



Revised National Curriculum Statement Grades R-9 (Schools)

Technology



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This document must be read as part of the Revised National Curriculum Statement Grades R-9 (Schools).

This Revised National Curriculum Statement Grades R-9 (Schools) includes:

1. An Overview
2. Eight Learning Area Statements:
 - Languages
 - Mathematics
 - Natural Sciences
 - Social Sciences
 - Arts and Culture
 - Life Orientation
 - Economic and Management Sciences
 - Technology

HOW TO USE THIS BOOK

- For general information see:
 - *Introducing the National Curriculum Statement in Chapter 1* - This will provide information on Outcomes-based Education, the Revised Curriculum Statement for Grades R-9 (Schools), and Learning Programmes.
 - *Introducing the Learning Area in Chapter 1* - This will provide an introduction to the Learning Area Statement including its features, scope and Learning Outcomes.
 - *Learner Assessment* - This chapter provides guidelines to assessment principles in Outcomes-based Education, discusses continuous assessment, and provides examples of record-keeping.
 - The *Reference Lists* provide both a general Curriculum and Assessment Glossary and a specific Learning Area Glossary.
- The body of this book is divided into several chapters. There is one chapter for each of the Phases of the General Education and Training Band - Foundation Phase, Intermediate Phase, Senior Phase. Each of these chapters has a brief introductory section, followed by the Assessment Standards for the Phase. There is also a chapter on Learner Assessment.
- The Assessment Standards for each Phase are presented in a way that makes it possible to track progression. That is, similar Assessment Standards for each grade are lined up with each other so that the teacher will be able to compare progression over the years. This results in some blank spaces, as not every Assessment Standard has its match in every grade.
- Certain symbols are used throughout this book to guide the reader in finding the information she or he is looking for. These symbols are:



Assessment Standard



Grade



Learning Outcome

CONTENTS

CHAPTER 1: INTRODUCTION 1

INTRODUCING THE NATIONAL CURRICULUM STATEMENT 1

Outcomes-based Education 1

Revised National Curriculum Statement: Learning Area Statements 2

Revised National Curriculum Statement: Learning Programmes 2

Time Allocations 3

Assessment 3

The Kind of Teacher that is Envisaged 3

The Kind of Learner that is Envisaged 3

INTRODUCING THE TECHNOLOGY LEARNING AREA 4

Definition 4

Purpose 4

Unique Features and Scope 5

TECHNOLOGY LEARNING OUTCOMES 6

CHAPTER 2: FOUNDATION PHASE (Grades R-3) 11

INTRODUCTION 11

LEARNING OUTCOME 11

Learning Outcome 1: Technological Processes and Skills 11

ASSESSMENT STANDARDS 11

Learning Outcome 1: Technological Processes and Skills 12

CHAPTER 3: INTERMEDIATE PHASE (Grades 4-6)	17
INTRODUCTION	17
LEARNING OUTCOMES	17
Learning Outcome 1: Technological Processes and Skills	17
Learning Outcome 2: Technological Knowledge and Understanding	18
Learning Outcome 3: Technology, Society and the Environment	18
ASSESSMENT STANDARDS	19
Learning Outcome 1: Technological Processes and Skills	20
Learning Outcome 2: Technological Knowledge and Understanding	26
Learning Outcome 3: Technology, Society and the Environment	28
CHAPTER 4: SENIOR PHASE (Grades 7-9)	31
INTRODUCTION	31
LEARNING OUTCOMES	31
Learning Outcome 1: Technological Processes and Skills	31
Learning Outcome 2: Technological Knowledge and Understanding	32
Learning Outcome 3: Technology, Society and the Environment	32
ASSESSMENT STANDARDS	33
Learning Outcome 1: Technological Processes and Skills	34
Learning Outcome 2: Technological Knowledge and Understanding	46
Learning Outcome 3: Technology, Society and the Environment	50
CHAPTER 5: LEARNER ASSESSMENT	53
INTRODUCTION	53
ASSESSMENT PRINCIPLES USED IN OUTCOMES-BASED EDUCATION	54
Definition	54
Key Elements	54
Purposes of Assessment	54

CONTINUOUS ASSESSMENT	55
Characteristics of Continuous Assessment	55
Assessment Strategies	56
Common Tasks for Assessment	56
MANAGING ASSESSMENT	56
People Involved in Assessment	56
School Assessment Policy	56
KEEPING RECORDS	57
Record Books	57
CODES TO USE FOR ASSESSMENT	57
National Codes	58
Progression Schedules	59
Learner Profiles	59
REPORTS	60
Information to be Included in Reports	60
Report Cards	60
REFERENCE LISTS	63
CURRICULUM AND ASSESSMENT GLOSSARY	63
TECHNOLOGY LEARNING AREA GLOSSARY	65



CHAPTER 1

INTRODUCTION

INTRODUCING THE NATIONAL CURRICULUM STATEMENT

The Constitution of the Republic of South Africa (Act 108 of 1996) provides the basis for curriculum transformation and development in South Africa. The Preamble to the Constitution states that the aims of the Constitution are to:

- heal the divisions of the past and establish a society based on democratic values, social justice and fundamental human rights;
- improve the quality of life of all citizens and free the potential of each person;
- lay the foundations for a democratic and open society in which government is based on the will of the people and every citizen is equally protected by law; and
- build a united and democratic South Africa able to take its rightful place as a sovereign state in the family of nations.

Education and the curriculum have an important role to play in realising these aims. The curriculum aims to develop the full potential of each learner as a citizen of a democratic South Africa.

Outcomes-based Education

Outcomes-based education forms the foundation of the curriculum in South Africa. It strives to enable all learners to achieve to their maximum ability. This it does by setting the outcomes to be achieved at the end of the process. The outcomes encourage a learner-centred and activity-based approach to education. The Revised National Curriculum Statement builds its Learning Outcomes for the General Education and Training Band for Grades R-9 (for schools) on the critical and developmental outcomes that were inspired by the Constitution and developed in a democratic process.

The critical outcomes envisage learners who are able to:

- identify and solve problems and make decisions using critical and creative thinking;
- work effectively with others as members of a team, group, organisation and community;
- organise and manage themselves and their activities responsibly and effectively;
- collect, analyse, organise and critically evaluate information;
- communicate effectively using visual, symbolic and/or language skills in various modes;
- use science and technology effectively and critically, showing responsibility towards the environment and the health of others; and
- demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation.

The developmental outcomes envisage learners who are also able to:

- reflect on and explore a variety of strategies to learn more effectively;
- participate as responsible citizens in the life of local, national, and global communities;
- be culturally and aesthetically sensitive across a range of social contexts;
- explore education and career opportunities; and
- develop entrepreneurial opportunities.

Issues such as poverty, inequality, race, gender, age, disability and challenges such as HIV/AIDS all influence the degree and way in which learners can participate in schooling. The Revised National Curriculum Statement Grades R-9 (Schools) adopts an inclusive approach by specifying the minimum requirements for all learners. All the Learning Area Statements try to create an awareness of the relationship between social justice, human rights, a healthy environment and inclusivity. Learners are also encouraged to develop knowledge and understanding of the rich diversity of this country, including the cultural, religious and ethnic components of this diversity.

Revised National Curriculum Statement: Learning Area Statements

The Revised National Curriculum Statement Grades R-9 (Schools) consists of an Overview and eight Learning Area Statements for:

- Languages;
- Mathematics;
- Natural Sciences;
- Social Sciences;
- Arts and Culture;
- Life Orientation;
- Economic and Management Sciences; and
- Technology.

Each Learning Area Statement identifies the main Learning Outcomes to be achieved by the end of Grade 9. Each Learning Area Statement also specifies the Assessment Standards that will enable the Learning Outcomes to be achieved. Assessment Standards are defined for each grade and describe the depth and breadth of what learners should know and be able to do. Each Learning Area Statement's Assessment Standards show how conceptual and skill development can take place over time. Assessment Standards can be integrated within grades as well as across grades. The achievement of an optimal relationship between integration across Learning Areas (where necessary and educationally sound), and conceptual progression from grade to grade, are central to this curriculum.

Revised National Curriculum Statement: Learning Programmes

The Revised National Curriculum Statement is aimed at promoting commitment as well as competence among teachers, who will be responsible for the development of their own Learning Programmes. In order to support this process, the Department of Education will provide policy guidelines based on each Learning Area Statement. Provinces will develop further guidelines where necessary in order to accommodate diversity.

The underlying principles and values of the Revised National Curriculum Statement Learning Area Statements underpin the Learning Programmes. Whereas the Learning Areas stipulate the concepts, skills and values to be achieved on a grade by grade basis, Learning Programmes specify the scope of learning and assessment activities for each phase. Learning Programmes also contain work schedules that provide the pace and sequence of these activities each year, as well as exemplars of lesson plans to be implemented in any given period.

In the Foundation Phase, there are three Learning Programmes: Literacy, Numeracy and Life Skills. In the Intermediate Phase, Languages and Mathematics are distinct Learning Programmes. Learning Programmes must ensure that the prescribed outcomes for each learning area are covered effectively and comprehensively. Schools may decide on the number and nature of other Learning Programmes in the Intermediate Phase based on the organisational imperatives of the school, provided that the national priorities and developmental needs of learners in a phase are taken into account. In the Senior Phase, there are eight Learning Programmes based on the Learning Area Statements. Time allocations for each Learning Area are prescribed for all Grades and Phases.

Time Allocations

In terms of Section 4 of the Employment of Educators Act, (1998), the formal school day for teachers will be seven hours. In terms of the National Education Policy Act, (1996), the formal teaching time per school week is 35 hours. This is set out in:

- (i) Overview Document ISBN 1-919917-08-X, pages 17 & 18.
- (ii) Government Gazette No. 23406, Vol. 443, May 2002, pages 26 & 27

Assessment

Each Learning Area Statement includes a detailed section on assessment. An outcomes-based framework uses assessment methods that are able to accommodate divergent contextual factors. Assessment should provide indications of learner achievement in the most effective and efficient manner, and ensure that learners integrate and apply skills. Assessment should also help students to make judgments about their own performance, set goals for progress and provoke further learning.

The Kind of Teacher that is Envisaged

All teachers and other educators are key contributors to the transformation of education in South Africa. This Revised National Curriculum Statement Grades R-9 (Schools) envisions teachers who are qualified, competent, dedicated and caring. They will be able to fulfil the various roles outlined in the Norms and Standards for Educators. These include being mediators of learning, interpreters and designers of Learning Programmes and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors and Learning Area or Phase specialists.

The Kind of Learner that is Envisaged

The promotion of values is important not only for the sake of personal development, but also to ensure that a national South African identity is built on values very different from those that underpinned apartheid education. The kind of learner that is envisaged is one who will be inspired by these values, and who will act in the interests of a society based on respect for democracy, equality, human dignity, life and social justice. The curriculum seeks to create a lifelong learner who is confident and independent, literate, numerate, multi-skilled, compassionate, with a respect for the environment and the ability to participate in society as a critical and active citizen.

INTRODUCING THE TECHNOLOGY LEARNING AREA

Definition

Technology has existed throughout history. People use the combination of knowledge, skills and available resources to develop solutions that meet their daily needs and wants. Some of these solutions have been in the form of products (e.g. shaping bones into fishhooks and needles, making clay cooking pots), while some solutions have involved combining products into working systems (e.g. bow and arrow, moving water and a wheel, pestle and mortar).

Today people still have needs and wants. However, the knowledge, skills and resources used to find solutions are of a different kind because of accelerating developments in technology. Today's society is complicated and diverse. Economic and environmental factors and a wide range of attitudes and values need to be taken into account when developing technological solutions. The development of products and systems in modern times must show sensitivity to these issues. It is in this context that Technology is defined as:

The use of knowledge, skills and resources to meet people's needs and wants by developing practical solutions to problems, taking social and environmental factors into consideration.

Purpose

The Technology Learning Area will contribute towards learners' technological literacy by giving them opportunities to:

- develop and apply specific skills to solve technological problems;
- understand the concepts and knowledge used in Technology, and use them responsibly and purposefully; and
- appreciate the interaction between people's values and attitudes, technology, society and the environment.

The significance of the Technology Learning Area is directly related to the overall goal of the Revised National Curriculum Statement Grades R-9 (Schools), which is to develop citizens who can display the competencies and values encapsulated in the critical and developmental outcomes. The essence of Technology Learning Area activities in the General Education and Training Band involves the following:

- The application of the design process: At the heart of this process is the identification of everyday problems, needs or wants of people, and the selection and application of appropriate resources, knowledge, skills and values to develop practical solutions. The design process encourages the development of critical and creative thinking skills.
- The Technology Learning Area offers authentic, real-life opportunities for learners to interact with each other within teams when they develop technological solutions. They also interact with their communities when, for example, they test and market products that they made themselves.
- On a personal level, Technology learners become more and more aware of their responsibilities within their classrooms, schools, families and society. They learn to manage the technological resources at their disposal when developing products, and they also learn to minimise the potentially negative impact that their solutions could have on the environment and on human rights.

- Learners in Technology classrooms work in groups to analyse the given information in order to create practical solutions. Learners co-operate and communicate with each other, often combining verbal and graphic modes of communication. Discussing and reporting techniques and the use of appropriate terminology are encouraged during technological activities.
- The Technology Learning Area contributes to the intellectual and practical development of learners, to enable them to cope with the challenges of a technological society. Through its open-ended, problem-solving approach, the Technology Learning Area Statement links knowing with doing; it affords learners opportunities to apply and integrate their knowledge and skills from other Learning Areas in real and practical situations. These skills can be further developed in various situations throughout their lives.
- Learners explore both the positive and negative impacts of technology on their political, social, economical and biophysical environment. This will be done when they evaluate the product they have made, using criteria like affordability, safety, fit for purpose, effect on the environment, and so on. This will enable learners to develop into critical consumers.
- In the Technology Learning Area, learners are provided with opportunities to interact with business and various industries that help them to understand and adapt to changing economic realities. They learn to generate creative and innovative ideas, and to co-operate in translating their ideas into action. Learners gain skills, knowledge, competencies and confidence that equip them to explore entrepreneurial initiatives which will enable them to contribute to South Africa's social and economic development. This process also allows learners to explore various opportunities for further education and future careers.

Unique Features and Scope

The Technology Learning Area gives learners the opportunity to:

- learn by solving problems in creative ways;
- learn while using authentic contexts that are rooted in real situations outside the classroom;
- combine thinking and doing in a way that links abstract concepts to concrete understanding;
- carry out practical projects using a variety of technological skills – investigating, designing, making, evaluating, communicating – that suit different learning styles;
- use and engage with knowledge in a purposeful way;
- learn by dealing directly with inclusivity, human rights, social and environmental issues in their project work;
- use a variety of life skills in authentic contexts (e.g. decision making, critical and creative thinking, co-operation, needs identification); and
- create more positive attitudes, perceptions and aspirations towards technology-based careers.

The three Learning Outcomes in the Technology Learning Area are interrelated, and are based on the following:

- technological processes and skills;
- technological knowledge and understanding; and
- the interrelationship between technology, society and the environment.

Technology Learning Outcomes



Learning Outcome 1: Technological Processes and Skills

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.

The backbone outcome for the Technology Learning Area

During technological activities, the learner engages in investigating, designing, making, evaluating and communicating solutions. When used together, these skills are sometimes known as the ‘design process’ (see below). In addition to the design process, there are many other processes that can be described as technological processes.

Practical, solution-oriented learning

This Learning Outcome describes a core set of skills that can be developed through projects that are ‘needs driven’ - that is, they are built around developing and implementing practical solutions to realistic problems or needs. Since Learning Outcome 1 aims to develop technological skills (investigating, designing, making, evaluating and communicating), it should be used as an integrating Learning Outcome, to structure projects that develop the learner’s skills, knowledge, values and attitudes in a holistic way.

The design process

This is a creative and interactive approach used to develop solutions to identified problems or human needs. It is one of the ‘technological processes’. The skills associated with the design process are: investigate, design (development of initial ideas), make, evaluate, communicate. The elements of the design process can be explained more fully as follows:

- *Investigate*: Investigating a situation to gain information is an important starting point for Technology. Research, or finding of information, takes place mainly at this point. The learner gathers data and information, grasps concepts and gains insight, finds out about new techniques, and so on. Skills needed for investigating include information accessing and processing skills, recording, identifying, predicting, comparing, observing, classifying, interpreting, and collating.
- *Design (verb)*: Once a problem is fully understood, the design brief needs to be written. Possible solutions should then be generated. These ideas may be drawn on paper. The first idea may not necessarily be the best, so it is better if several possible solutions are considered. This part of the design process requires the knowledge and skills related to graphics (e.g. use of colour, rendering techniques, two-dimensional and three-dimensional drawings, planning, sketching, drawing, calculating, modelling) and managing resources. Once possible solutions are available, a decision must be made. The chosen solution will be the one that best satisfies the specifications. The learner is expected to justify the choices made. Final working drawings or sketches should then be prepared. These drawings should contain all the details needed for making the product or system – instructions, dimensions, annotated notes, and so on. Testing, simulating or modelling the solution may be done at this stage, before final manufacture is carried out.

Introduction

- *Make:* This aspect provides opportunities for the learner to use tools, equipment and materials to develop a solution to the identified problem, need or opportunity. It involves building, testing and modifying the product or system to satisfy the design specifications. The learner will cut, join, shape, finish, form, combine, assemble, measure, mark, separate, mix, and so on. The 'making' should be according to the design, although it is acceptable to make modifications if necessary. Making must always be undertaken in a safe and healthy atmosphere and manner.
- *Evaluate:* The learner needs to evaluate actions, decisions and results throughout the design process. The solutions, and the processes followed to arrive at them, must be evaluated by the learner. Changes or improvements should be suggested where necessary. Some evaluation should be done against the criteria (e.g. constraints) that may be given or self-generated. This stage requires the use of probing questions, fair testing, and analysis.
- *Communicate:* The assessment evidence of the processes followed in any project – that is, the ability to analyse, investigate, plan, design, draw, evaluate and communicate – is presented. This could be done in oral, written, graphic or electronic form. A record of the design process from conception to realisation of the solution should be kept in the form of a Project Portfolio.

Notes:

- The skills do not always have to be used in the order set out above during technological activities.
- It is not necessary to develop all the skills in every project.
- On occasion, it may be preferable to have short, stand-alone activities dealing with isolated Assessment Standards.

Information and communication technology

One of the features of a rapidly changing world is the accumulation of vast amounts of information and data. This has an impact on all aspects of modern life. Learners need to be equipped with knowledge and skills to be competent and confident in accessing and working with various forms of information and data.

These skills are included in Learning Outcome 1 as Assessment Standards related to investigating (e.g. information gathering, storing, processing, management) and communication skills (e.g. presenting information, identifying sources).

The approach to information and communication technology focuses on the use of learning support materials and equipment to access, process and use information in the most appropriate ways.

Where resources are available, schools should interpret the use of information and communication technology as including the following skills:

- word processing (skill needed in all learning areas);
- spread sheets (skill needed mostly by Mathematics, Economic and Management Sciences);
- database management (skill needed mostly by Social Sciences, Economic and Management Sciences);
- graphics (skill needed mostly by Arts and Culture, Technology, Languages, Social Sciences); and
- CD-ROM referencing (needed by all Learning Areas).



Learning Outcome 2: Technological Knowledge and Understanding

The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.

There are three core content areas in this Learning Outcome in the General Education and Training Band. They are Structures, Processing, and Systems and Control.

- **Structures:** This area focuses on practical solutions that involve supporting loads and ways of making products that are stiff, stable and strong when forces are applied to them. The learner can explore these issues within the contexts of housing, habitats, shelters, containers, towers, bridges, packaging, transport, storage, and so on.
- **Processing:** This area focuses on practical ways in which materials may be processed or manufactured in order to improve their properties to make them more suitable for their intended use. The learner should embrace a balanced range of materials in this content area in order to get a broad feel of how materials and their properties interrelate (e.g. paper, resin, cement, sand, plaster of paris). The learner explores processing in various ways (e.g. moulding, drying, casting, extracting, preserving, heating, laminating, forming). These methods of processing are used to alter the properties of materials for the purposes of ennobling and enhancing (e.g. taste, texture, hardness, weather resistance). The learner engages with projects that establish a need in a processing context (e.g. a farm wishing to produce sun-dried tomatoes, a system for grinding grain).
 - The Assessment Standards under 'Processing' are written to allow for flexibility in the choice of materials used. The learner does not have to engage with all the materials and processes listed.
 - Processing of many materials can be integrated with Structures or Systems and Control content areas.
- **Systems and Control:** This content area is divided into mechanical systems (including hydraulic and pneumatic systems) and electrical systems.
 - The study of mechanical systems focuses on producing movement in some way, and examines how energy sources can be used to power products to produce movement. In the higher grades, the learner should engage with the concept of mechanical advantage and how mechanical systems are used to achieve suitable speeds, forces or drive ratios.
 - The study of electrical systems focuses on the practical use of electrical energy in circuits to satisfy specific needs. Electronics, covered at higher levels, is seen as closely related to electrical circuits but deals more closely with low current signaling and sensing.

The learner explores the Systems and Control content area through contexts like transport, lighting, household devices, simple machines, and so on.



Learning Outcome 3: Technology, Society and the Environment

The learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment.

All technological development takes place in an economic, political, social and environmental context. Values, beliefs and traditions shape the way people view and accept technology, and this may have a major influence on the use of technological products.

In choosing a technological solution, the costs and benefits of the choice must be taken into account. There is a need for learners to understand the interconnection between technology, society and the environment.

As technology is now one of the central drivers of economic activity, every learner should have opportunities and access to learning in Technology. The provision of access to such opportunities should not discriminate against any learner (e.g. because of gender or disability).

The achievement of this Learning Outcome will ensure that learners are aware of:

- *indigenous technology and culture*: changes in technology over time, indigenous solutions to problems, cultural influences;
- *impacts of technology*: how technology has benefited or been detrimental to society and the environment; and
- *biases created by technology*: the influences of technology on values, attitudes and behaviours (e.g. around gender, race, ethics, religion and culture).



CHAPTER 2

FOUNDATION PHASE

(Grades R-3)

INTRODUCTION

Technology in this Phase is included mainly in the Life Skills Learning Programme, although many technological skills will be developed in Literacy and Numeracy.

Only Learning Outcome 1 is dealt with in this Phase. The Learning Outcome and its associated Assessment Standards have been written so that they reflect an integration of skills, knowledge, attitudes and awareness.

LEARNING OUTCOME



Learning Outcome 1: Technological Processes and Skills

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.

At this level, the learner is introduced to the surrounding world, which includes the use of technological products in various aspects of her or his life.

The learner should encounter technology through projects structured around technological skills – investigating, designing, making and evaluating. Creative and critical thought should be encouraged as artefacts are designed and made. The learner should also be encouraged to express opinions, make choices and plan the way in which things are done. Opportunities should be created for co-operative learning.

The learner needs to practice activities that will enhance fine motor co-ordination and dexterity through the use of simple tools for cutting, shaping, folding and joining materials like paper and card. Simple measuring skills can be taught and practised during this process.

The learner should be introduced to safety issues, and sensitised to the dangers of electrical outlets, gas and paraffin devices.

ASSESSMENT STANDARDS

In the next sections, the Assessment Standards for each Learning Outcome will be given for each grade. The technological skills around which the projects for this Learning Outcome revolve are shown as headings separating the various Assessment Standards.

Teachers need to remember that not all learners will have attended Grade R. Concepts, skills and strategies for Grade R need to be taught and consolidated in Grade 1.

Grade R



Learning Outcome 1

TECHNOLOGICAL PROCESSES AND SKILLS

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.



Assessment Standards

We know this when the learner:

Investigates

- Physically manipulates products to explore their shape, size, colour and the materials they are made of.

Designs

- Chooses from a given range, materials or substances that can be used to make simple products.

Makes

- Makes simple products from a range of materials provided.

Evaluates

- Expresses own feelings about the products made.

Grade 1



Learning Outcome 1

TECHNOLOGICAL PROCESSES AND SKILLS

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.



Assessment Standards

We know this when the learner:

Investigates

- Investigates why products are made of particular materials.

Designs

- Chooses suitable material or substances to make simple products to satisfy a given need.

Makes

- Makes simple products from different materials.

Evaluates

- Expresses and explains own feelings about the product made.

Grade 2



Assessment Standards

We know this when the learner:

Investigates

- Describes the past and current uses of different materials and substances.
- Describes the main purpose of different products.

Designs

- Chooses suitable materials or substances to make products, and suggests some ways they can be used to satisfy a problem, need or opportunity.

Makes

- Expresses how products are going to be made.
- Makes products safely from different materials following given steps.

Evaluates

- Identifies strengths and weaknesses about own products.

Grade 3



Assessment Standards

We know this when the learner:

Investigates

- Finds out about the historical context when given a problem, need or opportunity related to structures, processing, or systems and control.
- Finds out why given existing products related to a problem, need or opportunity are suitable for their purpose.

Designs

- Suggests different possible solutions, chooses one, and uses freehand sketches to represent it.

Makes

- Expresses how products are going to be made and what will be used to make them.
- Makes products safely by joining or combining a range of different materials.

Evaluates

- Identifies strengths and weaknesses about own products and the products of others.



CHAPTER 3

INTERMEDIATE PHASE

(Grades 4-6)

INTRODUCTION

Technology may be integrated with other Learning Areas (e.g. Natural Sciences) into one Learning Programme for Grades 4, 5 and 6. This allows for either combined or separate delivery modes to be used, depending on the capacity. Learners in the Intermediate Phase will encounter all three Technology Learning Outcomes.

Note:

- Learning Outcome 3 is the same in Technology and Natural Sciences.

LEARNING OUTCOMES



Learning Outcome 1: Technological Processes and Skills

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.

The learner in this Phase should encounter technology through this backbone Learning Outcome dealing with technological skills – investigating, designing, making, evaluating and communicating. The design process provides the methodology for the holistic delivery of all the technology outcomes in an integrated way.

Investigating in this Phase involves finding out about contexts and needs, investigating or evaluating existing products, and includes the possibility of performing relevant scientific investigations using science process skills. While doing investigations, the learner could be provided with opportunities to explore indigenous technology, impacts and bias in order to achieve the Assessment Standards in Learning Outcome 3.

Designing, Making and Evaluating in this Phase should be treated as interrelated skills that are dealt with in a systematic way. The learner should be introduced to different aspects of design, and given specifications and constraints in order to guide solutions.

Communicating includes graphical and written presentations and records of progress. It should be seen as a skill that permeates projects. The learner should also be introduced to some aspects of communication technology.



Learning Outcome 2: Technological Knowledge and Understanding

The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.

In this Phase, the three content areas of the Technology Learning Area are:

- Structures;
- Processing; and
- Systems and Control.

These may be integrated with the Natural Sciences Learning Area themes of Life and Living, Matter and Material, Earth and Beyond, and Energy and Change. The model used for integration can be topic-related, for example:

- Processing together with Matter and Materials; or
- Systems and Control together with Energy and Change.

Another approach could be to base integration on contexts or needs, for example:

- a study of shelter provides opportunities to learn about Structure that could lead on to learning about Life and Living; or
- space exploration provides opportunities to learn about Systems and Control that could lead on to learning about the Earth and Beyond.

Programmes should encourage creativity, critical thinking and problem solving, and be driven by the learner's enthusiasm and curiosity.



Learning Outcome 3: Technology, Society and the Environment

The learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment.

This Learning Outcome is the same in the Technology and Natural Sciences Learning Areas. Assessment Standards can, therefore, be achieved both in the Natural Sciences and the Technology Learning Areas. There are three specific areas:

- indigenous technology and culture;
- the impact of technology; and
- bias in technology.

The Assessment Standards should be integrated with those in Learning Outcome 1. The learner can be given opportunities to explore these issues within the contexts of particular needs. For example:

- Indigenous technology can be explored within the context of the need for people to drink safe water.
- The impact of technology can be explored within the same context; the learner can be made aware, for instance, of the difficulties people will experience in dry areas and how their lives can be changed if technology is used to supply safe water.

- Bias can be explored by looking at the difficulties some groups of people might have in collecting water from remote supplies, or how taps may be difficult for the disabled, old or very young to turn on.

These 'needs-based' opportunities are ideal for integrating with the 'investigating' standards (Learning Outcome 1), particularly when the learner is finding out about background contexts, the people concerned, the environmental situation, and so on.

These same issues should also be dealt with directly when designing. At this level the learner should be given specifications and constraints to guide design ideas. These should include aspects relating to people, impact and bias. These same criteria should also carry on to the evaluation stage, where the learner should use them to evaluate his or her own products.

ASSESSMENT STANDARDS

In the next sections, the Assessment Standards for each Learning Outcome will be given for each grade. The technological skills and content areas around which the Learning Outcomes revolve are shown as headings separating the relevant Assessment Standards.

Note:

- If Technology and Natural Sciences are not being integrated into one Learning Programme, then the third Assessment Standard – “Investigating” – on pages 20 and 21 is not applicable. (This Assessment Standard begins, ‘Performs...’.)

Grade 4



Learning Outcome 1

TECHNOLOGICAL PROCESSES AND SKILLS

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.



Assessment Standards

We know this when the learner:

Investigates

- Finds out, with assistance, about the background context (e.g. people, environment) when given a problem, need or opportunity.

- Finds out about existing products relevant to a problem, need or opportunity, and identifies the main design aspects (e.g. who it is for, what is it for, what it looks like) that make them suitable as a solution.

- Performs, where appropriate, scientific investigations about concepts relevant to a problem, need or opportunity using science process skills:
 - planning investigations;
 - conducting investigations;
 - processing and interpreting data;
 - evaluating and communicating findings.

Grade 5



Assessment Standards

We know this when the learner:

Investigates

- Finds out about the background context (e.g. people, environment, nature of the need) when given a problem, need or opportunity and lists the advantages and disadvantages that a technological solution might bring to people.
- Finds out about existing products relevant to a problem, need or opportunity, and identifies some design aspects (e.g. who it is for, what it looks like, what it is for, what it is made of).
- Performs, where appropriate, scientific investigations about concepts relevant to a problem, need or opportunity using science process skills:
 - planning investigations;
 - conducting investigations;
 - processing and interpreting data;
 - evaluating and communicating findings.

Grade 6



Assessment Standards

We know this when the learner:

Investigates

- Finds out about the background context when given a problem, need or opportunity, and lists the advantages and disadvantages that a technological solution might bring to people and the environment.
- Finds out about existing products relevant to a problem, need or opportunity, and identifies and compares their design aspects (e.g. who it is for, what it is for, what it looks like, what it is made of, how well it works, whether it will affect the environment).
- Performs, where appropriate, scientific investigations about concepts relevant to a problem, need or opportunity using science process skills:
 - planning investigations;
 - conducting investigations;
 - processing and interpreting data;
 - evaluating and communicating findings.

Grade 4



Learning Outcome 1 Continued

TECHNOLOGICAL PROCESSES AND SKILLS

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.



Assessment Standards

We know this when the learner:

Designs

- Writes or communicates, with assistance, a short and clear statement (design brief) for the development of a product for a given purpose.
- Suggests and records at least two possible solutions to the problem or need that link to the design brief and to given specifications or constraints (e.g. people, purpose, environment).
- Chooses one of these solutions, giving reasons for the choice.

Makes

- Briefly outlines a plan for making, listing the main steps.
- Uses suitable tools and materials to make products by measuring, marking out, cutting simple forms in a variety of materials, and joining them using a range of techniques.
- Works neatly and safely.

Grade 5



Assessment Standards

We know this when the learner:

Designs

- Writes or communicates, with assistance, a short and clear statement (design brief) related to a given problem, need or opportunity that demonstrates some understanding of the technological purposes of the solution.
- Suggests and records at least two alternative solutions to the problem, need or opportunity that link to the design brief and to given specifications and constraints (e.g. people, purpose, environment).
- Chooses one of these solutions, giving reasons for the choice, and develops the idea further.

Makes

- Outlines a plan that shows the steps for making, including drawings or sketches of main parts.
- Uses suitable tools and materials to make products by measuring, marking out, cutting or separating, shaping or forming, joining or combining, and finishing the chosen material.
- Works neatly and safely, ensuring minimum waste of material.

Grade 6



Assessment Standards

We know this when the learner:

Designs

- Writes or communicates a design brief for the development of a product related to a given problem, need or opportunity that clarifies the technological purposes of the solution.
- Suggests and records at least two alternative solutions to the problem, need or opportunity that link clearly to the design brief and to given specifications and constraints (e.g. people, purpose, safety, environmental impact, appearance).
- Chooses one of these solutions, giving valid reasons for the choice, and further develops the choice with graphics and/or modelling.

Makes

- Develops plans that detail the making steps, including drawings and sketches that help to clarify the plans.
- Chooses and uses suitable tools to make products by measuring, marking out, cutting or separating, shaping or forming, joining or combining, and finishing the chosen materials.
- Works efficiently and safely.

Grade 4



Learning Outcome 1 Continued

TECHNOLOGICAL PROCESSES AND SKILLS

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technologies.



Assessment Standards

We know this when the learner:

Evaluates

- Evaluates, with assistance, the product according to the design brief, and suggests improvements and modifications if necessary.

Communicates

- Produces simple two-dimensional sketches, enhanced with colour where appropriate.
- Makes presentations (posters, charts or models) of design ideas and final product, by combining simple two-dimensional text and sketches.

Grade 5



Assessment Standards

We know this when the learner:

Evaluates

- Evaluates, with assistance, the product according to the design brief and given specifications and constraints (e.g. people, purpose, environment), and suggests improvements and modifications if necessary.
- Evaluates the plan of action followed and suggests improvements and modifications if necessary.

Communicates

- Produces labelled two-dimensional drawings enhanced with colour where appropriate.
- Uses appropriate technologies to produce presentations that record and communicate the design process (e.g. simple portfolio, posters, charts, models).

Grade 6



Assessment Standards

We know this when the learner:

Evaluates

- Evaluates the product according to the design brief and given specifications and constraints (e.g. people, purpose, environmental impact, safety, appearance), and suggests improvements and modifications if necessary.
- Evaluates the plan of action followed and suggests improvements and modifications if necessary.

Communicates

- Draws appropriate sketches (e.g. labelled two-dimensional drawings of ideas, enhanced drawings of final solutions and drawings showing measurements) to communicate different information appropriately and effectively.
- Chooses and uses appropriate technologies to present, record or communicate the design process (e.g. simple portfolio, posters, charts, models).

Grade 4



Learning Outcome 2

TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING

The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.



Assessment Standards

We know this when the learner:

Structures

- Demonstrates knowledge and understanding of how to strengthen the structure of products by folding, tubing, and using triangular webs or strong joints.

Processing

- Demonstrates knowledge and understanding of the properties of common materials (e.g. wood, food, clay, plastic, paper, fabric), and how these properties influence the effectiveness of products.

Systems and Control

- Demonstrates knowledge and understanding of how to use simple mechanisms (e.g. wheels and axles, pivots, hinges) to make a product move in some way.

Grade 5



Assessment Standards

We know this when the learner:

Structures

- Demonstrates knowledge and understanding of different types of structures (e.g. frame, shell, solid), and of the relationship between materials and the load a structure of a product can support.

Processing

- Demonstrates knowledge and understanding of how simple processing (e.g. plaster casting, papier mâché, moulding) can be used to transform materials into products.

Systems and Control

- Demonstrates knowledge and understanding of how to use energy sources to power mechanical systems in order to make a product move in some way.

Grade 6



Assessment Standards

We know this when the learner:

Structures

- Demonstrates knowledge and understanding of materials suitable for supporting loads (e.g. stiffness, strength), how structures can be made stable (e.g. base size, ground anchors), and how they can be reinforced (e.g. using appropriate cross-sections, cross-braces, triangular webs, folding).

Processing

- Demonstrates knowledge and understanding of the reasons different materials deteriorate and ways of preserving them (e.g. drying, coating, canning, sealing).

Systems and Control

- Demonstrates knowledge and understanding of how different types of movement (e.g. linear, turning to and fro, swinging) can be achieved and how mechanical, pneumatic or hydraulic systems can be used to change the type and magnitude of an input movement into a different output movement.
- Demonstrates knowledge and understanding of the components of simple electrical circuits (e.g. connecting wires, battery, switch, output device), and how electrical energy can be converted into other forms (e.g. light, heat, sound, movement).

Grade 4



Learning Outcome 3

TECHNOLOGY, SOCIETY AND THE ENVIRONMENT

The learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment.



Assessment Standards

We know this when the learner:

Indigenous Technology and Culture

- Describes how local indigenous cultures have used scientific principles or technological products for specific purposes.

Impact of Technology

- Expresses opinions about how technological products make people's lives easier.

Bias in Technology

- Expresses reasons why certain groups of people might be disadvantaged when using technological products.

Grade 5



Assessment Standards

We know this when the learner:

Indigenous Technology and Culture

- Recognises how products and technologies have been adapted from other times and cultures.

Impact of Technology

- Identifies possible positive and negative effects of scientific developments or technological products on the quality of people's lives and/or the health of the environment.

Bias in Technology

- Describes possible consequences that the lack of access to technological products or services might have on certain groups of people.

Grade 6



Assessment Standards

We know this when the learner:

Indigenous Technology and Culture

- Describes similarities in problems and solutions in own and other societies – past, present and future.

Impact of Technology

- Suggests ways to improve technological products or processes to minimise negative effects on people and/or the health of the environment.

Bias in Technology

- Suggests how technological products or services can be made accessible to those presently excluded.



CHAPTER 4

SENIOR PHASE

(Grades 7-9)

INTRODUCTION

In the Senior Phase, Technology will be developed as an extension to the groundwork laid previously, and in preparation for the manufacturing and engineering fields of the Further Education and Training Band. In this Phase of the General Education and Training Band, the Technology Learning Area is delivered through a separate Learning Programme.

LEARNING OUTCOMES



Learning Outcome 1: Technological Processes and Skills

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.

The design process and its associated skills of investigating, designing, making, evaluating and communicating form the backbone of the Learning Area, and should be used to structure the delivery of all the Learning Outcomes in an integrated way. The learner should be exposed to problems, needs or opportunities as a starting point. The learner should then engage in a systematic process that allows the development of solutions that solve problems or satisfy needs.

Investigating in this phase involves investigating contexts and needs, investigating or evaluating existing products in relation to key design aspects, and performing practical tests to develop understanding of particular aspects of the content areas or determine the fitness for purpose of products. While doing investigations, the learner should be provided with opportunities to explore values and attitudes and to develop informed opinions that help to make compromises and value judgements. The learner should also be given the opportunity to engage with information technology (in its broadest sense) while performing these investigations.

Investigating can happen at any point in the design process. It should not be seen as something that must be completed before designing begins.

The skills of *Designing, Making and Evaluating* should not be seen as separate either; they are interrelated. For example, evaluation skills are used to choose ideas. At this level, the learner should be introduced to key aspects of design (design key words). These should be used to evaluate both existing and designed products against predetermined criteria. When making, the learner should be encouraged to continue to interrogate progress against these criteria and to modify solutions based on problems encountered. As the learner progresses, she or he should be able to demonstrate increasing accuracy and skill, better organisation and safer working practices.

Communicating should also be seen as integral to the overall process. The learner should be recording and presenting progress in written and graphical forms on an ongoing basis. Presentations should show increasing levels of formality and use of conventions as the learner progresses through the Phase. The Assessment Standards also include the use of communication technologies to enhance presentations.



Learning Outcome 2: Technological Knowledge and Understanding

The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.

The technological content areas detailed in this Learning Outcome are:

- Structures: including frame, shell and solid structures;
- Processing: including natural and synthetic materials or plant, animal, mineral and recyclable materials; and
- Systems and Control: including mechanical, electrical/electronic and hydraulic/pneumatic systems.

In *Structures*, the learner should be exploring more complex person-made structures. The learner should choose and use specific materials for their structural properties, and should be able to demonstrate awareness of ways of strengthening and stabilising structures under various loading conditions.

Processing in the context of this Learning Area Statement is seen as using chemical or physical methods to change or improve the properties of particular materials. The learner should investigate different processing techniques to produce products or materials that require specific properties (e.g. thermal insulation, water resistance, fire resistance). The choice of materials to be processed is optional (e.g. clothing, food, construction materials). They should include a balance of natural, synthetic and recyclable materials. The economic and environmental impacts should inform the choice of materials to be processed.

In *Systems and Control*, the learner should explore mechanisms that involve mechanical advantage and change in the direction of movement. The components of these mechanical systems could include cams, pistons, pulleys, pivot and slider, eccentric wheels, cranks, levers, linked levers, and so on. Practical tests with variations on size, length, and position of the components must contribute to knowledge development. The learner should also explore electrical systems with more than one output in series and parallel. By practical experimentation, the learner should develop understanding of the operational difference of the outputs when connected differently.

Where possible, the learner should engage in projects that integrate Processing, Structures, and Systems and Control.



Learning Outcome 3: Technology, Society and the Environment

The learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment.

The same three specific areas as seen in the Intermediate Phase carry over to this Learning Outcome:

- indigenous technology and culture;

- the impact of technology; and
- bias in technology.

The learner should engage with these issues in more detail and in wider contexts (unfamiliar and global) in the Senior Phase. The learner should be using factual evidence to express informed decisions, and make value judgements to minimise negative effects.

The learner in the Senior Phase should be aware of relevant safety codes and rules (e.g. the National Occupation and Safety Act). The learner should be able to treat minor injuries such as cuts and burns, and be able to administer first aid when necessary. The procedures to follow in the event of an accident should be understood.

ASSESSMENT STANDARDS

In the next sections, the Assessment Standards for each Learning Outcome will be given for each grade. The technological skills and content areas around which the Learning Outcomes revolve are shown as headings separating the relevant Assessment Standards.

Grade 7



Learning Outcome 1

TECHNOLOGICAL PROCESSES AND SKILLS

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.



Assessment Standards

We know this when the learner:

Investigates

- Investigates the background context, the nature of the need, the environmental situation, and the people concerned when given a problem, need or opportunity set in a local context.
- Examines existing products relevant to a problem, situation or need based on the following key aspects of design:
 - people;
 - purpose;
 - appearance;
 - environment;
 - safety;
 - cost.
- Investigates by performing simple practical tests relating to aspects of the technological knowledge areas (Structures, Processing, and Systems and Control).

Grade 8



Assessment Standards

We know this when the learner:

Investigates

- Investigates the background context, the nature of the need, the environmental situation, and the people concerned when given a problem, need or opportunity set in a nationally relevant context.
- Compares existing products relevant to the problem situation based on:
 - safety;
 - suitability of materials;
 - fitness for purpose;
 - cost.
- Develops and performs practical tests in the technological knowledge areas (Structures, Processing, and Systems and Control).

Grade 9



Assessment Standards

We know this when the learner:

Investigates

- Identifies and explains a problem, need or opportunity from a given real-life context, and investigates the context, the nature of the need, the environmental situation, and the people concerned.
- Analyses existing products relevant to an identified problem, need or opportunity based on:
 - safety;
 - suitability of materials;
 - fitness for purpose;
 - cost;
 - manufacturing method.
- Develops and performs practical testing procedures to determine or compare the suitability or fitness for purpose of relevant properties of materials, electrical or mechanical systems, structures, processes or finished products.

Grade 7



Learning Outcome 1 Continued

TECHNOLOGICAL PROCESSES AND SKILLS

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.



Assessment Standards

We know this when the learner:

- During investigations, plans a strategy for collecting data and information that includes:
 - identifying technologies and methods;
 - considering the source, resources and copyright laws;
 - uses search techniques;
 - extracts relevant data for specific purposes;
 - produces meaningful summaries.

Designs

- Writes or communicates a short and clear statement or a design brief for the development of a product or system related to a given problem, need or opportunity.

Grade 8



Assessment Standards

We know this when the learner:

- Uses appropriate technologies and methods to:
 - collect relevant data from different sources or resources;
 - extract relevant data;
 - make meaningful summaries;
 - use information to justify and support decisions and ideas.

Designs

- Writes or communicates a short and clear statement or a design brief in response to a given or identified situation for the development of a product or system.

Grade 9



Assessment Standards

We know this when the learner:

- Uses a variety of available technologies and methods to:
 - locate (e.g. use library referencing system, database searches, indexes);
 - collect (e.g. questionnaires, data collection forms, requests for information, information, searches, literature surveys);
 - compare;
 - sort;
 - verify;
 - evaluate (e.g. cross-checking different sources or resources);
 - store information (e.g. filing systems, indexes).

Designs

- Writes or communicates a short and clear statement or a design brief for the development of a product or system related to a context, problem, need or opportunity that has been identified by self.

Grade 7



Learning Outcome 1 Continued

TECHNOLOGICAL PROCESSES AND SKILLS

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.



Assessment Standards

We know this when the learner:

- Lists product and design specifications and constraints for a solution to a given problem, need or opportunity based on some of the design key words:
 - people: age, target market, human rights, access;
 - purpose: function, what the product will do;
 - appearance: colour, shape;
 - environment: where the product will be used or made, impact on the environment;
 - safety: for users and manufacturers;
 - cost: cost of materials, wastage, cost of manufacture, maximum selling price.

- Generates at least two alternative solutions and annotates the ideas.

- Chooses possible solutions, gives sensible reasons for choice, and develops a chosen idea using graphics or modelling techniques.

Grade 8



Assessment Standards

We know this when the learner:

- Lists product and design specifications and constraints for a solution to an identified or given problem, need or opportunity based on most of the design key words listed below:
 - people: age, target market, human rights, access;
 - purpose: function, what product will do;
 - appearance: colour, shape;
 - environment: where the product will be used or made, impact on the environment;
 - safety: for users and manufacturers;
 - cost: cost of materials, wastage, cost of manufacture, maximum selling price.
- Generates several alternative solutions and writes notes, ideas that show some links to the design brief, specifications and constraints.
- Chooses possible solutions based on well-reasoned argument and develops the chosen idea to include more specific details using graphic and/or modelling techniques.

Grade 9



Assessment Standards

We know this when the learner:

- Lists product and design specifications and constraints for a solution to an identified problem, need or opportunity based on all of the design key words listed below:
 - people: age, target market, human rights, access;
 - purpose: function, what product will do;
 - appearance and aesthetics: form, colour, shape, feel;
 - environment: where product will be used or made, impact on the environment in the long and short term;
 - safety: for users and manufacturers;
 - cost: cost of materials, wastage, cost of manufacture, maximum selling price;
 - ergonomics;
 - quality;
 - production: mass production, batch production, one-off production.
- Generates a range of possible solutions that are significantly different from each other, and that show clear links to the design brief and the specifications and constraints.
- Chooses possible solutions based on well-reasoned argument related to the specifications and personal opinions, and develops a chosen idea using graphics.

Grade 7



Learning Outcome 1 Continued

TECHNOLOGICAL PROCESSES AND SKILLS

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.



Assessment Standards

We know this when the learner:

Makes

- Develops a plan for making that details all of the following:
 - resources needed (e.g. materials lists, tools, people, costs);
 - dimensions (e.g. lengths, breadths, depths, widths);
 - steps for making the product (e.g. annotations, simple flow diagrams).

- Chooses and uses appropriate tools and materials to make products by measuring, marking, cutting or separating, shaping or forming, joining or combining, and finishing different materials with some accuracy.

- Uses safe working practices and shows awareness of efficient ways of using materials and tools.

Grade 8



Assessment Standards

We know this when the learner:

Makes

- Develops a plan for making that outlines all of the following:
 - resources needed (e.g. materials lists, tools, people, costs);
 - sketches showing the necessary dimensions or quantities;
 - all the steps necessary to making the product.
- Chooses and uses appropriate tools and materials to make products by measuring, marking, cutting or separating, shaping or forming, joining or combining, and finishing different materials accurately using appropriate techniques.
- Changes and adapts designs in response to checks in order to improve the quality of the finished product.
- Uses safe working practices and shows awareness of efficient ways of using materials and tools.

Grade 9



Assessment Standards

We know this when the learner:

Makes

- Develops plans for making that include all of the following:
 - resource lists (e.g. materials lists, tools, people, costs);
 - formal drawings showing dimensions or quantities (e.g. orthographic, oblique or isometric views, sequence drawings, exploded views);
 - manufacturing sequence (e.g. flow diagrams, flow charts).
- Chooses and uses appropriate tools and materials to make designed products with precision and control by measuring, marking, cutting or separating, shaping or forming, joining or combining, and finishing a range of materials accurately and efficiently.
- Uses measuring and checking procedures while making to monitor quality and changes, and adapts designs in response to practical difficulties encountered when making the products.
- Demonstrates knowledge and understanding of safe working practices and efficient use of materials and tools.

Grade 7



Learning Outcome 1 Continued

TECHNOLOGICAL PROCESSES AND SKILLS

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.



Assessment Standards

We know this when the learner:

Evaluates

- Evaluates the product or system based on criteria linked directly to the design brief and some of the specifications and constraints, and suggests improvements or modifications.
- Evaluates the efficiency of the plan of action followed and suggests improving future plans.

Grade 8



Assessment Standards

We know this when the learner:

Evaluates

- Tests and evaluates the products or system with some objectivity, based on objective criteria linked to the design brief, specifications and constraints, and suggests sensible improvements or modifications.
- Evaluates the efficiency of the plan of action followed with some objectivity, identifies areas of strength and weakness, and suggests sensible ways of improving personal performance.

Grade 9



Assessment Standards

We know this when the learner:

Evaluates

- Evaluates the product or system based on self-generated objective criteria linked directly to the design brief, specifications and constraints using self-designed procedures (e.g. surveys, questionnaires, testing procedures) for self-testing, and suggests sensible improvements or modifications that would clearly result in a more effective or higher-quality end product.
- Evaluates the efficiency of the plan of action followed, objectively demonstrates insight into the consequences of key decisions, and suggests sensible improvements.

Grade 7



Learning Outcome 1 Continued

TECHNOLOGICAL PROCESSES AND SKILLS

The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.



Assessment Standards

We know this when the learner:

Communicates

- Presents ideas (in a project portfolio) using two-dimensional or three-dimensional sketches, circuit diagrams or systems diagrams that include most of the following features:
 - notes to communicate design reasoning;
 - dimensions;
 - quantities;
 - enhancements of significant sketches (e.g. colour, texture, shade, thick and thin lines, shadow).
- Chooses and uses appropriate technologies (e.g. computers, photocopiers, stencils, audio-visual recordings) to present a combination of graphics and text in order to record and communicate progress.

Grade 8



Assessment Standards

We know this when the learner:

Communicates

- Presents ideas (in a project portfolio) using two-dimensional or three-dimensional sketches, circuit diagrams or systems diagrams that include all of the following features:
 - use of South African drawing conventions (e.g. dimension lines, labelling, line types, symbols);
 - notes to clarify and communicate design features and reasoning; enhancement of significant sketches like final solution drawings (e.g. colour, shade, texture, shadows, thick and thin lines).
- Chooses and uses appropriate technologies to produce project portfolios, poster presentations or reports that present graphical and written information clearly in a form mostly suitable for the target audience.

Grade 9



Assessment Standards

We know this when the learner:

Communicates

- Presents ideas (in a project portfolio) using formal drawing techniques, in two-dimensional or three-dimensional sketches, circuit diagrams or systems diagrams that include all of the following features:
 - use of South African conventional drawing standards (e.g. scale, outlines, dimension lines, first and third angle projection);
 - notes that clarify design reasoning and key choices;
 - impressive enhancements of significant sketches (e.g. colour, texture, shade, thick and thin lines, shadow).
- Chooses and uses appropriate technologies to combine and organise graphics and text effectively to produce project portfolios, poster presentations, case study reports, and so on, that have a formal organised structure appropriate for the target audience.

Grade 7



Learning Outcome 2

TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING

The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.



Assessment Standards

We know this when the learner:

Structures

- Demonstrates knowledge and understanding of structures in terms of:
 - specific properties and use of materials (e.g. water resistance, thermal insulation, fire resistance);
 - stability (e.g. base size, centre of gravity);
 - strengthening (e.g. corrugation, laminating, reinforcing);
 - joining techniques.

Processing

- Demonstrates knowledge and understanding of how materials can be processed to change or improve properties (e.g. strength, fire resistance, waterproofing, taste, volume, texture).

Grade 8



Assessment Standards

We know this when the learner:

Structures

- Demonstrates knowledge and understanding of frame structures:
 - the use and application of basic structural components (e.g. columns, beams, arches, buttresses, struts, stays, guys, ties);
 - reinforcing techniques for frame structures (e.g. triangulation, webs and fillets, orientation and cross-sectional area of members);
 - how frame structures can be made strong (e.g. relationship between the size and shape of the base, the centre of gravity and stability).

Processing

- Demonstrates knowledge and understanding of how materials can be processed to change or improve their properties by adapting them to suit particular purposes:
 - to withstand forces (e.g. tension, compression, bending, torsion, shear);
 - to increase strength or life-span;
 - how specific properties suitable for packaging can be achieved.

Grade 9



Assessment Standards

We know this when the learner:

Structures

- Demonstrates knowledge and understanding of structures:
 - properties of materials that affect their performance in structures (e.g. mass, hardness, stiffness, flexibility, corrosion resistance, strength in tension, compression, shearing);
 - analysis (no calculations) of the effects of different loads (even/uneven, static/dynamic).

Processing

- Demonstrates knowledge and understanding of how materials can be processed (e.g. galvanised, frozen, dried, painted, varnished, electroplated) to change or improve properties (life-span), and how recyclable materials can be re-manufactured.

Grade 7



Learning Outcome 2 Continued

TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING

The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.



Assessment Standards

We know this when the learner:

Systems and Control

- Demonstrates knowledge and understanding of mechanical systems that change a direction of movement using components (e.g. cams, pistons, pivot and slider, eccentric wheels), and/or the value of force in systems (e.g. lever systems, linked lever systems, pneumatic or hydraulic systems), and represents them using systems diagrams.
- Demonstrates knowledge and understanding of electrical circuits with more than one output device in the circuit (series and parallel), and represents them using systems diagrams.

Grade 8



Assessment Standards

We know this when the learner:

Systems and Control

- Demonstrates knowledge and understanding of how mechanical systems (e.g. pneumatic or hydraulic systems, gears, belt drive systems, pulley systems, linked lever systems) convert motion and force to give mechanical advantage, and represents them using systems diagrams.
- Demonstrates knowledge and understanding of how electrical circuits with more than one input or control device will work based on different logic conditions ('AND' and 'OR' logic), and represents them using circuit diagrams, systems diagrams and truth tables.

Grade 9



Assessment Standards

We know this when the learner:

Systems and Control

- Demonstrates knowledge and understanding of interacting mechanical systems and sub-systems by practical analysis and represents them using systems diagrams:
 - gear systems
 - belt drive or pulley systems with more than one stage;
 - mechanical control mechanisms (e.g. ratchet and pawl, cleats);
 - pneumatic or hydraulic systems that use restrictors;
 - one-way valves;
 - systems where mechanical, electrical, or pneumatic or hydraulic systems are combined.
- Demonstrates knowledge and understanding of how simple electronic circuits and devices are used to make an output respond to an input signal (e.g. resistors, light-emitting diodes, transistors, push or magnetic switches, thermistors, light-dependent resistors).

Grade 7



Learning Outcome 3

TECHNOLOGY, SOCIETY AND THE ENVIRONMENT

The learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment.



Assessment Standards

We know this when the learner:

Indigenous Technology and Culture

- Explains how indigenous cultures in South African history have used specific materials to satisfy needs and the main reasons for the differences.

Impact of Technology

- Expresses some reasons why products of technology affect the quality of people's lives positively and negatively.

Bias in Technology

- Expresses an opinion that explains how certain groups of society might be favoured or disadvantaged by given products of technology.

Grade 8



Assessment Standards

We know this when the learner:

Indigenous Technology and Culture

- Compares how different cultures have solved similar problems and relates the differences to the culture and values of their societies.

Impact of Technology

- Expresses and details opinions about the positive and negative impacts of products of technology on the quality of people's lives and the environment in which they live.

Bias in Technology

- Produces evidence that details opinions, backed up by factual evidence, about the effect of technological solutions on human rights issues (e.g. age, disability).

Grade 9



Assessment Standards

We know this when the learner:

Indigenous Technology and Culture

- Explores, compares and explains how different cultures in different parts of the world have effectively adapted technological solutions for optimum usefulness.

Impact of Technology

- Recognises and identifies the impact of technological developments on the quality of people's lives and on the environment in which they live, and suggests strategies for reducing any undesirable effects.

Bias in Technology

- Produces evidence that details opinions, backed up by factual evidence, about bias (e.g. gender, age, access) in making technological decisions, and suggests strategies for redress.



CHAPTER 5

LEARNER ASSESSMENT

INTRODUCTION

The assessment framework of the Revised National Curriculum Statement for Grades R-9 (Schools) is based on the principles of outcomes-based education. Assessment should provide indications of learner achievement in the most effective and efficient manner, and ensure that learners integrate and apply knowledge and skills. Assessment should also help students to make judgements about their own performance, set goals for progress, and provoke further learning.

To assist in the process of learner assessment, this Revised National Curriculum Statement:

- outlines the Learning Outcomes and their associated Assessment Standards in each Learning Area and for each grade in the General Education and Training (Grades R-9) band;
- contextualises the Critical and Developmental Outcomes within the Learning Outcomes and Assessment Standards; and
- places Assessment Standards at the heart of the assessment process in every grade. Assessment Standards describe the level at which learners should demonstrate their achievement of the Learning Outcome(s) and the ways (depth and breadth) of demonstrating their achievement.

The following diagram illustrates the interaction between the design elements of this Revised National Curriculum Statement:



ASSESSMENT PRINCIPLES USED IN OUTCOMES-BASED EDUCATION

Definition

Assessment in the Revised National Curriculum Statement for Grades R-9 (Schools) is a continuous, planned process of gathering information about the performance of learners measured against the Assessment Standards of the Learning Outcomes. It requires clearly-defined criteria and a variety of appropriate strategies to enable teachers to give constructive feedback to learners and to report to parents, and other interested people.

Key Elements

Outcomes-based education is a way of teaching and learning which makes it clear what learners are expected to achieve. The principle by which it works is that the teacher states beforehand what the learners are expected to achieve. The teacher's task is to teach in order to help learners to satisfy the requirements of the Assessment Standards in the curriculum; the learners' task is to learn or do what the Assessment Standards expect. Assessment is essential to outcomes-based education because it must be possible to assess when a learner has achieved what is required in each grade.

To help learners to reach their full potential, assessment should be:

- transparent and clearly focused;
- integrated with teaching and learning;
- based on predetermined criteria or standards;
- varied in terms of methods and contexts; and
- valid, reliable, fair, learner-paced, and flexible enough to allow for expanded opportunities.

Purposes of Assessment

The main purpose of assessing learners should be to enhance individual growth and development, to monitor the progress of learners and to facilitate their learning. Other uses of assessment include:

- *baseline assessment of prior learning*
Baseline assessment usually takes place at the beginning of a grade or phase to establish what learners already know. It assists teachers to plan learning programmes and learning activities.
- *diagnostic assessment*
Diagnostic assessment is used to find out about the nature and cause of barriers to learning experienced by specific learners. It is followed by guidance, appropriate support and intervention strategies.
- *formative assessment*
Formative assessment monitors and supports the process of learning and teaching, and is used to inform learners and teachers about learners' progress so as to improve learning. Constructive feedback is given to enable learners to grow.

- *summative assessment*

Summative assessment gives an overall picture of learners' progress at a given time, for example, at the end of a term or year, or on transfer to another school.

- *systemic assessment*

Systemic assessment is a way of monitoring the performance of the education system. One component of this is the assessment of learner performance in relation to national indicators. Systemic assessment is conducted at the end of each phase of the General Education and Training band. A representative sample of schools and learners is selected provincially or nationally for systemic assessment.

CONTINUOUS ASSESSMENT

Characteristics of Continuous Assessment

Continuous assessment is the chief method by which assessment takes place in the Revised National Curriculum Statement. It covers all the outcomes-based education assessment principles and ensures that assessment:

- *takes place over a period of time and is ongoing*: Learning is assessed regularly and the records of learners' progress are updated throughout the year.
- *supports the growth and development of learners*: Learners become active participants in learning and assessment, understand the criteria that are used for assessment activities, are involved in self-evaluation, set individual targets for themselves, reflect on their learning, and thereby experience raised self-esteem.
- *provides feedback from learning and teaching*: Feedback is a crucial element in formative assessment. Methods of feedback include appropriate questioning, focusing the teacher's oral and written comments on what was intended to be achieved by an assessment activity, and encouragement to a learner.
- *allows for the integrated assessment*: This may include assessing a number of related Learning Outcomes within a single activity, and combining a number of different assessment methods. Competence in particular Learning Outcomes can be demonstrated in many different ways, and thus a variety of assessment methods and opportunities must be provided through which learners can demonstrate their ability.
- *uses strategies that cater for a variety of learner needs (language, physical, psychological, emotional and cultural)*: Continuous assessment allows teachers to be sensitive to learners with special education needs and to overcome barriers to learning through flexible approaches. In any group of learners, there are different rates and styles of learning. All learners do not need to be assessed at the same time and in the same way.
- *allows for summative assessment*: The accumulation of the results of continuous assessment activities provides an overall picture of a learner's progress at a given time. Summative assessment needs to be planned carefully from the beginning of the year, to include a variety of assessment strategies – for example, exercises, tasks, projects, school and class tests - which will provide learners with a range of opportunities to show what they have learned.

Assessment Strategies

The choice of what assessment strategies to use is a subjective one, unique to each teacher, grade and school, and dependent on the teacher's professional judgement. The availability of space and resources influences this decision, but even when resources are similar, teachers differ in the way that they make their choices.

The methods chosen for assessment activities must be appropriate to the Assessment Standards to be assessed, and the purpose of the assessment must be clearly understood by all the learners and teachers involved. Competence can be demonstrated in a number of ways. Thus a variety of methods is needed to give learners an opportunity to demonstrate their abilities more fully.

Common Tasks for Assessment

The purpose of Common Tasks for Assessment is to:

- ensure consistency in teacher judgements;
- promote common standard setting;
- strengthen the capacity for school-based continuous assessment;
- increase the accuracy of the assessment process and tools;
- ensure that the school-based assessment tasks properly assess competencies and achievements; and
- ensure expanded opportunities for learners.

Common Tasks for Assessment may be set at national, provincial, district or cluster level, are conducted at school level, and are moderated externally.

MANAGING ASSESSMENT

People Involved in Assessment

The school and the teachers have overall responsibility for the assessment of learners. Teachers are expected to create a valid, reliable and credible assessment process. Provincial policies should ensure the involvement of learners, school assessment teams, district support teams, support services, and parents, as appropriate.

School Assessment Programme

Each school must develop an assessment programme based on provincial and national assessment guidelines. It needs to have a School Assessment Plan and a team to facilitate the implementation of this policy. The team should have representatives from each Phase and Learning Area.

To ensure a professional approach to assessment, the school assessment programme must outline clearly:

- the way continuous assessment is planned and implemented;
- how record books are to be kept, their accessibility and security;
- the assessment codes determined by the province;
- internal verification of assessment;
- how moderation takes place in the school;

- the frequency and method of reporting;
- the monitoring of all assessment processes; and
- the training of staff in areas of assessment.

Areas where in-school training needs to take place include:

- how to use criteria/rubrics to assess;
- finding agreement between teachers in the same grade about what is considered necessary to satisfy the Learning Outcomes;
- how to write comments for assessment results and reports; and
- achieving a common understanding of the school's assessment programme.

KEEPING RECORDS

Record Books

Good record keeping is essential in all assessment, particularly in continuous assessment. A record book or file must be kept up to date by each teacher. It should contain:

- learners' names;
- dates of assessment;
- name and description of the assessment activity;
- the results of assessment activities, according to Learning Areas or Learning Programmes;
- comments for support purposes.

All records must be accessible, easy to interpret, securely kept, confidential and helpful in the teaching and reporting process.

The school assessment programme determines the details of how record books must be completed. The assessment codes are used to express how the learner is performing against the Learning Outcomes. Codes used must be clear and understood by learners and parents.

Codes to Use for Assessment

There are many ways in which feedback from assessment can be provided to learners and recorded by teachers. Choosing the best way to do so for an assessment activity will depend on a number of factors, such as:

- the number of learners in the class and the amount of time available to the teacher;
- the complexity and the length of the assessment activity;
- the learning content or skills being assessed (e.g. Mathematics or writing);
- how quickly feedback is given;
- how individualised the feedback is;
- the criteria (or rubrics) used by the teacher to describe learners' performances and
- whether learners' performance is to be compared to peers, to previous performance, and/or the requirements of the Assessment Standards and Learning Outcomes.

Some assessment codes are better for some purposes than for others. For example, comments can be detailed, individual and provide suggestions for improvement. Comments are also useful for reporting on learner performance against Assessment Standards. However, comments take long to write and are not very easy to record. Codes such as 'Excellent', 'Very Good', 'Good', 'Competent', and 'Insufficient' are much quicker to write and allow assessment of progress against previous work and against Assessment Standards. However, they do not provide the detail made possible by comments. Marks, on the other hand, are quickly recorded and can be added together, multiplied and divided. They are useful for assessing learners' performance in relation to others in the class, and to other grades or schools. However, they provide little information on learners' performance against the Assessment Standards.

Examples, among many others, of further assessment codes are:

- not yet achieved, almost there, achieved;
- satisfactory performance, needs support;
- A, B, C; and
- phrases (or rubrics) designed especially for the assessment activity or report.

Whatever assessment code is used, feedback is more effective when combined with comments. There is more likely to be an improvement in achievement when learners are given written feedback rather than marks only. Although marks and percentages are very useful for recording purposes, as it is easy to write marks into a record book, they are often not useful for feedback and reporting. Other problems presented by marks are that they can be aggregated and manipulated and that they hide much about learners' achievement and progress. If learners have completed more than one assessment activity there is a temptation to use the marks arithmetically, to add and to average. When this is done, marks lose their usefulness to feed back information. An average or aggregate mark hides the fact that a learner might have achieved the intended learning well in one aspect but not in another.

Marks give an overall impression of achievement but hide the reasons for the assessment of the achievement (or lack of achievement) from the learner, and prevent a focus on learning something from the assessment. They also do not describe learner progress in the curriculum well. In many cases maintaining the same mark (provided it is a satisfactory one) is regarded as an indication of good progress. A mark of 70 against the Grade 5 Assessment Standards and a mark of 70 against the Grade 6 Assessment Standards disguises completely the progress a learner might have made during the year, which is best described in a statement, code, or comment(s).

National Codes

In recording or reporting on learner achievement in the Learning Outcomes specific to a grade, the following codes are to be used:

- 4** = Learner's performance **has exceeded** the requirements of the Learning Outcome for the grade.
3 = Learner's performance **has satisfied** the requirements of the Learning Outcome for the grade.
2 = Learner's performance **has partially satisfied** the requirements of the Learning Outcome for the grade.
1 = Learner's performance **has not satisfied** the requirements of the Learning Outcome for the grade.

Progression Schedules

At the end of each year, a progression schedule must be completed, and signed by the principal and a departmental official. The progression schedule is a record with summary information about the progress of all learners in the grade in the school.

The progression schedule should include the following information:

- name of the school and school stamp;
- list of learners in each grade;
- codes for progress in each Learning Area (National Coding System);
- codes for progress in each grade (progress to the next grade or stay in the same grade);
- comments on strengths and areas for support in each Learning Area; and
- date and signature of principal, teacher or other educator, and departmental official.

Learner Profiles

A learner profile is a continuous record of information that gives an all-round impression of a learner's progress, including the holistic development of values, attitudes and social development. It assists the teacher in the next grade or school to understand the learner better, and therefore to respond appropriately to the learner. The profile must be safeguarded for every learner and should accompany learners throughout their school careers.

The following kinds of information should be included in a learner profile:

- personal information;
- physical condition and medical history;
- schools attended and record of attendance;
- participation and achievements in extra-curricular activities;
- emotional and social behaviour;
- parental involvement;
- areas needing additional support;
- summative end-of-year overall report; and
- progression summary records of the schooling years.

Notes:

- The learner profile replaces all previous continuous record documents that have been used by schools, such as record cards, tutor cards and Edlab cards. The central purpose of a learner profile is to assist the learner by having access to the variety of information it includes.
- Personal information in a profile should never be used to discriminate unfairly against a learner.
- Learner profiles should not be confused with portfolios. A portfolio is a method of assessment that gives the learner and teacher together an opportunity to consider work done for a number of assessment activities. The work is placed in a folder, file or box. The learner profile, on the other hand, is a record containing information about a learner.

REPORTS

Information to be Included in Reports

Teachers need to be accountable to learners, parents, the education system and the broader community in assessing their learners. This takes place through reporting. In addition to written reports, oral or practical presentations, displays of learners' work and exhibitions might be used.

Every report on a learner's overall progress should include information on:

- the learning achieved;
- the learner's competencies;
- support needed; and
- constructive feedback, which should contain comments about the learner's performance in relation to peers and the learner's previous performance in relation to the requirements of the Learning Areas.

Reporting to parents should be done on a regular basis to encourage their involvement and participation. Teachers must report at the end of each term using formal report cards.

It will usually not be possible to give information on achievement in each Learning Outcome. However, reports should give information on achievement in each of the Learning Areas or Learning Programmes (in the case of the Foundation Phase).

Report Cards

The minimum requirements for a report card are:

1) Basic information

- name of school;
- name of learner;
- grade of learner;
- date of birth of learner;
- year and term;
- date and signature of parent or guardian;
- date and signature of teacher;
- date and signature of principal;
- dates of closing and opening of school;
- school stamp;
- school attendance profile; and
- the explanation of the codes of the national coding system.

2) Strengths and needs

- Give a description of the strengths, developmental needs, or areas of support required by the learner in each Learning Area or Learning Programme.

REFERENCE LISTS

CURRICULUM AND ASSESSMENT GLOSSARY

This is an alphabetical list of key terms used in designing the Revised National Curriculum Statement for Grades R-9 (Schools) and its learner assessment principles.

assessment - a continuous planned process of gathering information on learner performance, measured against the Assessment Standards

Assessment Standards - the knowledge, skills and values that learners need to show to achieve the Learning Outcomes in each grade

baseline assessment - initial assessment used to find out what learners already know

continuous assessment - assessment model that encourages integration of assessment into teaching and the development of learners through ongoing feedback

critical outcomes - together with the Developmental Outcomes, key outcomes of Revised National Curriculum Statement Grades R-9 (Schools), that are inspired by the Constitution; they include core life skills for learners, such as communication, critical thinking, activity and information management, group and community work, and evaluation skills

Curriculum 2005 - the first version of the post-apartheid National Curriculum Statement. That 1997 education policy document gives a framework for Early Childhood Development, General Education and Training, Further Education and Training, and Adult Basic Education and Training. This Revised National Curriculum Statement Grades R-9 (Schools) aims to strengthen Curriculum 2005

developmental outcomes - together with the Critical Outcomes, key outcomes of the Revised National Curriculum Statement Grades R-9 (Schools) that are inspired by the Constitution; they include enabling learners to learn effectively and to become responsible, sensitive and productive citizens

exit-level - when learners complete Grade 9 and are awarded the General Education and Training Certificate

formative assessment - a form of assessment that assesses learner progress during the learning process in order to provide feedback that will strengthen learning

Foundation Phase - the first phase of the General Education and Training Band: Grades R, 1, 2 and 3

General Education and Training Band - the ten compulsory schooling years, made up of the Foundation, Intermediate and Senior Phases

General Education and Training Certificate - the certificate obtained on successful completion of the General Education and Training Band

integration - a key design principle of the Revised National Curriculum Statement Grades R-9 (Schools), that requires learners to use their knowledge and skills from other Learning Areas, or from different parts of the same Learning Area, to carry out tasks and activities

Intermediate Phase - the second phase of the General Education and Training Band: Grades 4, 5 and 6

language of learning and teaching - the language that is most used in a particular learning and teaching environment; some learners experience learning and teaching in an additional language (not their home language)

Learning Areas - the eight fields of knowledge in the Revised National Curriculum Statement Grades R-9 (Schools): Languages, Mathematics, Natural Sciences, Technology, Social Sciences, Arts and Culture, Life Orientation, and Economic and Management Sciences

Learning Area Statements - the statement for each Learning Area that sets out its Learning Outcomes and Assessment Standards

learner profile - an all-round record of a learner's progress, including personal information, social development, support needs, samples of work and annual reports

Learning Programmes - programmes of learning activities, including content and teaching methods; these are guided by the Revised National Curriculum Statement Grades R-9 (Schools) but developed by provinces, schools and teachers

national coding system - a standard national system of performance codes to report on a learner's progress

outcomes - the results at the end of the learning process in outcomes-based education; these outcomes help shape the learning process

outcomes-based education - a process and achievement-oriented, activity-based and learner-centred education process; in following this approach, Curriculum 2005 and the Revised National Curriculum Statement Grades R-9 (Schools) aim to encourage lifelong learning

portfolio - individual file or folder of each learner's work

progression - a key design principle of the Revised National Curriculum Statement Grades R-9 (Schools) that enables the learner to gradually develop more complex, deeper and broader knowledge, skills and understanding in each grade

progression schedules - end-of-year tool for recording the progress of all learners in a grade, including codes for progress in each Learning Area and grade, and comments on support needed

summative assessment - different from formative assessment, as it is about regular reports of a learner's progress, usually at the end of the term or year

TECHNOLOGY LEARNING AREA GLOSSARY

aesthetics – characteristics of a product or system that make it look beautiful and attractive

artefact – a manufactured object

anthropometrics – measurements of people's shapes and sizes. Such measurements are usually taken when products are designed for human use (e.g. furniture, eating utensils, hairdryers, sporting equipment, cars, clothing).

biases – people's preconceived ideas or prejudices about some things or people before they actually meet or deal with them (e.g. in areas like gender, race, ethics, religion, disability)

biophysical environment – the land, air and water around us; the space in which we find ourselves

compression – a squeezing force

constraints – aspects that limit conditions within which the work or solution must be developed (e.g. time, materials, tools, human resources, cost)

control – the means by which systems are regulated; an adjustment of the process which makes the actual result conform more closely to the desired result

conventions – ways of showing information on designs or working drawings that are understood and recognised to have specific meaning

criteria – statements of a particular standard or requirement that a solution must satisfy

data – facts and figures (e.g. population statistics, rainfall figures, temperature readings). Data may be processed into information.

design (noun) – the plan, sketch, model, drawing, etc., that outlines or shows the intention of the proposed solution

design brief – a short and clear statement that gives the general outline of the problem to be solved as well as the purpose of the proposed solutions

design process – a creative and interactive approach used to develop solutions to identified problems or human needs. This is one of the technological processes. Its associated skills are investigate, design (development of initial ideas), make, evaluate and communicate

ergonomics – features of a product or system that make it user-friendly.

findings – things that have been discovered after a process of investigation or research

forming – changing a material's shape without cutting it

information – data that has been processed (e.g. recorded, classified, calculated, stored). Knowledge is gained when different kinds of information are compared and conclusions are drawn.

input – the command or information entered into a system

isometric – a three-dimensional drawing where the lines of sight are set at 30 degrees

machine – a device made up of a combination of simple mechanisms linked so as to form a system for the purpose of doing work

materials – physical substances used in technology (e.g. wood, textiles, fabric, plastic, food)

mechanical advantage – a concept that describes how much easier mechanisms or machines can make a particular task

mechanism – parts that can turn one kind of force into another and give mechanical advantage. Mechanisms can be combined to form a machine. The basic mechanisms are the lever, wedge/screw, cams/cranks and pulleys/gears

mode – the way or manner in which a thing is done

modelling – the testing of a solution (product or system). This could include using small replicas (scale models) and intangible representations of the solution (e.g. mathematical models, computer models).

need – a necessity for basic function (e.g. food)

oblique – a three-dimensional drawing where the lines of sight are set at 45 degrees

opportunity – the chance to do something about a need or a want

orthographic – a type of two-dimensional drawing, usually showing three separate views of the same object (e.g. front, top, left)

output – the actual result obtained from a system

perspective – a three-dimensional drawing in which the lines of sight converge on the horizon

product – the physical or tangible artefact that results from a process (e.g. model, poster, chart)

preserving – a process that prolongs the natural life of a product

problem – something that leads to a need or want and that can give rise to an opportunity

process – the part of a system that combines resources to produce an output in response to input

project portfolio – a systematic and organised collection of a learner's work. It includes findings, successful and unsuccessful ideas, notes on the process that was followed in developing solutions, data, pictures, drawings, and so on.

pulley – a wheel with a groove on its circumference, is used to transmit movement and used with a belt

recycle – reuse all or part of a substance

recyclable – a material that can be recycled

safety – the way that a person works with tools, materials and equipment that causes no physical harm

shaping – a process used to change the shape or contour of materials; involves the removal or addition of material

specification – an organised, detailed description of the requirements or criteria that the solution or product must meet (e.g. safety, size, material, function, human rights, environment)

structure – something that has been built, made or put together in a particular way

system – something that is made up of interlinked parts that function together as a whole to accomplish a goal (e.g. a 'mechanical system' has a combination of mechanisms that make it function as a whole; an 'electrical system' has interrelated electrical parts that work together to make the system do what it was designed to do)

technological capability – the ability to use a combination of skills, knowledge and resources in a variety of contexts to solve a technological problem. Technological capability leads to technological literacy.

technological solution – a plan that arises by using a systematic problem-solving process (e.g. ideas, flowcharts, models)

technological literacy – the ability to use, understand, manage, and assess technology

technological processes – creative human activities of developing technological solutions in order to satisfy human needs and wants (e.g. manufacturing, design, repair, restoration)

tension – a force that stretches an object or material; a pulling force

want – something that people would like but do not actually need (a convenience)