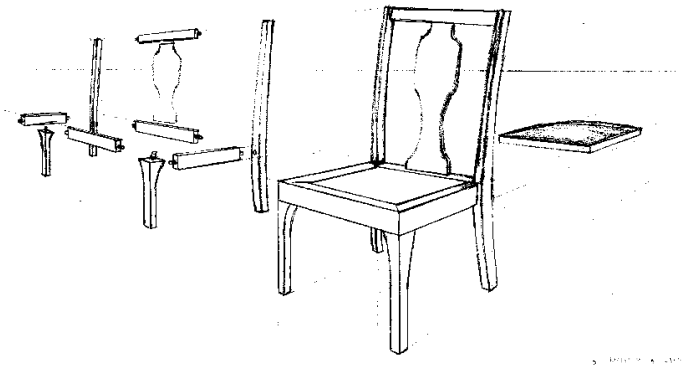
Stages of an industrial process	What happens in the food production line
-	-

If possible, arrange a visit to a bakery so that the learners can see the process in action for themselves. Other places you could investigate are fast food outlets or restaurants. Refer to the GICD Resource Directory for field trip possibilities.

How will the learner's achievement be assessed?

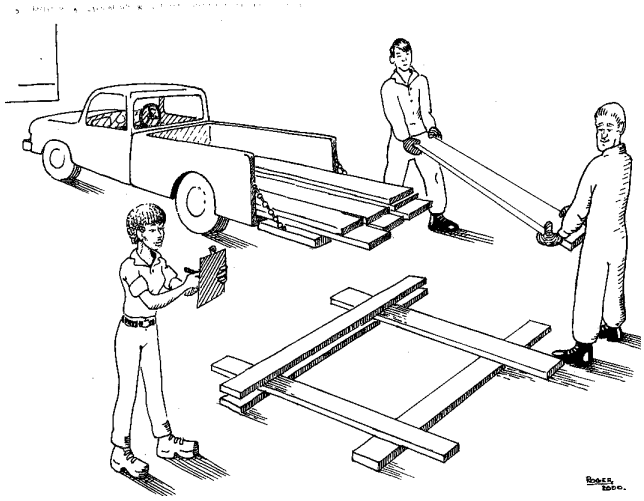
Outcomes being assessed	Evidence	Criteria	How evidence is collected	Recording
Learners will: - identify and understand the stages of an industrial process - apply this knowledge to food production	Completed worksheet and class discussion.	Poor, fair or good completion of 'Making Chairs' worksheet. Correct identification of stages in a different process during discussion.	Learners work through worksheet individually. The worksheet is marked by the teacher. Groups discuss the stages in food production. They report their findings to the whole class.	Use an annotated class list to record notes about how learners participate in the discussion. It is not necessary to record marks for the worksheet.

Making Chairs



Cosy Chairs is a company that makes upholstered dining room chairs. They submit a design proposal to supply painted wooden chairs with fabric covered seats to a large chain of furniture shops. They get orders from the shops to make about 100 chairs a week. This is the process they follow:

Once the company has won the order they buy the wood, fabric, paint, padding, glue and nails. When it all arrives, it is all inspected to make sure that it is correct. This is called incoming goods control and forms part of quality control. Quality control or QC, is a series of checks that happen during the whole process to make sure that nothing goes wrong. Problems are identified and corrected as they occur.



1. The men carrying the wood are wearing gloves, overalls and heavy boots. Why do you think they are wearing these things?

_____

_____

_____

_____

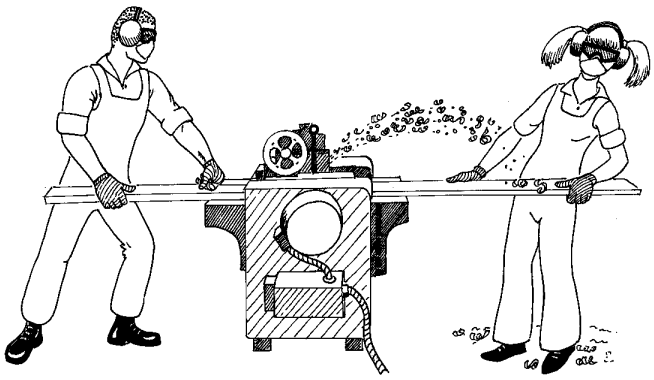
2. Look at how the men are stacking the wood. Where do you think they are going to put the next piece? Why?

_____

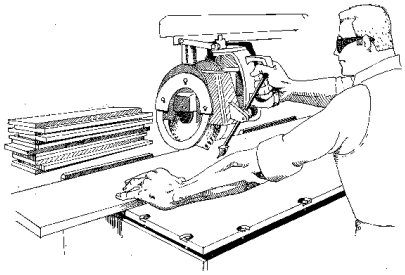
_____

_____

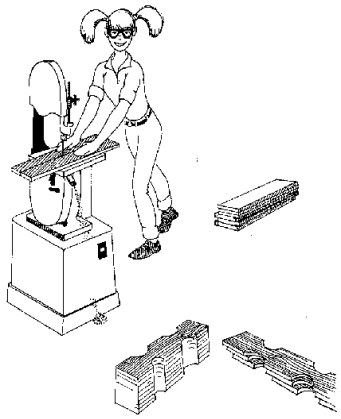
_____



The wood is cut to the correct thickness for the different parts of the chair – the legs, the back and the seat. A QC inspector checks that all the pieces are the correct thickness.



The wood is then taken to another station where it is cut to the correct lengths for all the different pieces, and checked by a QC inspector. The various shapes are then cut from the lengths of wood and are checked by a QC inspector.



3. Explain why the people cutting the wood in the pictures above are wearing each of the following:

Ear muffs: _____

Safety glasses: _____

Dust masks: _____

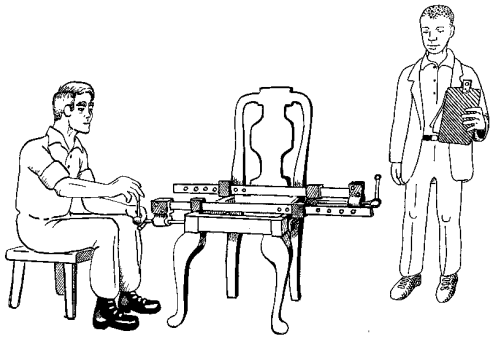
Gloves: _____

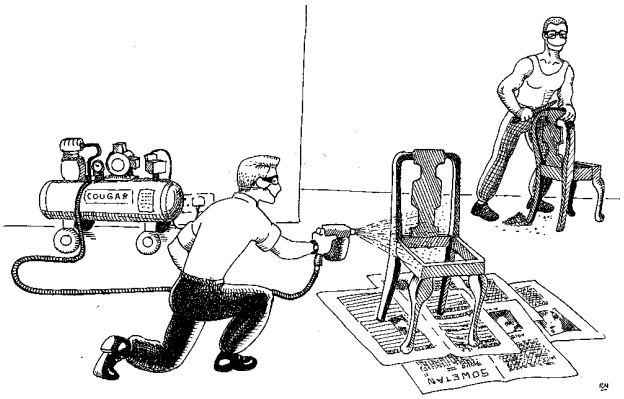
Safety shoes: _____

Overalls: _____

Hair tied back: _____

A skilled worker cuts the wood for the joints before the various pieces are joined together (assembled). The joints are glued and clamped together. The assembled pieces are left for a while to let the glue dry. A QC inspector checks the chairs to make sure they are good.



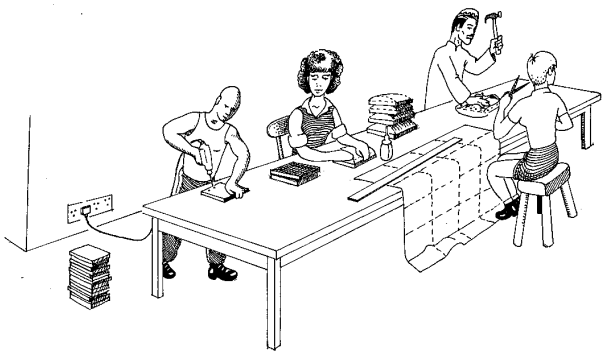


Once the glue is dry, each chair is taken for finishing. They are sanded down and then painted. The paint needs time to dry.

4. What safety precautions can you see being taken in the two pictures above?

_____

_____



While the chairs are being made, a separate group of workers make the seat. They take the cut wood and attach padding. The fabric is cut to the correct size and attached to the seat with nails or staples. A QC inspector checks all the stages in this process.

5. Describe in your own words what the QC inspectors do.

_____

_____

_____

6. List all the tools you can see being used in all the pictures so far. Decide whether they are hand tools (energy is provided by the person using the tool) or power tools (energy is provided by an external source e.g. electricity).

Hand tools: _____

_____

Power tools: _____

_____

Once the painted chair is dry, a completed seat is positioned and attached. There is a final QC check to make sure nothing has gone wrong.

Finally, the chairs are packed in protective wrapping and sent out to the customers.

7. How many stages are involved in making the chairs? List them below:

_____

_____

_____

_____

_____

8. Which of these stages happen at the same time? _____

_____

Activity 3: Resource Task 1 – Scaling up

Suggested duration
Resource Task 1 should take 1 hour to complete.

Resources needed
Recipes (see examples in Appendix 1 or cut some from newspapers or magazines)
Calculator

Class organisation
Whole class discussion
Groups (maximum 5 learners) work on scaling activity
Whole class plenary

What are the outcomes for this activity? (Performance Indicators)
Learners will:
- scale up a recipe for mass production (TECH SO3 AC2)

What will be done to achieve learning?
Learners will:
- investigate the concepts of ratio and proportion
- use these concepts to calculate how the quantity of raw materials varies if you want to get more or less out of the process
- apply this to a range of recipes

Discuss the idea of ratio and proportion. Most Standard 6 and Grade 8 maths textbooks contain details and exercises about ratio and we suggest you consult them for further details. Here is some extra information that might help you:

- A ratio compares two or more things (i.e. when quantities of the same type are compared, we get a ratio).
- A ratio can be expressed in two ways:
  a) by using the word 'to' (e.g. if we have 2 pens and 3 pencils, we say "the ratio of pens to pencils is 2 to 3")
  b) by using a colon (:) (e.g. we can write 2 to 3 as 2:3)
- The object that is stated first in the verbal description becomes the first component in the symbolic representation
  e.g. if we have 2 pens and 3 pencils,
  the ratio of pens to pencils is 2:3 and
  the ratio of pencils to pens is 3:2
- If we have one pen and one pencil, we say that the ratio of pens to pencils is 1:1.
- If Mary has R20 and Rachel has R10 we can say:
  a) Mary has R10 more that Rachel or Rachel has R10 less than Mary
  b) Mary has twice as much money as Rachel, or Rachel has half as much money as Mary
  c) For each R2 that Mary possesses, Rachel has R1, or for each R1 that Rachel has, Mary has R2
  d) The ratio of Mary's money to Rachel's money is 20:10 = (20)10):(10) 10) = 2:1
- We use ratio when:
  a) Doubling or trebling recipes
  b) Mixing cold drink (e.g. 1 part concentrate to 5 parts water)
  c) Mixing concrete (1 pocket cement to 2 wheelbarrows of sand and 4 wheelbarrows of stone)

You might like to get your MLMMS teacher involved here. Activity 2 in the MLMMS Grade 8 module *Working Together* deals with ratio.

Discuss how input affects output. Most recipes tell you how many 'things' it makes. This could be portions, size (for a cake) or a quantity (as in biscuits). If you want to make more or less of the product (output), you need to change the amount of ingredients that you put in (input). If you want more product, you need more ingredients. If you want to make less product, you need less ingredients.

Here is an example that you could discuss with the class:

Here are the main ingredients for Basic Fork Biscuits:
- 75 g butter
- 150 g castor sugar
- 1 egg
- 175 g flour, sifted

According to the recipe, this amount of ingredients will make 20 biscuits. Using this information, we can scale the recipe up to make 40, 60 and 100 biscuits as follows:

Ingredient	**Quantity of biscuits**			
	20	**40**	**60**	**100**
butter	75 g	150 g	225 g	375 g
castor sugar	150 g	300 g	450 g	750 g
egg	1	2	3	5
sifted flour	175 g	350 g	525 g	875 g
Ratio of original recipe to scaled up recipe	1:1	1:2	1:3	1:5

Instead of showing the learners the completed table, you could give them an incomplete version like the one below and get them to complete it.

Ingredient	**Quantity of biscuits**			
	20	**40**	**60**	
butter	75 g		225 g	375 g
castor sugar	150 g	300 g		750 g
egg	1	2	3	
sifted flour	175 g		525 g	875 g
Ratio of original recipe to scaled up recipe	1:1	1:2		1:5

Now give each group of learners a recipe and tell them to scale it up or down a number of times.

Let them discuss it in the group, then each learner does his or her calculations. They should compare the answers in the group and identify problems with the calculations.

Each group reports back to the whole class about the method they used to calculate the amount of ingredients needed and any problems they experienced.

Extension activity:
Other things you might like to discuss with the class:
- It would be difficult to scale down the recipe for Basic Fork Biscuits because of the egg. How do you measure half an egg? Or a third of an egg?
- Ingredients such as flour are sold in different quantities e.g. 500 g or 1 kg packets in supermarkets up to 50 kg sacks from wholesalers. Would all of these cost the same in terms of R/g? Why do wholesalers sell in large quantities? This leads towards

economies of scale. Your EMS teacher will be able to give your more information on this.

- Does scaling up or down affect the size of the biscuit?

How will the learner's achievement be assessed?

Outcomes being assessed	Evidence	Criteria	How evidence is collected	Recording
Learners will scale up a recipe for mass production	Completed table	Manipulation of numerical data (calculations) Use of ratios	Learners work individually and discuss their work in their group. The group decides on a method that they report back to the whole class, highlighting any problems they experienced.	Use an annotated class list to note any difficulties that learners experience so that you can give extension work where needed.

Activity 4: Resource Task 2 – Mixing it up

Suggested duration

Resource Task 2 comprises four sub-activities and should take 1½ hours to complete, with roughly 20 minutes allocated for each sub-activity. You might like to give RT2.3 as homework to give more time in class for the other tasks.

Resources needed

RT2.1

Material to make posters – cardboard, scissors, glue, coloured pens, appropriate pictures from magazines or newspapers

RT2.2

One recipe for each group (get from newspapers or magazines)

RT2.3

One recipe for each group (get from newspapers or magazines) OR use example given in RT2.2.

RT2.4

Chocolate (50 g per group)	Basin
Puffed rice cereal (20 g per group)	Spoon
Paper cases / cookie cups (10 per group)	Saucepan
Scale	

Class organisation

Whole class (discussions)
Groups of maximum 5 learners
Individual work (RT2.3)

What are the outcomes for this activity? (Performance Indicators)

Learners will:

- understand the information available in recipes (TECH SO3 AC1,2)
- demonstrate safe, hygienic food preparation skills (TECH SO2 AC2,3,5)

What will be done to achieve learning?

Learners will:

- discuss the concept of hygiene and its importance in food preparation (RT2.1)
- investigate recipes in terms of information included (RT2.2)
- sort out scrambled instructions (RT2.3)
- use simple process skills (measuring, mixing, rolling, cutting) to make a simple food product (RT2.4)

RT2.1 Hygiene and safety rules for working with food

It is important to work with food in a hygienic way. The following table gives some points to start a discussion with the whole class. It is not an exhaustive list – see how many other points you and your learners can add. They might want to add other categories. Encourage them to say what makes the items in the Action list hygienic and safe practice.

Category	Action
Food preparation	- wear an apron or overall - tie back hair, or cover it - cover cuts with waterproof plasters - wash hands in hot soapy water - keep nails short and clean - avoid touching nose and mouth - don't lick fingers or put tasting spoons back into food - ..... - ..... - ..... - .....
Handling and storing food	- store in sealed containers - store food that needs refrigerating below 5°C - store food that needs to be kept hot above 65°C - handle food as little as possible – use tongs, forks or spoons instead of fingers - ..... - ..... - ..... - .....
Working environment	- wash worktops with hot soapy water - keep the floor clean - keep the work area tidy - wrap food waste and put it into a dustbin - empty the dustbin regularly - wipe up any spilt food or drink immediately - ..... - ..... - ..... - .....
Equipment	- use clean equipment only - handle knives carefully, keeping the point facing away from you - pot handles should face away from the edge of the stove - open pot lids away from you in case the contents are boiling - use oven gloves or a thick cloth to take hot dishes out of the oven or off the stove - switch off stove plates or oven when you are finished using it - ..... - ..... - ..... - .....

Once the discussion is complete, allocate one category to each group of learners. They should then produce a poster covering all the points discussed.

The posters could be started in class and completed as homework. The posters can then be put on the walls as a reminder of safe, hygienic practice. You might like to speak to your Arts & Culture teacher to get some hints on good poster production. Some starting points are:

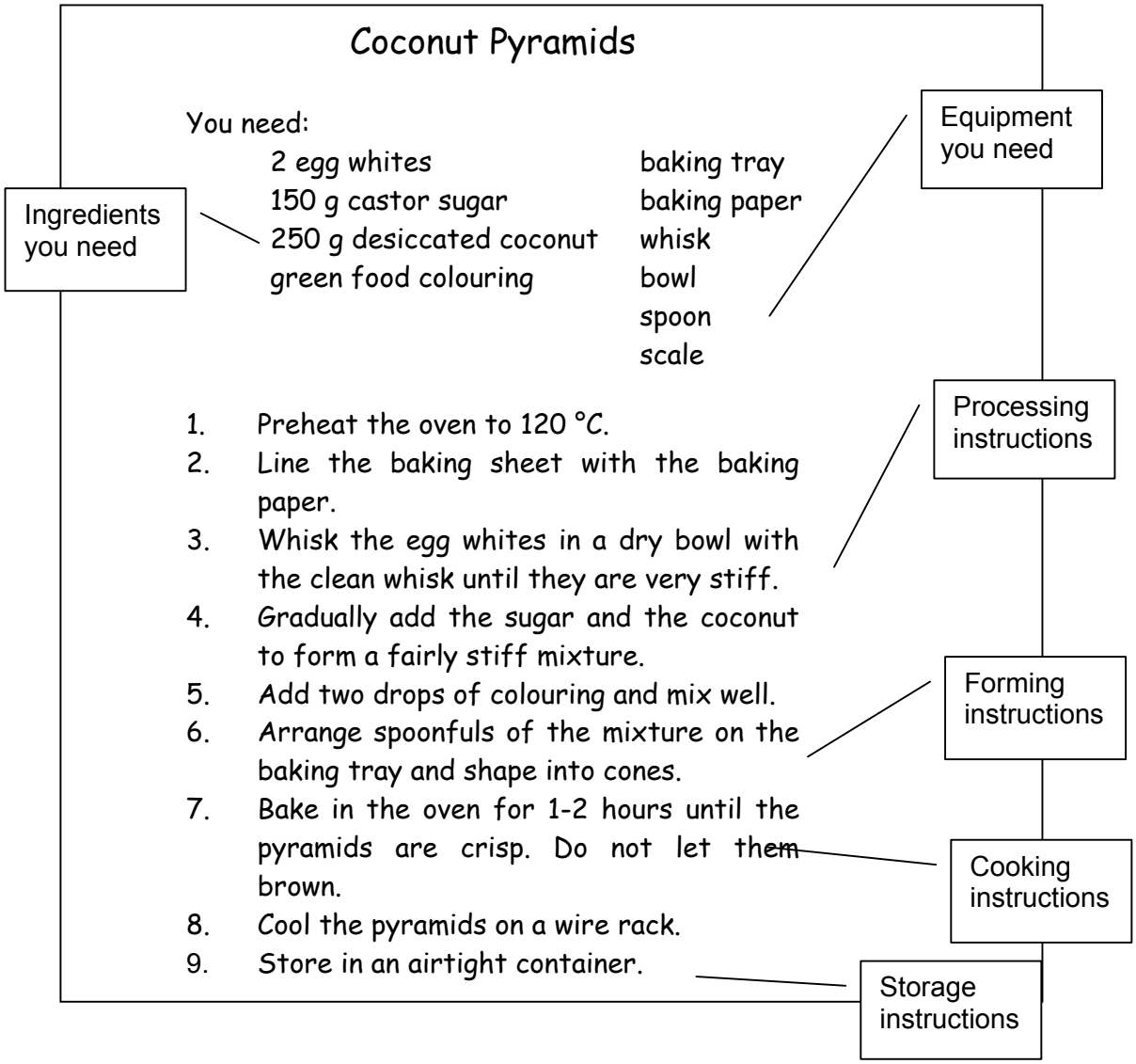
- posters should be at least A2 in size and done on cardboard
- you might like to use different colours of cardboard for each category of rules
- the poster should include illustrations as well as text
- illustrations could be cut from magazines and newspapers or hand drawn
- you should be able to read the text from at least 1m away

Extension activity:
Get a representative from the Public Health Department to give a talk on the hygiene issues surrounding the production of food for public consumption. The GICD has a Resource Directory for Teachers that will help you to find and contact useful people in this area.

RT2.2 What information can we get from recipes?

Recipes give us all the information we need to be able to make a product. They tell us what ingredients to use, how to combine them and how to process the mixture.

Use an example like the one below to discuss the types of information found in a recipe with the whole class. Make a list of the types of information you can find.



Then give each group a recipe to identify the different types of information in the list that the whole class compiled. You can use any recipes you like for this activity. Most newspapers and magazines include recipes. It could be interesting to give different groups different recipes – use some that don't require cooking (unlike the example shown here), some that need frying, baking or boiling, simple recipes or more complex ones (like making a cake and icing it).

Discuss each group's findings with the class.

RT2.3 Unscrambling instructions

Now the learners understand the kinds of information given in recipes, they should be able to put it in a logical order. Give each learner scrambled instructions for a recipe. You could do this by cutting the paper the recipe is printed on into pieces with one instruction per piece. Again, more than one recipe can be used. Each learner should submit his or her unscrambled instructions to you for assessment.

Here is an example for Chocolate Crispy Cakes:

Scrambled instructions
A. Put the chocolate pieces into the basin.
B. Put a spoonful of the mix into each paper case.
C. Stir the puffed rice cereal into the melted chocolate.
D. Remove the basin from the saucepan.
E. You will use a basin, a spoon, a saucepan and hot water
F. Place the basin over the saucepan of hot water until the chocolate melts.
G. Leave the cakes to set. This should take about 5 minutes.
H. You need 20 g puffed rice cereal, 50 g of chocolate and 10 paper cases.
I. Make sure the melted chocolate coats all the puffed rice cereal.
J. Break the chocolate into pieces.
K. Heat the water in the saucepan.

Unscrambled instructions
1. You need 20 g puffed rice cereal, 50 g of chocolate and 10 paper cases. (H)
2. You will use a basin, a spoon and a saucepan half-filled with water. (E)
3. Heat the water in the saucepan. (K)
4. Break the chocolate into pieces. (J)
5. Put the chocolate pieces into the basin. (A)
6. Place the basin over the saucepan of hot water until the chocolate melts. (F)
7. Remove the basin from the saucepan. (D)
8. Stir the puffed rice cereal into the melted chocolate. (C)
9. Make sure the melted chocolate coats all the puffed rice cereal. (I)
10. Put a spoonful of the mix into each paper case. (B)
11. Leave the cakes to set. This should take about 5 minutes. (G)

RT2.4 Practising food processing skills

Let the learners make the Chocolate Crispy Cakes from the unscrambled instructions. They will need to demonstrate the following skills:

- measuring the mass of the ingredients
- following instructions
- use a range of processing skills (breaking chocolate, using a 'double boiler', stirring, spooning out mixture)
- hygienic and safe food preparation

How will the learner's achievement be assessed?

Outcomes being assessed	Evidence	Criteria	How evidence is collected	Recording
Learners will understand the information available in recipes	Analysed recipes	Correctly identified data types	Groups assess each other's findings	Observation sheet
	Unscrambled instructions	Instructions unscrambled in a logical manner	Teacher compares submitted unscrambled instructions with original recipe.	Ability to unscramble instructions based on a 3 point scale
Learners will demonstrate safe, hygienic food preparation skills	Poster	Concepts of hygiene expressed in own words or pictures	Each group's poster is assessed by other groups	Each group uses a recording sheet.
	Biscuits	- measuring mass correctly - following instructions - hygienic and safe food preparation	Teacher observes learners in action.	Use an observation sheet to note any difficulties with processing skills.

Using assessment information for future planning

If your learners are struggling with food processing skills, demonstrate the processes first, then let them try themselves.

Activity 5: Resource Task 3 – Flowing along

Suggested duration
Resource Task 3 should take 1 hour to complete.

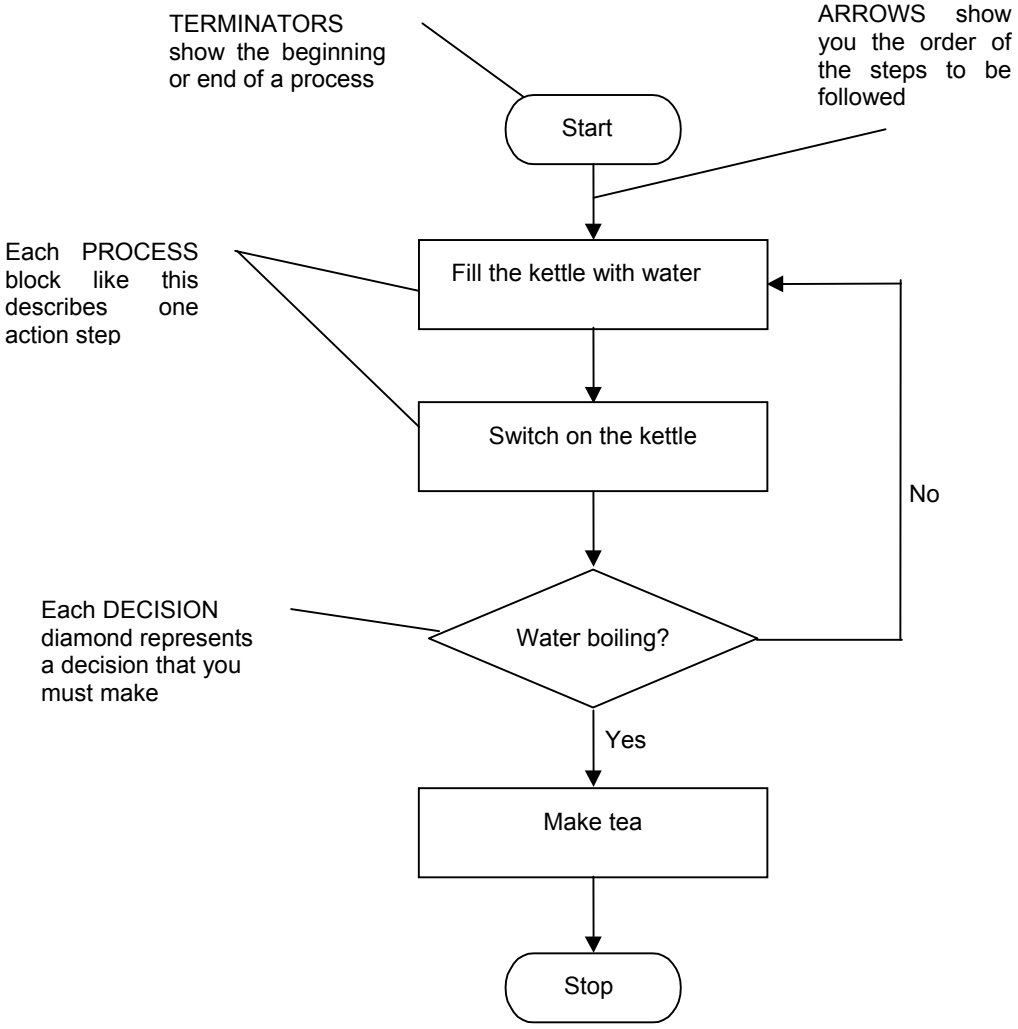
Resources needed
Recipes (those used in Resource Task 2)

Class organisation
Whole class discussion
Group discussion (about 5 learners per group)
Individual work

What are the outcomes for this activity? (Performance Indicators)
Learners will outline a process using a flowchart (TECH SO3 AC1-3)

What will be done to achieve learning?
Learners will:
- investigate the meaning of flow chart symbols
- describe an everyday event or process using a flow chart
- convert a recipe to a flow chart

The meaning of the four most common symbols used in flow charts are shown in the diagram below. Either draw this on the board or give a copy to each learner.



Now discuss with the class what might appear in process blocks or decision diamonds in everyday processes e.g. crossing the road, getting dressed or getting to school. Learners should draw these flowcharts.

Discuss whether all processes need decision diamonds.

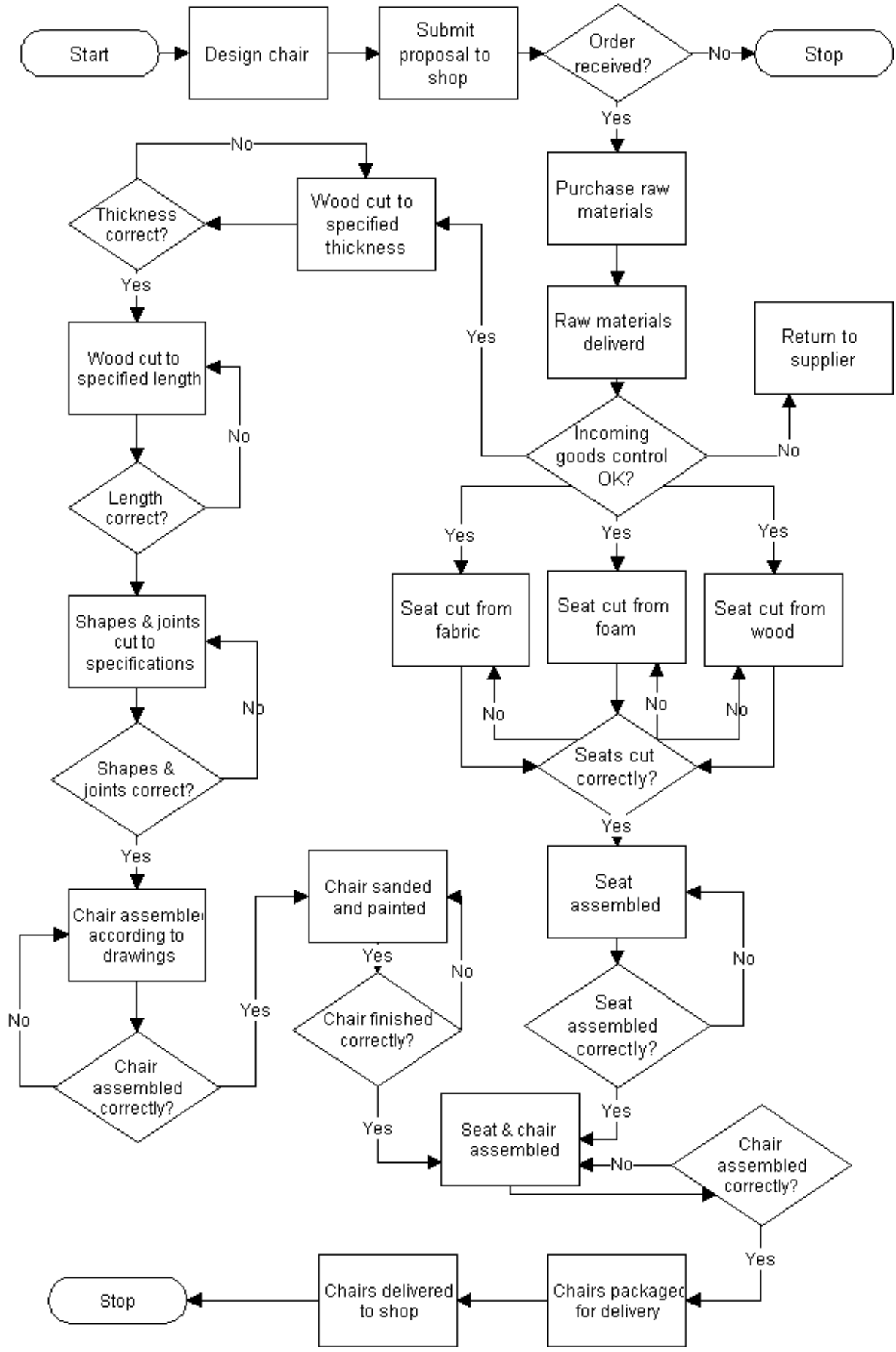
Discuss processes where certain tasks can occur in parallel, such as making the chairs and making the seats as described in Resource Task 1. This is shown in the flow chart on the next page – you might like to give a copy to each learner.

Get learners to draw flowcharts for the recipes in Resource Task 2. Learners can discuss this in their groups, but each learner should submit their own flow chart and copy of the original recipe for teacher assessment.

How will the learner's achievement be assessed?

Outcomes being assessed	Evidence	Criteria	How evidence is collected	Recording
Learners will outline a process using a flowchart	Flowchart for a recipe	Are the instructions clear and in the correct order? Has anything been left out? Have the flowchart symbols been used correctly?	Teacher compares the original recipe to learners' flowcharts	Note whether learners have problems manipulating data in this way.

Flow chart of chair production process from Case Study



Activity 6: Resource Task 4 – Getting the price right

Suggested duration
Resource Task 4 should take 1 hour to complete.

Resources needed
Recipes (see examples in Appendix 1)
Prices of the ingredients (visit your local supermarket, or make prices up yourself)
Calculators

Class organisation
Groups (maximum 5 learners) and individual work

What are the outcomes for this activity? (Performance Indicators)
Learners will be able to calculate the cost of making a product, given the costs of the ingredients (TECH SO3 AC2,3)

What will be done to achieve learning?
Learners are given a recipe and the price of the various ingredients. They calculate the cost of making a batch as shown here for the Chocolate Crispy Cakes that were discussed in Resource Task 2.

Ingredients	Price	Amount required	Cost
Puffed rice cereal	R15 per 500g packet	20g	
Bar of chocolate	R6 per 100g	50g	
Paper cases	R5 per 25	10	

Calculate a selling price for Chocolate Crispy Cakes. You might like to calculate the unit cost first e.g. the cereal costs R15/500g = R0.03/g or 3c per gram. Multiply this unit cost by the amount required to get the cost for the recipe e.g. 3c/g x 20g = 60c. So the cereal part of the recipe will cost 60c. Do the same with the other ingredients and add the costs together. This will tell you how much the raw materials cost.

Repeat the process with a different recipe. Groups can discuss the process but individuals should submit their calculations.

Extension activity
These costs don't include time taken to make the cakes (labour costs) or energy used to keep the water hot. These costs would need to be included if you intended to sell the cakes and make a profit.

You can calculate profit by adding, let's say, 10% of the raw ingredients cost on to the total. So in this example, the total was R5.60. 10% of that is 56c, which we add to R5.60 to get R6.10. The recipe makes 10 cakes, so the selling price would be 61c each. What happens if you change the percentage profit? How much do you think people would pay for the cakes?

How will the learner's achievement be assessed?

Outcomes being assessed	Evidence	Criteria	How evidence is collected	Recording
Learners will be able to calculate the cost of making a product, given the costs of the ingredients	Table with calculated costs.	Accurate manipulation of numbers	Groups discuss the process but individuals submit calculations to the teacher	3 point scale reflecting accuracy of calculations

Using assessment information for future planning

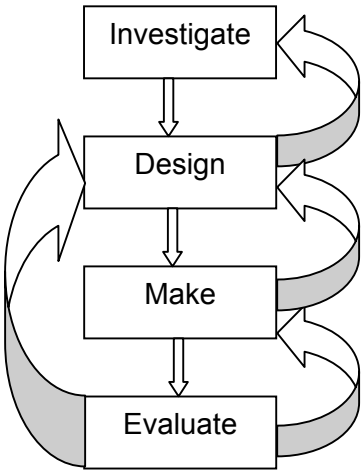
Make notes about problems that the learners experienced and give them extension work to address them.

Appendix 1: The Technological Process

The main phases of the technological process are:

1. **Investigate**, which has inputs of human needs and wants, natural and technical resources and constraints (e.g. natural phenomena, the availability of materials and processes), economic environment, cultural resources and constraints (e.g. time, money, manpower). Investigation involves researching of the problem, location of useful information, analysis of the problem and specification of requirements.
2. **Design**, which has as inputs the output of the investigate phase. Design involves the generation of possible solutions through brainstorming, drawing and modelling. The output of this phase is a description of the optimal solution, either graphically or modelled.
3. **Make,** which comprises the use of tools and equipment and has the inputs of the design phase output, materials, energy and information. This phase involves the making of the product according to the design and specifications. Outputs are a product and waste.
4. **Evaluate,** which includes testing of the product (is it working?), and evaluating the finished product against the specifications. It also includes the preparation of operating or maintenance instructions as well as advertising, selling and distribution of the product.

Feedback from evaluate, making and designing, results in continuous evaluation and improvement.



Appendix 2: Biscuit recipes

Basic fork biscuits (makes 20 biscuits)

INGREDIENTS		PROCEDURE
75 g butter 150 g castor sugar 1 egg ½ teaspoon grated lemon zest 175 g cake flour, sifted pinch of salt		1. Preheat oven to 190 °C. 2. Cream the butter and sugar together. 3. Add the egg and lemon zest. 4. Work in the flour and salt. 5. Put spoonfuls of the mixture on to a baking tray and flatten with the back of a fork. 6. Bake for 10-12 minutes until pale brown. 7. Cool on rack
EQUIPMENT		**VARIATIONS**
scale teaspoon basin sieve grater	wooden spoon metal spoon baking tray cooling rack	**Choc chip biscuits**. Use brown sugar instead of castor sugar. Add 50 g chocolate chips (or grated chocolate). **Nutty biscuits**. Use brown sugar instead of castor sugar. Add 50 g nibbed almonds or other chopped nuts.

Basic melting dough biscuits (makes 20 biscuits)

INGREDIENTS		PROCEDURE
120 g self-raising flour ¼ teaspoon bicarbonate of soda 15 g castor sugar 60 g butter 90 g syrup		1. Preheat the oven to 180 °C. 2. Sift the flour with the bicarbonate of soda. 3. Heat the sugar, butter and syrup until melted. 4. Pour the melted mixture over the flour and mix in. 8. Roll the dough into 20 balls, place on to a baking tray and gently flatten with the back of a fork. 5. Bake for 15-20 minutes. 6. Cool on rack.
EQUIPMENT		**VARIATIONS**
scale teaspoon basin sieve saucepan	wooden spoon fork baking tray cooling rack	**Oaty**. Add ½ teaspoon of dried ginger, ½ teaspoon of ground cinnamon and ¼ teaspoon ground nutmeg to the flour. Roll the balls in oats before baking. **Ginger nuts**. Add 1 teaspoon of ground ginger and 1 teaspoon of ground cinnamon to the flour.

Basic rubbed-in dough biscuits (makes 20 biscuits)

INGREDIENTS		PROCEDURE
180 g cake flour 30 g cornflour 120 g margarine 120 g castor sugar 1 egg		1. Preheat the oven to 180 °C. 2. Sift the flour with the cornflour. 3. Rub in the margarine. 4. Stir in the sugar. 5. Add the beaten egg. 6. Knead the mixture until smooth. 7. Roll out and cut into shapes. 8. Bake for 15-20 minutes. 9. Cool on rack.
EQUIPMENT		**VARIATIONS**
scale basin sieve	cookie cutters baking tray cooling rack	**Peppermint round**. Add a few drops of peppermint essence to the mixture. Use a round cookie cutter. **Currant round**. Add 50 g currants to the mixture. Use a round cookie cutter.

Appendix 3: Glossary

zest	The outer (coloured) part of citrus (oranges, lemons, etc.) skin used to flavour food.
rub in	Using the fingertips to mix flour with butter or margarine to get a crumbly mixture.
cream	Beat butter and sugar together until they are light in colour and have increased in volume